

The cost of social isolation in older people
in the English and Portuguese
National Health Services

Filipa Isabel Trigo Landeiro

Oriel College

University of Oxford

Hilary 2017

D.Phil. Thesis

To Jorge

Acknowledgements

After many sleepless nights, cups of tea, and comforting bowls of homemade soup, I am delighted to have completed five long but fulfilling years of research. It has been quite a journey – at times stressful, at other times uplifting – and I could not have made it here without the help of wonderful people who have kept me inspired, on-track and, most importantly: sane! I cannot fully put my gratitude into words, but, nonetheless, I will try to do so.

First, to my supervisors, Dr José Leal and Professor Alastair Gray, I am deeply thankful for all the teaching, supervision and support you have given me throughout this DPhil. You have both stood by me, not just through the smooth-sailing times, but especially in the bad, stress-inducing moments when I felt like I was going nowhere. Thank you both for believing in my research, and in me. I could not have asked for better supervisors.

I have also received invaluable financial support from my home country of Portugal: I am grateful to my funding bodies, *Fundação Calouste Gulbenkian via Instituto do Envelhecimento – Universidade de Lisboa* and *Fundação para a Ciência e Tecnologia*, without whom this DPhil project would have never happened.

To Professor Manuel Villaverde Cabral and Dr Pedro Alcântara da Silva, whom I consider my mentors, your unconditional support and guidance has meant the world to me. In fact, you were the ones who encouraged me to come to Oxford, and that has changed my

life. A word of thanks also goes to Dr Amílcar Moreira for the advice and support with my application.

To Professors Rita and Henrique Bicha Castelo, I owe rich knowledge passed on to me in several life fields. Thank you for introducing me to the area of healthcare, and for so generously sharing what you know with me.

I also benefitted greatly from the medical knowledge of the clinical body at *Serviço de Cirurgia II* at the *Hospital de Santa Maria*. I cherish all the enlightening conversations I have had with all of you, and can assure you they were very useful to carry on with my research. In alphabetical order, a special thank you goes to Dr Afonso Ramirez, Dr Andreia Barão, Dr Emilia Vieira, Dr João Coutinho, Dr João Malaquias, Dr José Girão, Dr José Rocha, Dr Isidra Cantante, and Dr Rosário Rosa.

I also spent countless hours in discussion with Dr Tânia Fernandes and Dr José Miranda about delayed discharges and social support networks. Thank you both for being so charitable with your time, and for providing on-the-field knowledge about delayed discharges. A word of thanks is also due to the remarkably efficient Cátia Martinho, who managed to help me with numerous administrative tasks with excellence.

I would not have been able to complete this DPhil without the help of Professor Jacinto Monteiro, who graciously allowed this project to be conducted in the Orthopaedics Department at the *Hospital de Santa Maria*. Thank you for your unwavering support, and for the opportunities that you created for me. I am also incredibly indebted to Dr Joaquim

Soares do Brito, who gave so much time – I have lost count! – helping me with data collection, explaining technicalities, and discussing my findings with me. Thank you also to Dr Renata Gomes, Dr Ana Maximiano, and Nurses Clara Alves and Anabela Matos, for the help that you offered me with the identification of patients and data collection.

And, to my friends and colleagues in Oxford, my second home.

To Dr Kassim Javaid, thank you for allowing my study to be conducted as a sub-study of Fracture Free. Your generosity and guidance gave me direction and reassurance. This DPhil was also run, in no small part, on the cake and chocolate provided by Edmarcia Araújo, who was both my research facilitator and friend. Thank you for shouldering the burden with me. You were my best Christmas present ever.

I also owe my thanks to the best recruitment team. In chronological order, Dr Sam Williamson, Dr Thomas McConnell, Dr Ramez Golmohamad, Dr Roshyn Harris, Dr Sam O'Neil, Dr Gunveer Plahe, Dr Dariush Arabian, Dr Asanka Wijendra, Dr Lucy Fulford-Smith, Dr Christopher Rooney, Dr Anuyha Vusirikala, Dr Amarnath Marthi, Dr Lucy Loong, Dr Emily Dobell, Dr Katherine Nichols, Dr Lucy Aquilina, Dr Tae Lee, and Dr Ahmad Saif: thank you for your excellent work, and your amazing recruitment skills!

Dr Ku Shah and Dr Claire Pulford provided clinical support, clarification, and help in setting up my project, and I am most grateful for that. I would also like to thank the assistance of Mr Nuno Baptista and Mr Filipe Oliveira, who facilitated my access to the

Trauma and Orthopaedics Unit. And another word of thanks goes to Mr John McMaster who allowed my study to be conducted in his Unit.

To Dr Premila Webster and Mrs Lesley Maitland, from the Oxford School of Public Health, you sourced for medical doctors to help with the recruitment of patients, and have also been a source of great support and friendship. And to Professor Sasha Shepperd, a very special thank you for your support throughout this DPhil, first as my examiner and then as the director of graduate studies. Also, to Barbara Kitchener for her efficient and prompt help with administrative tasks and her loving and caring friendship.

I am also obligated to the many patients who took part in my study. They helped me without compensation, and I hope that this research, which they contributed to, can help inform future practices and improve healthcare services.

To my fellow DPhil students who embarked on this adventure together with me: James, Liz, Anees, Reem and Ines, the journey was all the better because of you. To Patrícia Ferreira, also a fellow PhD student: you were in another country, but it felt like no distance at all, because you were always present, providing moral support and engaging in long discussions over research with me. Thank you for all the information about the Portuguese National Health Service. It has been a privilege and pleasure to have you by my side.

I owe much to my two amazing statistics gurus, through whom I have learnt a lot, especially about Stata. Seamus Kent and Wei Han, thanks to you, I now know how to

write code, and keep a tidy do-file. I can only say that all those hours you invested in patiently coaching me have paid off in the results of the pages to follow.

My heartfelt appreciation also goes to Dr Ellen Nuttall Musson and Dr Paige Barrows, for all their help in conducting the systematic review on social isolation, and to Kenny Roberts for being the second reviewer of the systematic review on the prevalence and costs of delayed discharges.

I also benefitted from the excellent collaborative approach at the Health Economics Research Centre and other healthcare research centres. Words cannot express my thanks to all the colleagues who took the time to provide feedback and proof read the language on several chapters of this thesis. As per chapter order, I am grateful to Jacqui Murphy, Larry Roope, James Buchanan, Filipe Sardinha, Alexandra Roche, Patrícia Ferreira, Apostolos Tsihristas, Joaquim Soares do Brito, Anthony Palmer, Sam Williamson, Liz Stokes, Helen Dakin, Peter Einbich, Bobby Mihaylova, Seamus Kent, Helena Wace and Katie Walsh.

And, to my friend Kenny Roberts, who does things only a great friend would do for you: thank you so much for proof reading my entire thesis!

My goal was to survive in Oxford, but I have been fortunate to have been able to do much more: I found a family, and the moral support I have received through its warmth has meant just as much to me as the scientific support I was given by my colleagues. To my “Oxford family”, thank you for these five amazing years, for all the spontaneous

kitchen parties, laughter and love: Sarah, Alejandro, Wei, Heu, José, Mir, Laurent, Ragnhild, Joelle, James, Jenaleen, Anees, James, Liz, Kenny, Marisa, Jono, Ines, Seamus, Ai Seon, Olena, Qinrun and Jingyi, you will always have a place in my heart. And to Cheryl, thank you very much for looking after me over the past five years.

And I cannot forget those that were always near, no matter how far you were: Isabel, Duarte, Maricarmen, Silvia, João Paulo, Andreia, Hans, Pedro, Sofia, Ália, José Luís and Maria. Thank you very much for your friendship.

To my parents, Laura and António Landeiro, for all your emotional and financial support throughout these five years. And to my cousins Filipe, Fernanda and João, for being the wonderful people that you are, for always being present in good, and not-so-good times. To them, but also to my uncle Zé António, my aunts Graça and Jú, thank you for being there for my father when I was away.

Finally, I could not possibly end this long list without mentioning my grandparents. They are the reason for my interest in ageing, and the first people to teach me the meaning of active ageing. To my *avô* Diamantino, my *bisavó* Mariana, my *avó* Laura and my *tio-avô* Zé, I truly mean it, when I say that I am the person I am today because of you, because you brought me up, nurturing and instilling all the values that I hold dear. I miss you all terribly, and simply cannot thank you enough. And, lastly, to my *tia-avó* Maria Lucrecia, you inspire me because you live out the philosophy of “ageing well” every day. It is a privilege to have older – and wiser! – people like you in one’s life.

Publications and presentations related to this thesis

Publications

Landeiro F, Leal J, Gray AM. The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs. *Osteoporosis International* 2016; 27(2):737-45. doi: 10.1007/s00198-015-3293-9.

Landeiro F, Barrows P, Nuttall Musson E, Gray AM, Leal J Reducing social isolation and loneliness in older people: a systematic review protocol. *BMJ Open* 2016; 7: e013778 - e013778. doi: dx.doi.org/10.1136/bmjopen-2016-013778.

Landeiro F, Roberts K, Gray AM, Leal J. Delayed hospital discharges of older patients: a systematic review on prevalence and costs. *The Gerontologist* 2017. doi: 10.1093/geront/gnx028 (in press).

Presentations

Landeiro F, Leal J, Gray AM [Oral presentation by FL]. Retrato sócio-funcional das fraturas proximais do fémur. February 2014. IX *Congresso Português de Osteoporose*, Aveiro, Portugal.

Landeiro F, Leal J, Gray AM [Oral presentation by FL]. The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs. July 2014. International Health Economics Association 10th World Congress, Dublin, Ireland.

Landeiro F, Leal J, Gray AM [Poster presentation by FL]. The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs. July 2015. Medical Sciences DPhil Day, Oxford, United Kingdom.

Landeiro F, Leal J, Gray AM [Poster presentation by FL]. The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs. October 2015. Nuffield Department of Population Health Poster Prize Competition, Oxford, United Kingdom.

Landeiro F, Leal J, Gray AM [Oral presentation by FL]. The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs. October 2015. 14^a *Conferência Nacional de Economia da Saúde*, Lisbon, Portugal.

Landeiro F, Roberts K, Gray AM, Leal J [Oral presentation by FL]. The impact of delayed discharges amongst the elderly: a literature review. October 2015. 14^a *Conferência Nacional de Economia da Saúde*, Lisbon, Portugal.

Landeiro F, Kent S, Gray AM, Javaid MK, Leal J [Discussion paper]. Delayed hospital discharges and social isolation among elderly hip fracture patients in England. January 2016. Health Economics Study Group meeting, Manchester, United Kingdom.

Landeiro F, Leal J, Gray AM [Poster presentation by FL]. The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs. January 2016. Nuffield Department of Population Health Symposium, Oxford, United Kingdom.

Landeiro F, Leal J, Gray AM [Oral presentation by FL]. The impact of social isolation on delay hospital discharges of older hip fracture patients and associated costs. June 2016. Nova Healthcare Initiative Open Day – *Universidade Nova de Lisboa*, Lisbon, Portugal.

Landeiro F, Gray AM, Leal J [Oral presentation by FL]. Delayed discharges and social isolation in countries with an ageing population: England versus Portugal. June 2016. XXXVI *Jornadas de Economía de la Salud*, Murcia, Spain.

Landeiro F, Kent S, Javaid MK, Shah K, Pulford C, Gray AM, Leal J [Poster presentation by FL]. Delayed hospital discharges and social isolation among elderly hip fracture patients in England. July 2016. European Health Economics Association conference 2016, Hamburg, Germany.

Landeiro F, Kent S, Javaid MK, Shah K, Pulford C, Gray AM, Leal J [Poster presentation by FL]. Delayed hospital discharges and social isolation among elderly hip fracture patients in England. October 2016. Nuffield Department of Population Health Poster Prize Competition, Oxford, United Kingdom.

Landeiro F, Gray AM, Leal J [Poster presentation by FL]. Delayed discharges and social isolation in countries with an ageing population: England versus Portugal. October 2016. 12th Congress of the European Union Geriatric Medicine Society, Lisbon, Portugal.

Landeiro F, Gray AM, Leal J [Poster presentation by FL]. Delayed discharges and social isolation in countries with an ageing population: England versus Portugal. January 2017. Nuffield Department of Population Health Symposium, Oxford, United Kingdom.

Abstract

The cost of social isolation in older people in the English and Portuguese National Health Services

Filipa Landeiro, Oriel College
D.Phil. in Public Health
Hilary 2017

In this thesis I explore the impact of social isolation on delayed hospital discharges of older proximal femoral fracture (PFF) patients in Portugal and in England, and estimate the costs associated with these delays. A delayed discharge occurs when a patient remains in hospital after being deemed medically fit for discharge, and a better understanding of them will help when designing policies to reduce them and improve the allocation of scarce healthcare resources.

Although the literature reports that delayed hospital discharges are prevalent and costly, I found limited knowledge about the impact of pre-admission patient characteristics, including social isolation, on these delays; the significant variability in prevalence of delayed discharges, which could be better understood if estimated by disease area; and the costs associated with such delays.

To address these knowledge gaps, I assessed the impact of social isolation, measured with a validated tool, on delayed hospital discharges in older patients using two case studies: PFF patients admitted to the Hospital de Santa Maria (HSM) in Portugal and to the John Radcliffe Hospital (JRH) in England. My research showed that social isolation is a predictor of the number of days of delayed hospital discharges. However, whereas in Portugal the number of days of delayed discharges increased progressively with the level of social isolation, in England no such dose-response relationship was observed, indicating that any social isolation leads to delayed discharge but the level of social isolation has little effect.

The costs of delayed discharges were found to be significant in both countries. Preventing delayed discharges could have led to a €2,352 saving in hotel costs per PFF patient with a delay in discharge in Portugal, and £2,328 in England. When extrapolated to a national level, the annual costs of delayed discharges were estimated to vary between 5.4% and 11.2% of total acute inpatient costs for PFF patients aged 75 and above in Portugal, and between 2.9% and 4.4% of total acute inpatient costs for PFF patients aged 70 and above in England.

Two interventions aiming at alleviating social isolation were identified through a systematic review and were incorporated in the delayed discharge models at the HSM and the JRH. The case studies show potential for these interventions to reduce the number of days of delayed discharge.

Table of contents

Acknowledgements	iii
Publications and presentations related to this thesis	ix
Publications	ix
Presentations	ix
Abstract	xiii
Table of contents	xiv
List of tables	xx
List of figures	xxii
List of abbreviations	xxiv
Chapter 1 : Introduction.....	1
1.1 Rationale for the thesis	1
1.2 Case studies.....	5
1.3 Thesis aims and objectives	7
1.4 Structure of the thesis	8
1.5 Contribution to the literature	10
1.6 Conclusion	12
Chapter 2 : Delayed discharges of older patients from acute hospitals: what do we know?.....	13
2.1 Introduction	13
2.2 Background to delayed discharges of older patients from acute hospitals	13
2.3 Systematic review of the literature on prevalence, costs, and impact of social isolation on delayed hospital discharges	15
2.3.1 Methods	16
2.3.2 Results	20
2.3.3 Discussion.....	37
2.3.4 Limitations.....	41
2.4 Conclusion	43
Chapter 3 : Health and long-term care services for ageing populations in Portugal and England.....	45
3.1 Introduction	45

3.2 Ageing populations and their health and long-term care needs	45
3.2.1 Demographic changes worldwide	46
3.2.2 Provision of health and long-term care services for ageing populations.....	48
3.2.3 Population ageing and health: provision of health and long-term care services in Portugal and England	54
3.3 Proximal femoral fractures	79
3.3.1 Fractures.....	79
3.3.2 Discharge process in Portugal and England	83
3.4 Conclusion	86
Chapter 4 : Delayed discharges in proximal femoral fracture patients at the Hospital de Santa Maria	88
4.1 Introduction	88
4.2 Delayed discharges at the Hospital de Santa Maria	89
4.3 Data collection and analysis	89
4.3.1 Study design, setting and participants.....	89
4.3.2 Ethics approval and consent.....	90
4.3.3 Data collection.....	90
4.3.4 Resource use	91
4.3.5 Costs	92
4.3.6 Statistical analysis.....	95
4.4 Results of the Hospital de Santa Maria case study	100
4.4.1 Study population	100
4.4.2 Predictors of delayed discharges	107
4.4.3 Number of days of delayed discharges.....	108
4.4.4 Costs of delayed discharges.....	110
4.5 Discussion of the results.....	112
4.5.1 Main findings and interpretations	112
4.5.2 Strengths and limitations	116
4.5.3 Policy implications.....	118
4.6 Conclusions	118
Chapter 5 : Delayed discharges of proximal femoral fracture patients at the John Radcliffe Hospital.....	120
5.1 Introduction	120
5.2 Delayed discharges at the John Radcliffe Hospital	120

5.3 Data collection and analysis	122
5.3.1 Study design, setting and participants.....	122
5.3.2 Ethics approval and consent.....	123
5.3.3 Data collected.....	123
5.3.4 Resource use	124
5.3.5 Costs	125
5.3.6 Statistical analysis.....	126
5.4 Results	130
5.4.1 Study population	130
5.4.2 Probability of having a delayed discharge	135
5.4.3 Number of days of delayed discharges.....	136
5.4.4 Costs of delayed discharges.....	138
5.5 Discussion.....	142
5.5.1 Main findings and interpretations	142
5.5.2 Strength and limitations of the study	144
5.5.3 Comparisons with other studies	146
5.5.4 Other considerations	147
5.6 Conclusions	148
Chapter 6 : Delayed discharges and social isolation: a tale of two countries.....	149
6.1 Introduction	149
6.2 Defining the terms for the comparison on delayed discharges and respective costs between the two countries	150
6.2.1 Comparing days of delayed discharge in proximal femoral fracture patients	151
6.2.2 Costs of proximal femoral fractures and delayed discharges	152
6.3 Results.....	158
6.3.1 Baseline characteristics of the two samples.....	158
6.3.2 Days of delayed discharge in proximal femoral fracture patients	163
6.3.3 Costs of proximal femoral fractures and delayed discharges in Portugal and England	169
6.3.4 Costs of delayed discharges in proximal femoral fracture patients in Portugal and England.....	170
6.4 Considerations on the comparison of the results of the two studies and extrapolation of costs to a national level.....	171
6.4.1 On the number of days and costs of delayed discharges.....	171
6.4.2 On strengths and limitations of these results.....	177
6.4.3 Additional considerations.....	180

6.5 Conclusions	183
Chapter 7 : Alleviating social isolation in older people – a systematic review on effectiveness of interventions.....	185
7.1 Introduction	185
7.2 Systematic review of interventions aimed at alleviating social isolation.....	186
7.2.1 The concept of social isolation	186
7.2.2 Risk factors for social isolation	186
7.2.3 Interventions to alleviate social isolation	187
7.2.4 Objectives of the meta-analysis.....	188
7.2.5 Methodology	188
7.2.6 Results	196
7.2.7 Discussion of the results of the meta-analysis.....	216
7.3 Conclusion	223
Chapter 8 : Can delayed discharges be reduced by alleviating social isolation?	224
8.1 Introduction	224
8.2 Can interventions to alleviate social isolation reduce delayed discharges?	225
8.2.1 Methods	226
8.2.2 Results	232
8.2.3 Discussion.....	235
8.3 Conclusion	241
Chapter 9 : Conclusion	242
9.1 Introduction	242
9.2 Overview of the thesis findings	242
9.3 Challenges of this research.....	244
9.4 Limitations of this research	246
9.5 Implications of this research	249
9.5.1 Contribution to health economics and other fields	249
9.5.2 Generalisability of the findings	250
9.5.3 Policy and practical implications	251
9.6 Future research	252
9.7 Concluding remarks.....	255
List of references	257
Appendix 1: Search syntax used in systematic review on prevalence and costs of delayed discharges	277

Appendix 2: Data extraction pro-forma for the systematic review on prevalence and costs of delayed discharges.....	282
Appendix 3: List of references included in the systematic literature review on prevalence and costs of delayed discharges	286
Appendix 4: Data from studies included in the systematic literature review on prevalence and costs of delayed discharges	291
Appendix 5: Detail of covariates included in the meta-regression on the prevalence of delayed discharges	301
Appendix 6: Quality assessment of each reference included in the systematic review on prevalence and costs of delayed discharges	305
Appendix 7: Demographic drivers of population ageing in Portugal and the United Kingdom	309
Appendix 8: Summary of legislation and guidance related to delayed discharges in England.....	315
Appendix 9: Proximal femoral fractures: anatomy and treatment.....	319
Anatomy	319
Fractures	320
Appendix 10: Letters of approval to conduct the study at the Hospital de Santa Maria	326
Appendix 11: Case report form for the Hospital de Santa Maria.....	328
Appendix 12: Social and clinical information form	341
Appendix 13: Logistic regression models on the occurrence of delayed discharges at the Hospital de Santa Maria.....	343
Appendix 14: Negative binomial regression models on the occurrence of delayed discharges at the Hospital de Santa Maria	344
Appendix 15: Fracture Free Study protocol	345
Appendix 16: Approval letter from the Ethics Committee	360
Appendix 17: Baseline case report form for the Fracture Free Study	362
Appendix 18: Social and clinical information form	374
Appendix 19: Logistic regression models on the occurrence of delayed discharges at the John Radcliffe Hospital	376
Appendix 20: Log-gamma GLM regression models on the occurrence of delayed discharges at the John Radcliffe Hospital	377
Appendix 21: Negative binomial regression models on the number of days of delayed discharges at the HSM and the JRH	378

Appendix 22: Search syntax used in systematic review on interventions to alleviate social isolation 379

Appendix 23: Data extraction Pro-forma for the systematic review on interventions to alleviate social isolation..... 384

Appendix 24: Features of the studies in the systematic review on interventions to alleviate social isolation..... 388

Appendix 25: Quality assessment of the studies included in the systematic review on interventions to alleviate social isolation 391

Appendix 26: Sensitivity analysis for all interventions to alleviate social isolation 394

Appendix 27: Sensitivity analysis for group based interventions to alleviate social isolation..... 396

Appendix 28: Sensitivity analysis for non-technological interventions to alleviate social isolation..... 397

List of tables

Table 1: Summary of the characteristics of the studies included in the review	22
Table 2: Study timeframe by study design.....	23
Table 3: Criteria used to determine delayed discharges	26
Table 4: Summary statistics of the proportion of delayed discharges for the whole sample	27
Table 5: Summary statistics for the proportion of delayed discharges for studies conducted in the UK.....	30
Table 6: Univariate and multivariate random effects logistic models.....	32
Table 7: Mean cost per delayed discharge, USD 2011.....	34
Table 8: Internal and external causes of delayed hospital discharges	35
Table 9: Percentage of healthy life years at birth and people having a long-standing illness or health problem in Portugal and the UK (2005-2014).....	50
Table 10: Percentage of the population aged 65 and above reporting being limited in basic and instrumental activities of daily living in 2014	51
Table 11: Total number of hospital beds, length of hospital stay, acute care bed occupancy rate and proportion of delayed discharges in Portugal and United Kingdom (2000-2014)	59
Table 12: Public expenditure on long-term care in Portugal and the UK (2004-2014)	66
Table 13: Total number of beds and places in EDCCIs team in the RNCCI in 2015	68
Table 14: Number of places available in care homes in the UK in 2010	74
Table 15: Number of places available in care homes in the independent sector in the UK (1987-2010)	75
Table 16: Unit costs used to estimate the costs of hip fractures and delayed discharges	95
Table 17: Coding of the variables included in the analysis	97
Table 18: Socio-economic and health characteristics of the patients	101
Table 19: LOS, length of medically-necessary stay and days of delayed discharges by level of social isolation	104
Table 20: Logistic regression model on the occurrence of delayed discharge	108
Table 21: Negative binomial regression model on the number of days of delayed discharge	110
Table 22: Costs incurred by patients waiting for a bed in a publicly-funded rehabilitation unit while in a temporary setting (n=19) (Euros, 2013)	112
Table 23: Coding of the variables included in the analysis	128
Table 24: Socio-economic and health characteristics of the sample patients	131
Table 25: LOS, length of medically-necessary stay and days of delayed discharges by level of social isolation	133
Table 26: Delayed discharge by level of social isolation and discharge destination.....	135

Table 27: Univariate and multivariate logistic regression model on the occurrence of delayed discharge	136
Table 28: Univariate and multivariate log-gamma GLM on the number of days of delayed discharges.....	138
Table 29: Costs for total LOS (including A&E) and delayed discharges	141
Table 30: Criteria used to determine medical fitness for discharge at the HSM and the JRH	151
Table 31: Estimated number of hip fractures in Portugal in 2013 by age group and gender.....	154
Table 32: Excess bed day costs calculated using the FCE HRGs for the JRH sample	156
Table 33: Socio-demographic characteristics of sample patients recruited from HSM and JRH	158
Table 34: Results of the LSNS questions on family and friends	161
Table 35: Clinical characteristics and discharge destination of sample patients recruited from HSM and JRH	162
Table 36: LOS and delayed discharges for PFF patients at the HSM and the JRH	165
Table 37: Negative binomial regression models on additional days of delayed discharge for PFF patients at the HSM and the JRH	168
Table 38: Description of the interventions used in the studies	198
Table 39: Costs of interventions	202
Table 40: Characteristics of participants in social isolation intervention studies and the cohort studies at the HSM and the JRH	227
Table 41: Mean LSNS and mean number of days of delayed discharge pre- and post-interventions for the cohorts at the HSM and the JRH	232

List of figures

Figure 1: PRISMA flow chart	21
Figure 2: Number of studies by year of publication	24
Figure 3: Number of studies by level of quality and study design	25
Figure 4: Proportion of delayed discharges by type of study (box plot)	28
Figure 5: Proportion of delayed discharges by country (box plot)	29
Figure 6: Proportion of delayed discharges by type of ward (box plot)	30
Figure 7: Proportion of delayed discharges by criteria used to determine delayed discharges (box plot).....	31
Figure 8: Percentage of the population aged 60 years or over by world region (1950-2050)	47
Figure 9: Three hypothetical trajectories of physical capacity	49
Figure 10: Number of years of healthy life lost due to disability per 100,000 population, and top 10 health conditions associated with disability, in populations aged 60 years and older in 2012	53
Figure 11: Total expenditure on health as a percentage of the Gross Domestic Product (1995-2014)	54
Figure 12: Percentage of public and private expenditure of total health expenditure in Portugal and United Kingdom (1995-2014)	56
Figure 13: Current health expenditure by function in 2014	58
Figure 14: Percentage of the population aged 65 and above living alone, by NUTS level 2 region, in 2011.....	64
Figure 15: Total number of beds in the RNCCI (2006-2015)	68
Figure 16: Number of places available in publicly-funded and private care homes, day care centres and domiciliary care services in Portugal (2000-2015)	70
Figure 17: Rate of use of long-term care by older people by municipality in Portugal in 2014	71
Figure 18: Long-term care expenditure by support setting in England in 2015-2016 (£ thousands).....	73
Figure 19: Adult social care market trends, September 2010 to August 2016	77
Figure 20: Net change in nursing home beds in England between December 2013 to April 2015 compared with April 2015 to August 2016	78
Figure 21: Kernel density plot of days of delayed discharges by level of social isolation	105
Figure 22: Kernel density plot of days of delayed discharges by level of social isolation	134
Figure 23: Level of social isolation of the patients at the HSM and the JRH	159
Figure 24: Average marginal effects of social isolation on predicted days of delayed discharge	169

Figure 25: PRISMA flow diagram	197
Figure 26: Forest plot for all studies.....	205
Figure 27: Funnel plot for all studies.....	207
Figure 28: Forest plot for studies looking at group interventions only	209
Figure 29: Forest plot for studies looking at one-to-one interventions only	211
Figure 30: Forest plot for studies looking at a mix of one-to-one and group interventions	212
Figure 31: Forest plot for studies looking at technological interventions versus standard care	213
Figure 32: Forest plot for studies looking at non-technological interventions versus standard care	215

List of abbreviations

A&E	Accident and Emergency
ACSS	<i>Administração Central do Sistema de Saúde, I.P.</i>
ADL	Activity of Daily Living
ADSE	<i>Direção-Geral de Proteção Social aos Trabalhadores em Funções Públicas</i> (health subsystem for civil servants)
AEP	Appropriateness Evaluation Protocol
AIC	Akaike's Information Criterion
APES	<i>Associação Portuguesa de Economia da Saúde</i>
AMR	Arithmetic Mean Ratio
AMT	Abbreviated Mental Test
ANOVA	One-way Analysis of Variance
BA	Uncontrolled Before-and-After Study
BADL	Basic Activity of Daily Living
BIC	Bayesian's Information Criterion
BRIICS	Brazil, Russia, India, Indonesia, China and South Africa
CASSR	Council with Adult Social Service Responsibility
CBA	Controlled Before-and-After Study
CCI	Charlson Comorbidity Index
CH	Churchill Hospital
CI	Confidence Interval
CHLN	<i>Centro Hospitalar Lisboa Norte, E.P.E.</i>
CFR	Case Report Form

COPD	Chronic Obstructive Pulmonary Disease
DRG	Diagnostic Related Group
EDCCI	<i>Equipas Domiciliárias de Cuidados Continuados Integrados</i> (domiciliary integrated continuous care teams)
ERPI	<i>Estruturas Residenciais para Pessoas Idosas</i> (care homes)
EU	European Union
FCE	Finished Consultant Episode
GDP	Gross Domestic Product
GLM	Generalised Linear Model
HESG	Health Economics Study Group
HRG	Healthcare Resource Group
HRG4+	2013/2014 Casemix Grouper Software
HSM	<i>Hospital de Santa Maria</i>
IADL	Instrumental Activity of Daily Living
ICD-10	International Classification of Diseases and Related Health Problems (10 th revision)
IMD	Index of Multiple Deprivation
INE	<i>Instituto Nacional de Estatística, I.P.</i>
IRR	Incidence Risk Ratio
JRH	John Radcliffe Hospital
LOS	Length of hospital stay
LSNS	Lubben Social Network Scale
LTC	Long-Term Care
NEADLS	Nottingham Extended Activity of Daily Living Scale

NHFD	National Hip Fracture Database
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NOC	Nuffield Orthopaedics Centre
NTPS	National Tariff Payment System
NRCT	Non-randomised Controlled Trial
OECD	Organisation for Economic Co-operation and Development
OPCS-4	Classification of Surgical Operations and Procedures (version 4)
OUH Trust	Oxford University Hospitals NHS Trust
PFF	Proximal Femoral Fracture
PPP	Purchasing Power Parity
PRISMA	Preferred Reporting Item for Systematic Reviews and Meta-Analyses
RCT	Randomised Controlled Trial
RNCCI	<i>Rede Nacional de Cuidados Continuados Integrados</i> (national continuous care network)
SAD	<i>Serviço de Apoio Domiciliário</i> (domiciliary care service)
SAD	<i>Serviço de Assistência na Doença</i> (health subsystem for the police)
SAMS	<i>Serviços de Assistência Médico Social</i> (health subsystem for banking and insurance employees)
SD	Standard Deviation
SE	Standard Error
SMD	Standardised Mean Difference
UN	United Nations
UK	United Kingdom

USD	United States Dollars
WHO	World Health Organisation

Chapter 1 : Introduction

1.1 Rationale for the thesis

In this thesis I explore the impact of social isolation in older people on the consumption of healthcare resources, more precisely, on the inappropriate use of acute hospital beds due to delays in discharge, and estimate the costs associated with these delays. A delayed hospital discharge occurs when a patient remains in hospital after being deemed medically fit for discharge. Understanding what drives delayed hospital discharges is important from a health economics, gerontology and health policy perspective, as it could inform the devising of policies that would result in a more efficient allocation of scarce healthcare resources. With this in mind, the aim of this chapter is, therefore, to explain why delayed hospital discharges are an important topic of research and the focus of this thesis. This chapter describes how delayed hospital discharges represent a significant burden to healthcare systems, and why, for economic, administrative, and humanitarian reasons they are perceived as a major challenge. The patient characteristics that have been associated with these delays are presented and the gaps in knowledge, which in turn provide the rationale for this thesis, are identified.

With the number of acute hospital beds being reduced in almost all healthcare systems¹, there is an increasing need to make more efficient use of the existing beds and one way to achieve this is to reduce the average length of hospital stay (LOS). Studies conducted in a variety of populations suggest that long LOS is due not only to acute medical needs but also to other non-clinical factors that can create delays in the discharge of patients²⁻⁴.

The literature identifies older people as the main population at risk of a delayed hospital discharge⁵, especially those with complex health and social needs^{6,7}. People aged 60 years or over accounted for 11.7% of the total world population in 2013, a figure which is projected to rise to 21.1% by 2050, with those aged 80 years or over expected to increase from 1.7% to 4.1% of the total⁸. Such demographic changes present a great challenge to healthcare services, with spending expected to increase further as the number of older people grows and demand for healthcare services rises⁸⁻¹¹. This segment of the population has the highest rate of chronic illnesses and long-term disabilities requiring care¹², which makes them the greatest consumers of health and social care services. In developed countries, older people already consume around half to two-thirds of the total acute hospital bed days¹³⁻¹⁵. A rapidly ageing population and an increasing number of people with complex long term conditions, such as dementia and stroke, has led to concerns being raised about a rise in inappropriate use of acute hospital beds by older patients whose needs would be better attended in facilities with a lower level of care, such as community hospitals, care homes, or even their own homes^{6,16}. However, this population is facing increasing rates of social isolation, which may be contributing to longer LOS in acute hospitals due to lack of support networks. Social isolation in older people has detrimental effects on health^{17,18}, having been identified as a risk factor for all-cause morbidity and mortality¹⁹, with outcomes comparable to smoking, obesity, lack of exercise and high blood pressure²⁰. It has also been associated with decreased resistance to infection^{21,22}, cognitive decline and mental health conditions (such as depression and dementia)²⁰, increased emergency admission to hospital²³ and longer length of stay in acute hospitals²⁴.

When a patient is occupying a bed for longer than necessary, colloquially known as “bed blocking”, it can have a variety of far-reaching consequences; it consumes scarce resources that could be used to benefit other patients, leads to cancellation of elective surgical procedures and longer waiting lists, and blocks emergency admissions²⁵. Furthermore, there is an opportunity cost associated with beds occupied by delayed discharge patients equal to the health gain arising were these beds instead used to treat patients requiring acute hospital services²⁶. In some healthcare systems this opportunity cost may be monetary as well as health-related, with hospitals failing to gather sufficient reimbursement to cover their variable costs for delayed discharge patients²⁶. Delivering acute services to patients who no longer need them, often with inadequate compensation, is unsatisfactory to clinicians and managers²⁶.

Delays in the discharge of older people from hospitals are associated with a detrimental effect on patients’ health²⁷: patients affected are likely to experience more iatrogenic complications and adverse events due to their prolonged hospitalisation²⁸, such as phlebitis, urinary tract infections, diarrhoea, drug reactions, confusion, depression, fractures, hospital borne infections, and acute renal failure²⁹⁻³². Moreover, older people frequently experience an often irreversible functional decline during hospitalisation that can lead to further morbidity and disability³³⁻³⁶. Longer hospital stays are also associated with a higher probability of being admitted to a care home, or even death, after discharge³⁷ and, from a psychosocial perspective, prolonged hospital stays are associated with an increase in the level of social isolation or the development of dependent relationships³⁸. Whilst waiting for a transfer to a lower level of care, patients may also suffer setbacks and consequently need further acute treatment²⁷. Therefore, reducing

delayed discharges could contribute to a decrease in the incidence of adverse outcomes such as functional decline, nursing home admission and in-hospital mortality. The level of care that patients with delayed discharge receive in an acute hospital setting is not appropriate to their needs and could be detrimental to their physical and mental health.

Delayed discharges from acute hospitals have been a cause of concern worldwide for the last forty years^{39,40}. However, despite efforts to reduce its prevalence, delayed discharge of older people is still a persistent problem. Delayed discharges are therefore becoming an increasingly pressing problem; despite acute hospital services constituting the costliest component of healthcare budgets, many acute hospital beds are still inappropriately occupied by older patients who are medically fit for discharge but are unable to be transferred back to the community^{4,41,42}.

Several factors have been found to contribute to delayed hospital discharges, and based on a grounded theory approach to the literature¹⁶ these have been grouped into individual factors, organisational factors, and factors associated with wider social policy and the structure of current services. In terms of individual factors, these have been divided into three groups: predisposing factors (e.g. age and gender); vulnerability factors (e.g. pathologies, physical and mental disabilities); and enabling factors (e.g. social isolation and availability of a caregiver)⁶. Although individual enabling factors have been recognised as potential determinants of delayed hospital discharges in older patients, no study to date has assessed the impact of social isolation, measured with a validated tool, on delayed hospital discharges. This thesis aims to fill that knowledge gap.

Hence, in this thesis I explore how social isolation, measured with a validated instrument, impacts on delayed hospital discharges in two countries with different social support network, continuing care, community care and social care structures for older people, and estimate the costs associated with these delays. The following section introduces two case studies, which were informed by data collected on patients with proximal femoral fractures (PFFs), both through interviews and data extraction from medical records, and which included patients with cognitive decline and hearing/speaking impairments. The use of these two case studies enabled cross country comparisons.

1.2 Case studies

PFFs, also known as hip fractures, occur mainly in older people and are the most common reason for admission to an orthopaedic trauma ward⁴³. The diagnosis of a PFF is clearly defined and is made very soon after the patient presents to accident and emergency (A&E). Because this is a condition with a clearly defined treatment, it is amenable to direct comparisons between hospitals providing care to PFF patients⁴⁴, and this makes it an excellent case study for the exploration of the methods within this thesis. Chapter 3 provides a detailed description of PFFs and respective health and social care pathways in each country.

PFF is associated with a significant loss of mobility, and in most cases patients who were completely independent or had only a minor level of dependency prior to the fracture will be severely or entirely dependent on others, even when fit for discharge from acute care⁴⁵. This sudden increase in the level of dependency of the patients will be reflected in

their care needs upon discharge from the acute hospital, making their social support networks extremely important when it comes to post-acute care.

In order to analyse the impact of social support networks on the discharge patterns of PFF patients, a hospital was chosen in each of two countries where the role of the family in the provision of care for older people is believed to differ: Portugal and England⁴⁶.

In Portugal, the chosen hospital was the *Hospital de Santa Maria* (HSM) in Lisbon, a public-funded university hospital which together with *Hospital Pulido Valente* constitutes the *Centro Hospitalar Lisboa Norte, EPE*ⁱ (CHLN). These hospitals provide acute care to a catchment population of approximately 373,000 inhabitants and HSM also acts as a tertiary centre⁴⁷. HSM is the hospital within CHLN where patients with a PFF are treated.

In England, the chosen hospital was the John Radcliffe Hospital (JRH) in Oxford, also a public-funded university hospital which, together with the Churchill Hospital, the Nuffield Orthopaedic Centre and the Horton General Hospital, constitutes the Oxford University Hospitals NHS Foundation Trust (OUH Trust). The OUH Trust hospitals in Oxford serve a population of 655,000 and the JRH is the major trauma centre for the Thames Valley region, and therefore the hospital to which patients with PFFs are referred to in the Oxford region⁴⁸.

ⁱ *Entidade Pública Empresarial*

Both the CHLN and the OUH Trust are comprised of acute hospitals only and they are not vertically integratedⁱⁱ with non-acute care hospitals. For all the above reasons, the HSM and the JRH were judged to be appropriate to conduct the research necessary for this thesis.

1.3 Thesis aims and objectives

In this thesis I aim to answer the following research question: what is the impact of social isolation on delayed hospital discharges and what are the costs associated with these delays? The primary hypothesis of this thesis is that social isolation is an important determinant of delayed hospital discharges, as patients with poorer social support networks will have more difficulty in returning to the community after hospital discharge. This hypothesis will be tested in two countries with different social support structures for older people, namely Portugal and England, by collecting and analysing data from two studies I designed which aimed to estimate the main individual factor influencing delayed hospital discharges. Four key objectives underlie this research question:

1. To estimate the number of days of delayed discharges and the level of social isolation of older patients admitted to the HSM and the JRH with a PFF;
2. To assess the impact of social isolation on delayed discharges;
3. To estimate the costs of these delays for this specific patient population; and,
4. To explore how delayed discharges can be reduced through alleviation of social isolation.

ⁱⁱ Vertical integration focuses on networks and groups at different stages of care within the health economy (what some commentators refer to as the supply chain or care pathway) and might involve, for instance, the drawing together of a hospital with local community services.

1.4 Structure of the thesis

This thesis has nine chapters. This section provides a synopsis of each of the chapters.

Chapter 2

In Chapter 2 I provide the background to the thesis by presenting a systematic review of the literature which evaluates the prevalence and costs of delayed discharges worldwide. I also present a meta-analysis assessing the factors that have an impact on delayed discharges. I then focus on a critical assessment of the main causes of delayed discharges, especially regarding how individual patient characteristics, such as the level of social isolation, impact on unnecessary hospital stays. Finally, I conclude the chapter by describing how the results of this review will be used to address the main research question of the thesis. A manuscript related to this work was accepted for publication in a peer-reviewed gerontology journal.

Chapter 3

In Chapter 3 I provide an overview of the health and social care systems in Portugal and England. The comparison focuses on provision and accessibility of services and respective funding mechanisms. I then describe the PFF pathology and the health and social care pathways for PFFs in both countries.

Chapter 4

In Chapter 4 I provide information on the case study conducted at the HSM in Lisbon, Portugal. I begin the chapter by describing my data collection process in this hospital. I then present evidence on the proportion of delayed discharges in PFF patients and their

level of social isolation. I describe the results of the analysis of the factors influencing delayed discharges in these patients, including social isolation, and estimate the costs associated with these delays. A paper related to this work was published in a peer-reviewed orthopaedics journal.

Chapter 5

In Chapter 5 I present the case study conducted at the JRH in Oxford, England. I begin the chapter by describing the methodology used to collect data in this hospital and then present the proportion of delayed discharges for PFF patients and their level of social isolation. I describe the factors influencing delayed discharges, including social isolation, and evaluate the costs associated with these delays.

Chapter 6

In Chapter 6 I present a comparison of the Portuguese and English case studies, described in Chapters 4 and 5 respectively, including an analysis of how social isolation affects delayed discharges in both cases. I then extrapolate the results of these two studies to a national level, and estimate the number of days of delayed discharges and the costs of delayed discharges in PFF patients for both the Portuguese and English National Health Services (NHSs).

Chapter 7

In Chapter 7 I present a description of interventions that have proven to be effective in alleviating social isolation. This description is informed by a systematic review and meta-

analysis. A paper related to this work was accepted for publication in a peer-reviewed medical journal.

Chapter 8

In Chapter 8 I use interventions aiming at alleviating social isolation identified in Chapter 7 to estimate by how much delayed discharges could be reduced through alleviation of social isolation using the Portuguese and English models described in Chapters 4 and 5.

Chapter 9

In Chapter 9 I conclude the thesis by providing an overview of the main findings of the previous chapters, in terms of the impact of social isolation on delayed hospital discharges, and by discussing how these delays can be tackled at a patient level through prevention or alleviation of social isolation. I outline the challenges faced when conducting this research and highlight the research limitations. I then consider the wider implications of this research, focusing on the contribution of this project to the fields of health economics, health policy and gerontology, and the generalisability and practical implications of the results for policy makers. Finally, I discuss the scope for future research to build on these findings.

1.5 Contribution to the literature

In this thesis I estimate the impact of social isolation on delayed hospital discharges using an objective and validated tool to measure social isolation. This is the first study to do so. Furthermore, while previous studies have estimated proportions of delayed discharges in orthopaedics wards (either alone²⁵ or in conjunction with other surgical and medical

wards^{7,49-53}), to the best of my knowledge no other study has looked specifically at delayed discharges in patients with PFFs, a condition which affects mostly older people and is significantly disabling. In this thesis I report on two cohort studies in this subgroup of patients, conducted during a one year period in order to account for seasonal fluctuations (e.g. the “winter bed crisis”). The data for these studies were collected through questionnaires filled in together with the patients or their next of kin (in order to include patients with hearing/speaking impairments and patients with temporary or permanent cognitive impairment). The data collected via questionnaires were complemented with data collected from medical records. By conducting these analyses in two different countries with significant social and cultural differences in terms of provision of family support in the care of older people, it was possible to examine the impact of social isolation on delayed discharges across different settings.

This thesis will contribute to three fields of research: health economics, health policy, and geriatrics and gerontology. The contribution to the health economics field will be made through the two costing studies based on the PFF patient data collected at the HSM and the JRH, which will play an important role in informing decisions about service provision and resource allocation. The contribution to the health policy, geriatrics and gerontology fields will be made, firstly, in terms of informing how individual patient factors have an impact on delayed hospital discharges in older people and, therefore, on the unnecessary consumption of healthcare resources, and, secondly, by providing evidence on which health promotion interventions can reduce social isolation in older people and how they can impact on delayed discharges.

1.6 Conclusion

This chapter provided an introduction to the thesis. The rationale and objectives of the thesis were presented and the contribution that this thesis will make to the literature was described.

Chapter 2 : Delayed discharges of older patients from acute hospitals: what do we know?

2.1 Introduction

This chapter provides a background to delayed discharges in an international context, analysing their impact in terms of resource consumption (e.g. how many unnecessary days patients are spending in hospital) and associated costs. A meta-regression of covariates influencing the proportion of delayed discharges is conducted and a descriptive overview of how individual patient factors, particularly social isolation, impact on delayed discharges, is provided. The chapter concludes by describing how the research gaps identified in this literature review will be addressed in this thesis to answer its main research questions: what is the impact of social isolation on delayed hospital discharges and what are the costs associated with these delays?

2.2 Background to delayed discharges of older patients from acute hospitals

Delayed discharges from hospital are a longstanding international policy concern as they represent an inefficient use of hospital beds and are an indicator of failings in patient-centred, effective and integrated care. Several authors have quantified the extent of this issue in older people^{4,41,54-56}, reporting on the number of bed days lost to delayed discharges or the number of days of delayed discharges as a proportion of total length of stay (hereafter referred to as the “proportion of delayed discharges”). These data indicate the extent to which acute hospital resources are being inappropriately spent on

the care of older people who could benefit more from other types of health and social care, and they allow us to estimate the economic impact of delayed discharges.

The underlying causes of delayed discharges identified in previous literature reviews^{16,57,58} still persist. At an individual level, over-reliance on informal support is observed⁴⁵ and the specific needs of certain patient groups (e.g. treatment of mental health issues) remain unaddressed⁵⁹. At an organisational level, delays in the provision of services such as diagnostic tests and interventions still impact on delayed discharges^{2,60}; lack of assessment and planning for discharge continues to happen^{3,61}; and inadequate notice of discharge or consultation with patients and carers is still reported^{42,62}. At a structural level, poor communication between healthcare and social care, and between acute care and intermediate care persists⁶³, and the provision of statutory services is still insufficient^{45,64}.

Some countries, such as Sweden, Norway, and England, have introduced policies to tackle the structural causes of delayed discharges. These measures may have reduced the number of days of delayed discharges in Nordic countries^{56,65}, but some controversy about the effectiveness of these measures, especially the Community Care Act⁶⁶, remains in England⁶⁷. This reinforces the idea that local factors play an important role in reducing delayed discharges, and that a whole-system approach could yield greater benefits^{16,63,68,69} than current practice.

A literature review of studies conducted in the United Kingdom (UK) before the introduction of the Community Care Act 2003⁶⁶ reported that the proportion of delayed

discharges varied between 8% and 66% depending on the study location, the type of participants included, and the methodology used¹⁶. Other reviews have identified policies for reducing delayed discharges⁵⁷, evaluated the appropriateness of instruments used to assess delayed discharges, assessed the impact of available appropriate facilities for patients at discharge⁵⁸, and assessed the effectiveness of planning the acute hospital discharge of patients⁷⁰. However, these reviews were either limited to the UK^{16,57} or did not quantify the number of delayed discharges^{58,70}, and none of these reviews estimated the economic costs of these delays. In addition, although the level of social isolation of older inpatients has been identified as a factor that could be a major cause of delayed discharges^{40,71}, the impact of this factor has not been evaluated in previous reviews.

There is, therefore, considerable uncertainty regarding the resources consumed by delayed discharges worldwide, the costs of these delayed discharges to healthcare systems, and the impact of social isolation on delayed discharges. In order to address these research gaps, a review of the relevant literature was conducted. This review is described in section 2.3.

2.3 Systematic review of the literature on prevalence, costs, and impact of social isolation on delayed hospital discharges

This section describes the methods and results of a systematic literature review which aimed to examine:

- The proportion of delayed discharges of older people worldwide, including synthesising the results of published studies on the proportion of delayed discharges to identify the main factors associated with them;
- The economic impact of delayed discharges on healthcare systems;
- The impact of the social isolation of older inpatients on unnecessary hospital stays.

2.3.1 Methods

Search strategy

The literature searches were undertaken in Medical Literature Analysis and Retrieval System Online (Medline), Excerpta Medica dataBASE (Embase), Global Health, CAB Abstracts, Econlit, Web of Knowledge, EBSCO – Cumulative Index to Nursing and Allied Health Literature (CINAHL), The Cochrane Library, Health Management Information Consortium, and SCIE – Social Care Online. The selection of databases and the specification of search strategies (described in Appendix 1) were undertaken in conjunction with an information specialist. Search terms were identified by reviewing the terminology employed in relevant papers and the keywords used in a previous literature review on this specific subject¹⁶. The chosen search strategy was broad in order to avoid missing any relevant studies, hence no language restrictions were applied. The searches were undertaken in February 2015 and were limited to studies published from 1990 onwards to ensure that the results of the review were relevant to the present setting. The reference lists of relevant papers and previous literature reviews were searched manually to ensure that all relevant studies were included. Searches were also carried out on the internet sites of the British and Portuguese health economics associations – Health

Economics Study Group (HESG) and *Associação Portuguesa de Economia da Saúde* (APES), respectively – in order to retrieve conference papers on delayed discharges of older patients.

Study selection criteria

The inclusion criteria used to identify relevant studies were as follows:

- Study populations were inpatients in acute hospitals;
- Mean age of the sample population was 65 years or older;
- Data were reported on either the number of days of delayed discharges or the proportion of delayed discharges;
- Studies were comparative (randomised controlled trials and non-randomised studies), or observational studies (cross-sectional studies, cohort studies, case-control studies and using administrative healthcare databases);
- Journal articles, theses and conference papers were included.

ENDNOTE X7, Thomson Reuters, was used to manage the references. Duplicates were removed and each abstract was assessed to determine whether full text review was needed. The full text of potentially eligible studies was then retrieved and assessed for final inclusion. A second reviewer (Kenny Roberts) independently assessed a randomly selected sample of 10% of the references (528 references). Any disagreements were resolved through discussion between the two reviewers. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed.

Data extraction

Data from each included study was recorded in a data extraction proforma designed for this analysis (Appendix 2). A second reviewer (Kenny Roberts) also extracted data from a random sample of the included studies. Any disagreements were resolved through discussion between the two reviewers.

The main outcomes analysed were: 1) the proportion of total discharges that were delayed; and 2) the mean cost of delayed discharges per patient. Costs were inflated to 2011 prices, where required, using the World Bank Gross Domestic Product (GDP) deflator for each country⁷² (healthcare sector inflation data were not consistently available across countries). Costs were then converted into United States Dollars (USD) using annual average currency exchange rates for the year 2011^{73,74} and adjusted using the Purchasing Power Parity (PPP) method⁷⁵.

Data was also extracted on study characteristics, including the study location, design, timeframe, sample size and the wards in which the study was conducted.

Quality assessment

A quality appraisal of each study was performed independently and a second reviewer (Kenny Roberts) assessed the quality of a sample of studies included. The quality of randomised controlled trials was assessed using the Jadad scale⁷⁶. The quality of cohort, cross-sectional and quasi-experimental studies was assessed using the Newcastle-Ottawa scale⁷⁷ questionnaire for cohort type studies, on the assumption that this could also be applied to cross-sectional and quasi-experimental studies. Case-control studies were

assessed using the case-control questionnaire of the Newcastle-Ottawa scale. Overall quality was defined using previous methodology⁷⁸.

Statistical analysis

The proportion of delayed discharges was summarised as a weighted mean, where the weights were proportional to the sample size. When studies had more than one observation, these data were considered separately.

A meta-regression was used to estimate the impact of relevant variables on the proportion of delayed hospital discharges. A logistic random effects model was used, accounting for within and between-study variation, in which the data on the proportion of delayed discharges reported in each study was assumed to vary randomly around an overall mean⁷⁹. This approach combines the meta-analysis of the proportion of days of delayed discharge out of all hospital stay from different studies (accounting for within study variation), with the logistic regression to estimate the proportion of delayed discharges conditional on study covariates.

Four covariates were examined:

- Mean age of the sample participants – this covariate aims to assess whether older age is associated with delayed discharges;
- Definition of delayed discharge used – the Appropriateness Evaluation Protocol (AEP) is a tool used to assess the appropriateness of hospital stay. In order to determine whether using this tool yields significantly different effects from using

other measures of delayed discharges, this covariate was categorised as use of AEP or derivatives⁸⁰ versus other definitions);

- Main type of funding of the country's health system – in order to determine to what extent the type of funding of a country's healthcare system impacts on delayed discharges, this covariate was categorised as tax funded versus social or private insurance; and,
- Existence of co-payment for inpatients – this covariate aims to assess if the existence of a co-payment for inpatients in the country where the study was conducted has an impact on delayed discharges.

Univariate and multivariate logistic regressions were conducted. A covariate was judged to be significant if $p < 0.05$. This analysis was carried out in STATA version 12 (StataCorp. LP, College Station, United States of America).

2.3.2 Results

Figure 1 describes the flow of studies through the review. The database searches identified 3,038 unique references. Manual screening of titles and abstracts identified 146 potentially relevant references, for which full text was obtained in order to identify those which fully met the inclusion criteria. Fifty-three references were included in the review. The reference lists of these 53 references were searched for additional studies, as well as the reference lists of previously published literature reviews. Eleven additional studies were identified, which led to a final set of 64 included in this review. Appendix 3 lists the studies included in the review and Appendix 4 describes the data extracted for each study.

Figure 1: PRISMA flow chart

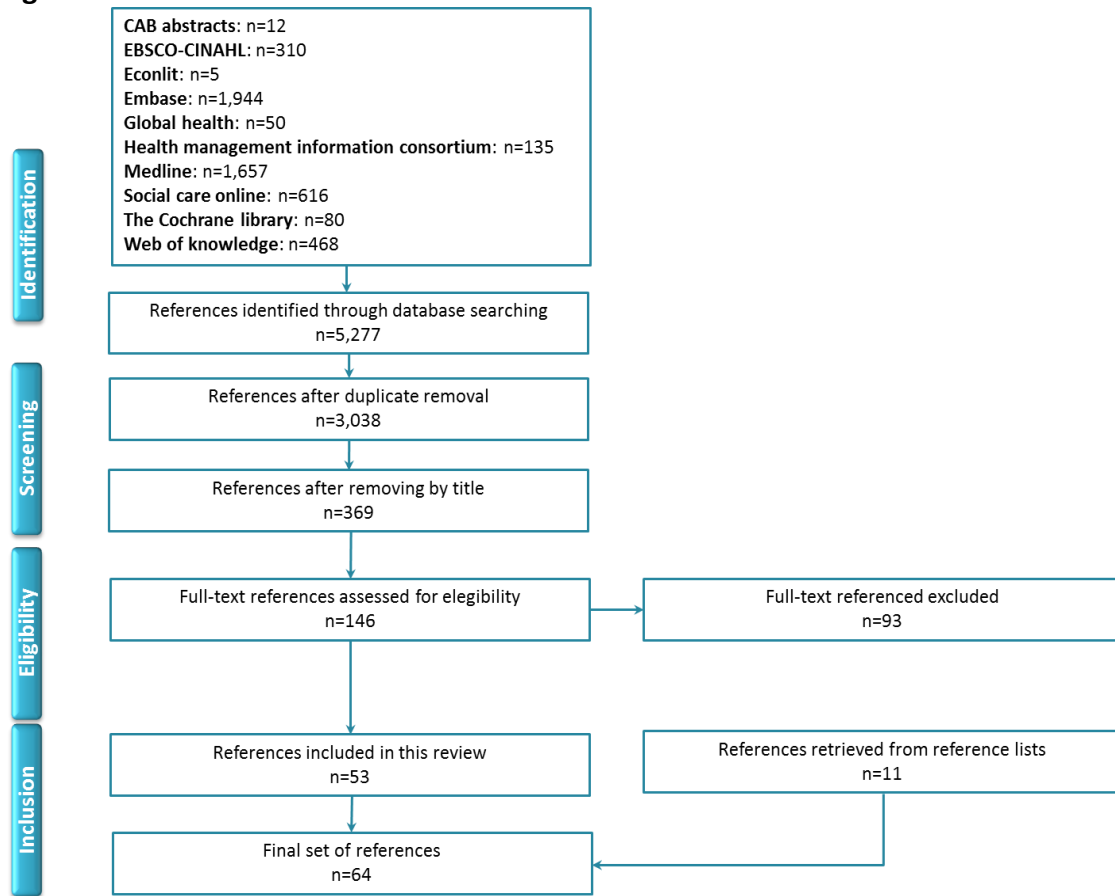


Table 1 summarises the characteristics of all of these studies. Most were either cohort (62.5%) or cross-sectional studies (26.5%). Most studies were conducted in Europe (18 (28.1%) in Great Britain, eight (12.5%) in Spain, seven (10.9%) in Italy and 13 (20.3%) in other countries) and in North America (seven (10.9%) in Canada and four (6.3%) in the USA). In most of these countries healthcare services are primarily tax funded, however it should be noted that delayed discharges also occur in countries where healthcare services are mainly funded by private insurance (Appendix 5).

Table 1: Summary of the characteristics of the studies included in the review

Study characteristics	Number (%)
Study design	
Randomised controlled trial	1 (1.6%)
Quasi-experimental study	4 (6.2%)
Case-control study	1 (1.6%)
Cohort study	40 (62.5%)
Cross-sectional study	17 (26.5%)
Study using administrative data	1 (1.6%)
Country	
Canada	7 (10.9%)
Cuba	1 (1.6%)
France	1 (1.6%)
Ireland	1 (1.6%)
Israel	3 (4.7%)
Italy	7 (10.9%)
Mexico	1 (1.6%)
The Netherlands	4 (6.3%)
New Zealand	1 (1.6%)
Portugal	1 (1.6%)
Singapore	1 (1.6%)
Sweden	2 (3.1%)
Switzerland	4 (6.3%)
Spain	8 (12.5%)
United Kingdom	18 (28.1%)
United States of America	4 (6.3%)
Type of centre	
Single centre	45 (70.3%)
Multi-centre	18 (28.1%)
Information not available	1 (1.6%)
Type of ward	
Medical and surgical	26 (40.6%)
Medical wards	30 (46.9%)
Surgical wards	4 (6.2%)
Psychiatric wards	3 (4.7%)
Information not available	1 (1.6%)

Forty-five studies (70.3%) were conducted in single centres, while 18 (28.1%) were multicentre within a single country. Thirty studies (46.9%) were conducted in medical wards and 26 (40.6%) in both medical and surgical wards.

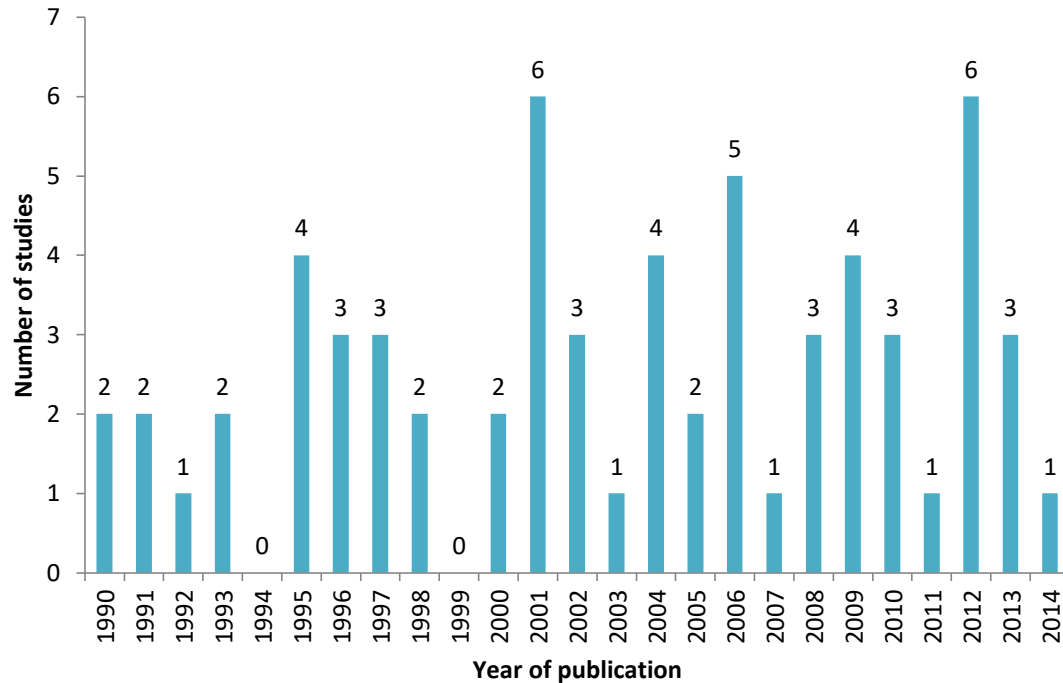
Study timeframe varied considerably by study design (**Table 2**). The time frame of analysis for cohort studies ranged between two weeks and three years. Thirteen of the 40 cohort studies (32.5%) took a one year timeframe and seven studies (17.5%) lasted three months. Nine of the seventeen cross-sectional studies (52.9%) were one-day point-prevalence surveys. The quasi-experimental studies lasted between 21 days and one year. The case-control study analysed delayed discharges over a six month period. The data collection for the randomised controlled trial lasted one year. The study using administrative data also examined one year of data.

Table 2: Study timeframe by study design

Study timeframe	Study design					
	Randomised controlled trial	Quasi-experimental study	Case-control study	Cohort study	Cross-sectional study	Study using administrative data
1 day	n.a.	n.a.	n.a.		9 (14.1%)	n.a.
> 1 day and < 1 month	n.a.	1 (1.6%)	n.a.	2 (3.1%)	6 (9.4%)	n.a.
≥ 1 month and < 3 months	n.a.	1 (1.6%)	n.a.	4 (6.3%)	n.a.	n.a.
≥ 3 months and < 6 months	n.a.	1 (1.6%)	n.a.	9 (14.1%)	1 (1.6%)	n.a.
≥ 6 months and < 1 year	n.a.	1 (1.6%)	1 (1.6%)	5 (7.8%)	n.a.	n.a.
1 year	1 (1.6%)	n.a.	n.a.	13 (20.3%)	1 (1.6%)	1 (1.6%)
≥ 1 year	n.a.	n.a.	n.a.	7 (10.9%)	n.a.	n.a.

The majority of the studies (n=45; 70.3%) were published after 1999. **Figure 2** shows the studies grouped by publication year.

Figure 2: Number of studies by year of publication

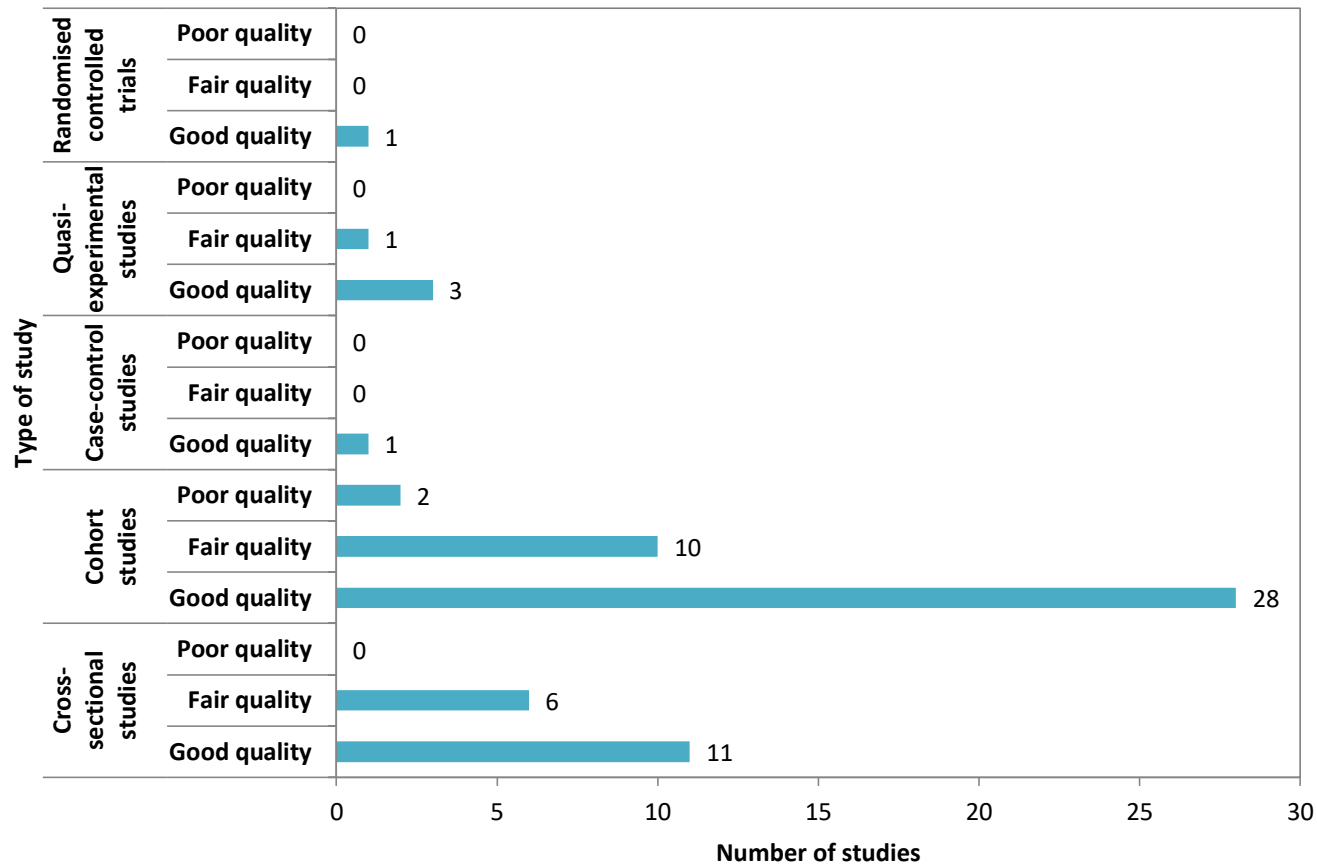


Quality assessment

The quality of all studies was assessed (except for the study using administrative data⁶⁷). Appendix 6 summarises the quality of each study, while **Figure 3** describes the quality of studies by study design. In general, the quality of the studies included in this review was high with a mean quality score of 84.9% (median: 89.0%). The mean quality score for quasi-experimental studies was 89.0% (median: 89.0%), for cohort studies was 86.0% (median: 89.0%), and for cross-sectional studies was 81.0% (median: 89.0%). Two cohort studies (3.1%) were found to be of low quality, mainly due to the lack of information

provided on the assessment and analysis of the outcome of interest, with one being published as letter to the editor⁸¹.

Figure 3: Number of studies by level of quality and study design



Criteria to determine delayed discharges

Various criteria were used to determine delayed discharges, which fell into five categories (**Table 3**). Twenty-three studies (35.9%) considered that a patient's discharge was delayed if they remained in hospital after being declared medically fit for discharge, though only five of these studies specified the criteria used for determining medical fitness for discharge^{41,42,59,62,82}. Thirteen studies (20.3%) determined delays by estimating when patients could be benefiting from a lower level of medical care. Two studies (3.1%)

allowed for a specific time period to elapse after the patient was deemed medically fit for discharge (e.g. 24 hours after the patients were declared fit for discharge and three days had passed since certain criteria were met) in order for transport to be in place, medication to be ready and necessary preparations for discharge to be completed. Finally, 22 studies (34.4%) used the AEP or derivatives, such as the Oxford Bed Study Instrument⁸³ to assess the appropriateness of admission and subsequent hospitalisation days.

Table 3: Criteria used to determine delayed discharges

Parameters	Number of studies	Study (year of publication)
Remained in hospital after being declared medically fit for discharge	23	Becchi (2010); Benson (2006); Bryan (2006); Carey (2005); Chin (2001); De Bey (2004); Edirimanne (2010); Epstein (2001); Falcone (1991); Foer(2012); Gallagher (2008); Hanif (2008); Hendy (2012); Lewis (2006); Lenzi (2014); Mendoza-Giraldo (2012); Meschi (2004); Mohamed (2001); Panayiotou (1995); Panero (2013); Rockwood (1990); Styrborn (1993); Tadros (2011)
Patients could benefit from lower level of care	13	Chen (2012); Costa (2012); De Coster (2005); Fillit (1993); Hermans (1995); Ingold (2000); Koffman (1996); Koffman (1996); McClaren (1991); Merom (1998); Namdaran (1992); Van Straten (1997); Victor (1990)
Allow for a minimum time period between medically fit and actual discharge date	2	Jasinarachchi (2009); Mayo (1997)
No criteria provided	4	Brown (2010); Godden (2009); Hayee (2001), Styrborn (1995)
AEP or derivatives	22	Barisonzo (2013); Bianco (2006); Caminiti (2013); Choppard (1998); DeCoster (1997); Fenn (2000); Kossovsky (2002); Majeed (2012); Monteis Catot (2007); Mould-Quevedo (2009); Moya-Ruiz (2002); Paillé-Ricolleau (2008); Paldi (1995); Panis (2002); Rodríguez-Vera (2003); Sáez(2004); San Román (2009); Suárez-García (2001); Vieira (2006); Villalta (2004); Vuadens (1996); Zambrana-García (2001)

Proportion of delayed discharges

Table 4 displays information on the proportion of delayed discharges for the studies reporting it. The weighted mean was 22.8% for the 39 studies (seven studies had more than one observation) reporting both proportion of delayed discharges and sample size, and the arithmetic mean was 29.1% for the 42 studies (10 studies had more than one observation) reporting proportion of delayed discharges, with an interquartile range of 21.8%. The minimum proportion of delayed discharges of 1.6% was observed by Godden (2009) who used administrative English data to assess whether the Community Care Act⁶⁶ reduced delayed discharges during the period 2006-2007. These data included patients of all ages in any type of ward in the National Health Service (NHS). McClaran⁸⁴ reported the maximum proportion of delayed discharges of 91.3%, which was observed in a population of chronic older patients in the Montreal General Hospital, Canada.

Table 4: Summary statistics of the proportion of delayed discharges for the whole sample

Summary statistics	
Minimum	1.6%
25 th percentile	17.1%
Arithmetic mean (n)	29.1% (52)*
Weighted mean (n)	22.8% (46)**
75 th percentile	38.9%
Maximum	91.3%

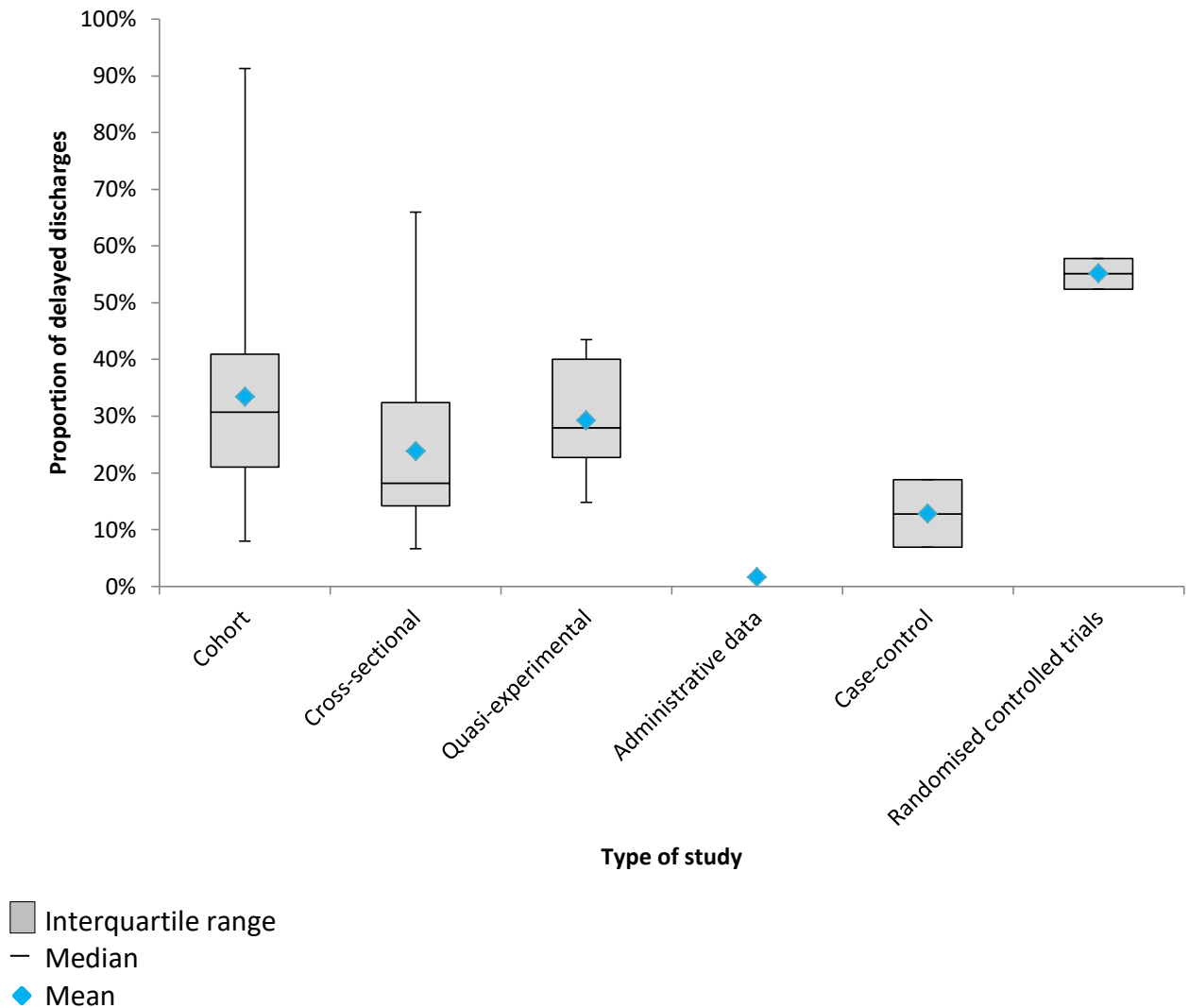
* Ten studies had more than one observation

** Seven studies had more than one observation

The range in the proportion of total discharges that were delayed remained wide when the studies were aggregated by design (**Figure 4**). Observational studies (i.e. cross-sectional studies and cohort studies) had a higher variation than experimental studies

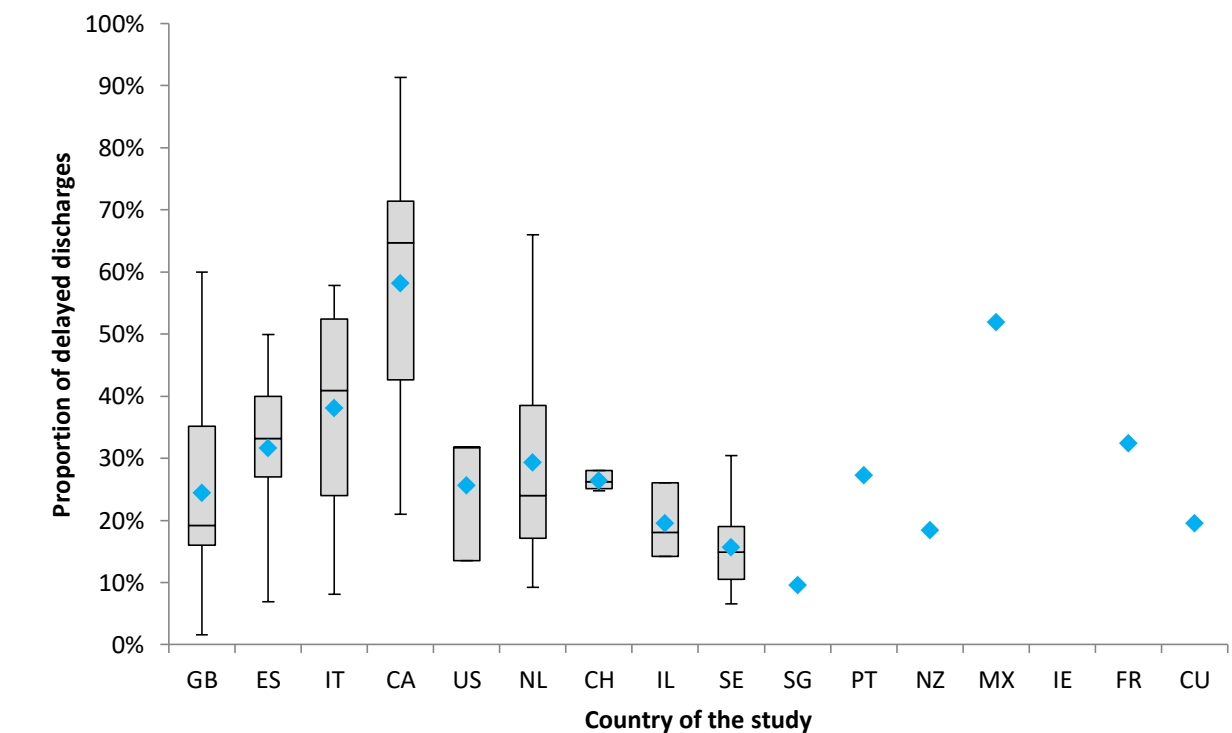
(i.e. quasi-experimental studies and randomised controlled trials), but there were fewer of the latter studies.

Figure 4: Proportion of delayed discharges by type of study (box plot)



Wide variation in the proportion of delayed discharges was also observed within countries, with a range of 58.4% in the UK, 43.0% in Spain, 49.7% in Italy, 70.3% in Canada, and 56.8% in the Netherlands (Figure 5).

Figure 5: Proportion of delayed discharges by country (box plot)



■ Interquartile range
 — Median
 ◆ Mean

Country code: CA– Canada; CH– Switzerland; CU– Cuba; ES– Spain; FR– France; GB– United Kingdom; IE– Ireland; IL– Israel; IT– Italy; MX– Mexico; NL– The Netherlands; NZ– New Zealand; PT– Portugal; SE– Sweden; SG– Singapore; US– United States of America

The proportion of delayed discharges in the UK was assessed separately, as this is the country where the highest number of studies has been conducted (14 studies) (**Table 5**). The proportion of delayed discharges in English studies varied between 1.6%⁶⁷ and 60.0%⁸⁵ (in a cross-sectional study conducted in an acute hospital in which data were collected for patients aged 65 and over), with an interquartile range of 21.8%. The weighted mean was 23.1%, which is very close to the arithmetic mean of 24.4%.

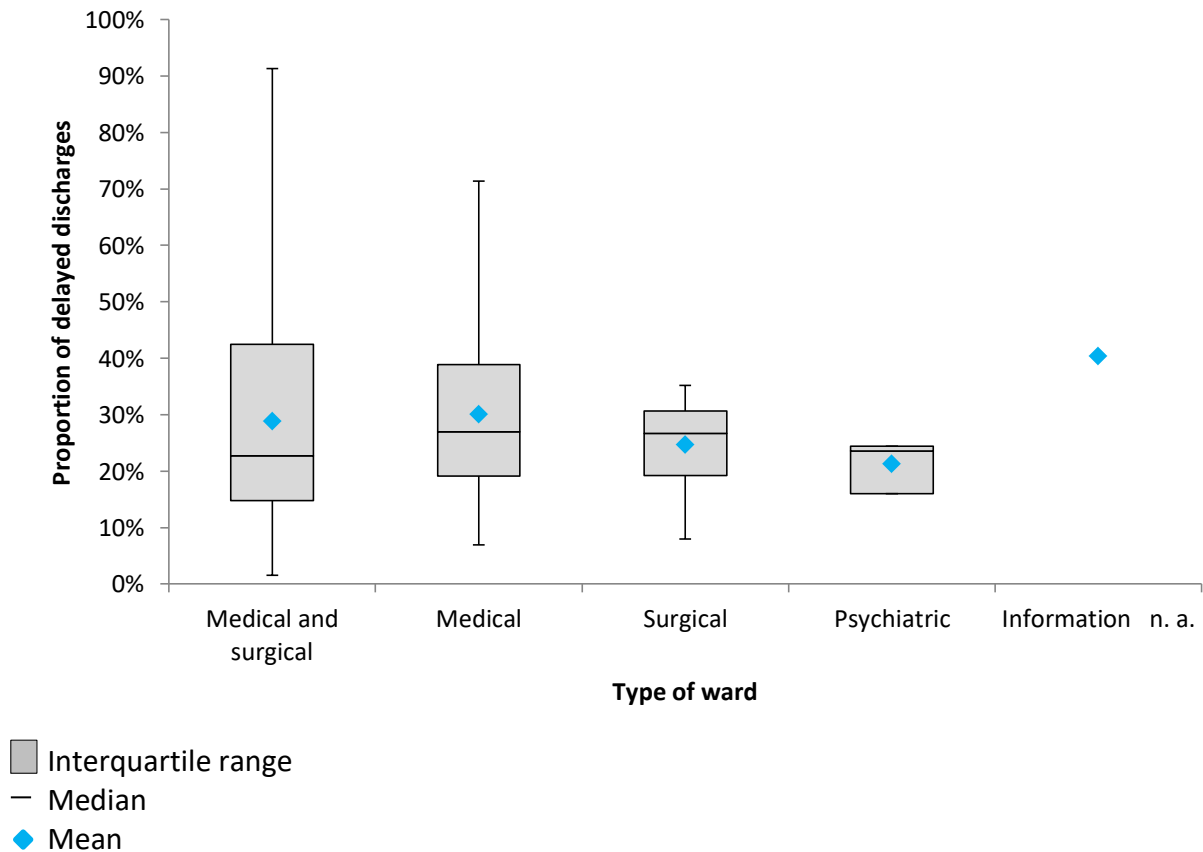
Table 5: Summary statistics for the proportion of delayed discharges for studies conducted in the UK

Summary statistics	
Minimum	1.6%
25 th percentile	16.2%
Arithmetic mean (n)	24.4% (14)*
Weighted mean (n)	23.1% (12)*
75 th percentile	31.1%
Maximum	60.0%

* One study had two observations

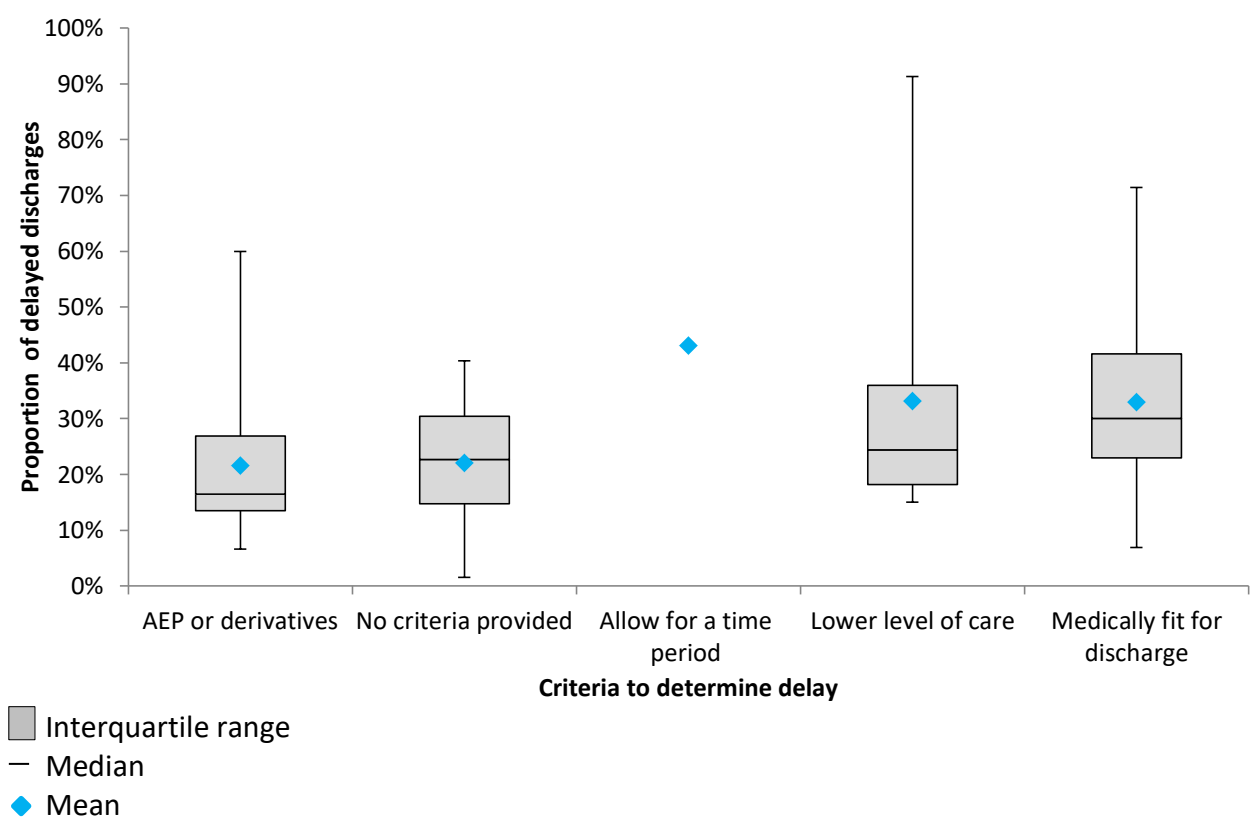
Figure 6 describes how the proportion of delayed discharges varied by type of ward in the whole sample. A wide variation was observed in studies conducted in medical only wards and medical and surgical wards. The variation was smaller in surgical only wards and in psychiatric wards, but there were fewer studies conducted in these wards.

Figure 6: Proportion of delayed discharges by type of ward (box plot)



The proportion of delayed discharges also varied within studies using similar criteria to determine when a delayed discharge had occurred (**Figure 7**).

Figure 7: Proportion of delayed discharges by criteria used to determine delayed discharges (box plot)



Meta-regression

Seventy-one observations from 50 studies were synthesised, corresponding to a total of 190,593 days of delayed discharge out of 463,679 hospitalisation days. Individual study detail of the covariates included in the meta-regression is presented in Appendix 5. No factor was found to be significantly associated with the proportion of delayed discharges in either the univariate or multivariate analysis (**Table 6**). Common to all univariate

analyses was a considerable degree of variation between studies, reflected in the large standard deviation (SD).

Table 6: Univariate and multivariate random effects logistic models

	Number of observations	Univariate Odds ratio (95% CI)	Multivariate Odds ratio (95% CI)
Mean age of participants	45	0.99 (0.95-1.02)	0.71 (0.38-1.32)
Between-study SD		0.92	-
AIC		2,700	-
BIC		2,705	-
Criteria used to determine delayed discharge	71		
Other criteria	36	1.00	1.00
AEP or derivative	35	1.22 (0.74-2.01)	0.85 (0.46-1.58)
Between-study SD		0.88	-
AIC		4,076	-
BIC		4,083	-
Existence of co-payment	71		
No co-payment	45	1.00	1.00
Co-payment	26	0.89 (0.53-1.49)	1.01 (0.55-1.84)
Between-study SD		0.89	-
AIC		4,077	-
BIC		4,084	-
Funding of health system	71		
Tax funded	49	1.00	1.00
Social/private insurance	22	0.70 (0.41-1.19)	0.60 (0.33-1.10)
Between-study SD		0.88	-
AIC		4,075	-
BIC		4,082	-
Number of observations in the multivariate model			45
Between-study SD		-	0.86
AIC		-	2,703
BIC		-	2,714
Wald χ^2			3.65 (p=0.456)

CI: Confidence interval; AIC: Akaike's Information Criterion; BIC: Bayesian Information Criterion; SD: Standard deviation

Cost of delayed discharges

Ten studies (15.6%) provided estimates of the costs of delayed discharges, three of which were based on UK populations. The unit costs of delayed discharges were obtained from

single hospitals/trusts in five studies, from national reference cost databases in four studies, and in one study no information about sources was given. The mean cost per delayed discharge was estimated for each study where possible, and these costs are reported in **Table 7**. The studies with information on mean costs per delayed discharge (n=9, 14.1% of the final set) were mostly cohort studies (n=8), with one quasi-experimental study. The mean cost per delayed discharge was USD 7,324 (median: USD 2,790), ranging from USD 154 to USD 31,935, including only hospitalisation costs.

Table 7: Mean cost per delayed discharge, USD 2011

Author (Year)	Country	Mean days of delayed discharges per patient with a delay	Source of unit cost	Daily cost of a bed (USD)	Mean cost per delayed discharge (USD)	Mean cost per delayed discharge (USD PPP adjusted)
Sáez (2004)	Cuba	3.4	Own hospital/trust costs (hospitalisation day)	45	154	482
Mould-Quevedo (2009)	Mexico	2.2	Own hospital/trust costs (hospitalisation day)	231	508	823
Chin (2001)	Singapore	4.6	Own hospital/trust costs (hospitalisation day)	227	1,104	1,561
Hendy (2012)	UK	4.4	National reference costs (excess bed day)	417	1,847	1,647
Styrborn (1995)	Sweden	12.7	National reference costs	345	2,790	2,054
Epstein (2001)	Israel	10.6	Own hospital/trust costs (hospitalisation day)	476	5,031	4,569
Koffman (1996)	UK	20.7	Unknown	499	10,317	9,199
Hanif (2008)	UK	26.1	Own hospital/trust costs (hospitalisation day)	468	12,233	10,908
Foer (2012)	USA	17.0	National reference costs	1,879	31,935	31,935
Mean		11.3			7,324	7,020
Median		10.6			2,790	2,054
Interquartile range		12.6			9,212	7,638
Mean absolute deviation		6.9			7,225	6,885

The study conducted in Cuba had the lowest mean cost per delayed discharge whereas the study conducted in the USA had the highest mean cost, reflecting differences in not only the daily cost of a bed but also the mean duration days of delayed discharges.

Causes of delayed discharges: the impact of social isolation

The reasons for delayed discharges have been attributed to internal and external hospital factors (**Table 8**).

Table 8: Internal and external causes of delayed hospital discharges

Causes of delayed discharges		Number of studies (%)
Internal hospital factors	Patients waiting for diagnostic or therapeutic procedures	27 (41.5%)
	Patients waiting for specialised consultations	17 (21.2%)
	Problems in scheduling tests or surgery	16 (24.6%)
	Unspecified in-hospital factors	9 (13.8%)
	Ineffective discharge planning	7 (10.8%)
	Extremely conservative line of treatment	5 (7.7%)
	Physicians undecided about discharge disposition of a patients	5 (7.7%)
	No work at the hospital in certain days/time of the day	4 (6.2%)
	Existence of planned discharge without written orders	2 (3.1%)
	Inappropriate admissions	1 (1.5%)
	Team errors	1 (1.5%)
External hospital factors	No bed availability in care home or rehabilitation units	51 (78.5%)
	Patient and/or family resolution	21 (32.3%)
	Delays in assessment of patient's future care needs and identification of appropriate settings	19 (29.2%)
	Delays in activating domiciliary care	16 (24.6%)
	Funding issues	9 (13.8%)
	Waiting for transport	8 (12.3%)
	Social issues	7 (10.8%)
	Transfer to another hospital	7 (10.8%)
	Need for caregiver training	2 (3.1%)

Thirty-two studies (50%) examined the impact of a combination of external and internal hospital factors on delayed discharges, and the majority attributed the highest number of days of delayed discharges to external factors.

Studies by Barisonzo², Chin⁸², Edirimanne⁴, Meschi⁸⁶ and Mohammed²⁵ reported that, respectively, 6.7%, 19.8%, 3.0%, 18.4% and 5.5% of all delayed discharges were attributable to social issues but did not specify these further. Epstein⁵⁰, Gallagher⁸⁷, Ingold⁷¹, Koffman⁸⁸, Moya-Ruiz⁸⁹, Paldi⁹⁰, Rockwood⁹¹, Villalta⁹² and Zambrana-Garcia⁹³ also reported social/family problems as a reason for delays but did not quantify their impact. Bryan⁶⁴ found that 17.2% and 14.7% of inappropriate hospitalisation days in two different weeks arose due to the refusal of family members to comply with a care plan, other family reasons and waiting for court protection orders or guardianship for mentally infirm patients. Fenn⁹⁴ reported that 6.7% of delays in discharge were due to uncertainty over social aftercare and Suárez-García¹¹ attributed 1.3% to the patient's social environment. Epstein⁵⁰, Gallagher⁸⁷, Hinchliffe²⁷, Ingold⁷¹, Koffman⁸⁸, Moya-Ruiz⁸⁹, Paldi⁹⁰, Rockwood⁹¹ and Zambrana-Garcia⁹³ noted that lack of patient/family cooperation was responsible for 18.0%, 10.0%, 8.1%, 14.6%, 5.1%, 3.2%, 9.1%, 2.4% and 6.2% of the delays in discharge, respectively.

The proportion of delayed discharges attributable to patients or their families ranged from 2.1% (Moya-Ruiz⁸⁹) to 21.8% (Mendoza Giraldo⁹⁵), with both studies being conducted in Spain. Reasons for delays due to patients or their families were varied: some relatives opposed the discharge because the patients were considered a physical or economic burden; there were difficulties in timely communication with the family; the

patient or their family exercised their right to choose a care home; the patient or their family did not make a timely decision about aftercare; or, there was no caregiver.

Nine studies examined the association between delayed discharges and living alone, having formal/informal help prior to hospital admission and having an uncooperative family. Ingold⁷¹ found a positive association between delayed discharges and patients living alone (Odds Ratio (OR): 2.6, 95% CI 1.2-5.8) as did De Bey⁹⁶ but Bianco⁴⁹, in contrast, found that patients who do not live alone were more likely to have inappropriate hospital days (OR: 2.16, 95% CI 1.19-3.92). Moreover, Barisonzo², Chin⁸², Panero⁹⁷ and Victor⁶ reported that living alone did not significantly predict delayed discharges. Ingold⁷¹ reported that patients with delayed discharges were more likely to have received formal help before hospitalisation (48.5 vs 32.8%, $p=0.03$) but this association was not significant in a multivariate analysis. In contrast, Becchi⁴¹ observed that not having a paid carer before hospitalisation was a predictor of inappropriate stays ($p=0.04$) and Victor⁶ noted that patients without a family carer were more likely to have a delayed discharge (OR: 2.1, 95% CI 1.3-3.4). Falcone²⁶ identified a positive correlation between delayed discharges and family uncooperativeness.

2.3.3 Discussion

The reported proportion of delayed discharges varied widely between studies, even within studies conducted in the same country (for instance, in the UK this proportion varied from 1.6% to 60.0%). This finding was also reported in earlier studies¹⁶. In part this is driven by the variation between studies in terms of the criteria used to determine when a discharge had been delayed. For example, Godden reported a proportion of

delayed discharges of 1.6%⁶⁷, using NHS England data on delayed transfers of care. This proportion reflected all hospital discharges across all specialities and age groups. However, when specific patient groups, such as geriatric patients, were examined in other studies, higher proportions of delayed discharges were observed^{55,85,98}. It should also be noted that NHS England data on delayed discharges is self-reported by hospitals, hence the accuracy of this data might be limited.

There are many systemic, cultural, political, and practical reasons for these variations in delayed discharges, such as waits for community care needs assessment or domiciliary care packages; lack of family support; lack of rehabilitation beds; specific clinical conditions involving significant loss of independence; need to make changes in the house; and these are even more so in the international analysis conducted here. However, delayed discharges occur in most countries, even when healthcare services are primarily funded by private insurance. For example, the proportion of delayed discharges in studies conducted in the USA varied between 13.5% and 31.8%. Also, the variation in proportions of delayed discharges in studies conducted in medical wards was higher than in studies conducted in surgical wards, as expected, since elective surgical patients should be less complex than older medical patients. Furthermore, there are several other potential explanations for the variations in proportions of delayed discharges. Seasonal fluctuations in hospital admissions can lead to underestimates or overestimates of the proportion of delayed discharges in studies that are conducted for periods shorter than one year. The proportion of delayed discharges may also vary depending on the level of seniority and professional background of the healthcare professional evaluating the patient's stay and fitness to be discharged^{16,99,100}. Furthermore, proportions of delayed

discharges reported in the same country can vary over time as policy measures to tackle this issue are introduced⁵⁶, and can vary in the same time period if hospitals are paid on a per diem basis and have different occupancy rates⁹⁰, or if different methodologies and data sources are used⁶⁷.

Another potential explanation for the difference in the proportion of delayed discharges across studies could be the use of different criteria to determine when a patient's discharge is classified as delayed. Some instruments such as the AEP are more objective and rigorous⁸⁰ in assessing delay but have limitations when used in isolation, mainly because they do not take into account local circumstances or the availability of alternative resources. These instruments may also introduce bias because they are applied retrospectively, or because they exclude patient subgroups such as people with mental health problems¹⁶. In addition, although the AEP instrument has been adapted for use in Europe, it was originally developed in the USA and differences may exist between these settings regarding whether a patient's stay is considered inappropriate. Finally, the AEP instrument was designed in 1981 and has not been substantially revised since then, although the way in which patients are managed and discharged has changed considerably over this time period¹⁰⁰. Although objective measures to assess inappropriate bed use are recognised to be superior to subjective decisions, the results of this review do not suggest that the use of the best validated tool (AEP) has a statistically significant impact on the reported proportion of delayed discharges. However, this may be due to lack of statistical power. Nonetheless, it is clear that discrepancies in parameters used to determine when a patient's discharge is delayed will impact upon the estimated proportion of delayed discharges, and therefore it is necessary to emphasise

the need for agreement on a set of internationally recognised parameters to determine when a patient is medically ready for discharge. It is also worth noting that instruments such as AEP consider as inappropriate hospital stays not only the time the patients spends in hospital after being deemed medically fit but also the time spent in hospital before medical fitness was declared, for example the time patients spent waiting for diagnostic or therapeutic procedures or internal delays in the scheduling of tests or procedures. Consequently, the causes of delayed discharges reported in studies are sometimes unrelated to the discharge process of the patient.

The mean costs of delayed discharges per patient varied considerably across studies due to differences in time periods, reported mean days of delayed discharge, daily cost of a bed and patient populations, all of which make comparisons between studies difficult. Considerable variation in costs was observed in three studies conducted in the same country (UK), which may be explained by the fact that one study was conducted in a gastrointestinal general medicine ward¹⁰¹, with 4.4 mean days of delayed discharge, another took place in three acute wards (surgical, general medicine and care of older patients)⁸⁸, with mean discharge delays of 20.7 days, and the last was carried out in an old-age psychiatric ward⁵⁵, with mean discharge delays of 26.2 days. Also, it is worth noting that there is no common definition of the “daily cost of a bed” in terms of delayed discharges. This is shown in the variation in the source of the unit costs used across studies: the cost of an excess bed day was taken from a national cost database by Hendy¹⁰¹, while the cost of a hospitalisation day was derived from the studied hospital’s own costs by Hanif⁵⁵; Koffman⁸⁸ did not report their source of unit cost data. Since the main cost to a hospital of a delayed discharge is the cost of bed occupancy, the variation

in days of delayed discharges is mirrored in the costs of delays. Additionally, using PPP exchange rates instead of market exchange rates typically raises the costs of low income countries and lowers the costs of high income countries. This is clearly illustrated in **Table 7**. In this particular case, using PPP exchange rates reduced the differences relative to market exchange rates, with a SD of 6,885 compared to a SD of 7,226 using the later.

Few studies evaluated the individual pre-admission factors that can influence delayed discharges. Some studies considered the possible influence of social isolation by analysing the impact of living alone or having formal/informal help before admission on delayed discharges, with contradictory results. However, these studies do not capture the full essence of social networks of patients as these are not solely determined by their living arrangements prior to hospital admission but also by their networks of family and friends and help provided to others (i.e. looking after a spouse or a grandchild). It is therefore important to assess the social support available to a patient as a whole by using an appropriate tool, such as the Lubben Social Network Scale¹⁰² (LSNS), and evaluating its impact on delayed discharges, and this has not yet been done.

2.3.4 Limitations

This is the first review of delayed discharges to conduct a meta-regression of potential factors influencing the proportion of delays at an international level and to analyse their economic impact. However, there are some limitations to this review. First, only 10% (n=528) of the studies identified through database searching were reviewed by a second reviewer. These reviewers produced highly concordant results, identifying the same seven studies to include in the final set of 64 studies. Hence, it was judged that it was not

necessary to subject the remaining references to second review. The second reviewer also extracted data and performed a quality assessment of the seven identified studies. No major differences were identified in terms of data extraction or quality assessment between the two reviewers. Second, the studies included used different methodologies for data analysis and this makes it difficult to compare results across studies. Some studies only reported delayed discharges (i.e. days that patients spent in hospital after being declared medically fit for discharge) while others also reported inappropriate hospital stays. The latter included not only days of delayed discharges but also days spent in hospital before being declared medically fit (i.e. days wasted due to inappropriate admissions, problems in scheduling operation room, diagnostic tests and procedures and other speciality appointments, and lack of staff available to declare the patient medically fit). This variation in methodologies means that some studies, especially those using AEP and derivatives, may have higher proportions of delayed discharges. However, the results of this review do not show the use of AEP to be significantly associated with higher proportions of delayed discharges. Furthermore, the total length of hospital stay for the sample was not reported in some studies, hence it was not possible to determine the proportion of delayed discharges.

Third, the number of studies available for the meta-regression was relatively small, which limited the number of covariates that could feasibly be explored. Sample sizes were also small in several studies, which reduced the statistical power to investigate the association between the outcome and possible explanatory factors. Other factors may also be associated with the proportion of delayed discharges, such as level of social support for patients, level of income, level of dependency in daily living activities prior to hospital

admission, or presence of comorbidities. However, such information was not consistently reported across the identified studies.

Fourth, patients in the identified studies came from a variety of ward types. Even though this review explored grouping studies by type of ward of admission, some studies included a variety of wards and did not report the results by ward type. There is, therefore, a significant amount of clinical heterogeneity that could impact on the results of the meta-regression and cannot be fully explored due to limitations in the reported data.

Fifth, it would also be informative to analyse the prevalence of delayed discharges by disease area, since certain patient groups (e.g. hip fractures, or stroke patients) may have specific post-discharge needs, such as rehabilitation, which could impact on delayed discharges from acute care.

Finally, it was not possible to generalise the data on costs of delayed discharges. However, these costs are clearly high, hence reducing inappropriate stays should be a priority, especially in the light of increasingly overburdened healthcare systems.

2.4 Conclusion

This chapter has provided an overview of delayed discharges in terms of the amount of days unnecessarily spent in hospital by older patients and how much these delays in discharge cost. These results were informed by a systematic literature review on the

prevalence and costs of delayed discharges which also assessed the reported impact of social isolation on delayed hospital discharges.

The variability in the reported prevalence of delayed discharges, and available data on costs limits the knowledge of the full impact of delayed discharges, with several conclusions being based on subjective judgement.

Further research is needed to determine the extent of delayed discharges, as these are affected not only by individual, organisational, and structural factors, but also by methodological limitations in the studies conducted to date. Determining the impact of delayed discharges by specific disease areas and based on pre-admission patient characteristics, such as social isolation, may help to better establish which services would be most appropriate for these patients at discharge. Accurate and up-to-date costs for these delays are also necessary to devise policies to reduce these delays and associated costs.

In order to address the research gaps identified in this literature review, Chapters 4 and 5 will describe the analysis conducted in two hospitals in different countries.

Chapter 3 : Health and long-term care services for ageing populations in Portugal and England

3.1 Introduction

In this chapter I discuss the factors influencing population ageing and its implications for healthcare. I consider in more detail two specific countries in which the case studies presented in this thesis were conducted, namely Portugal and England. I analyse how population ageing impacts upon the consumption of health and long-term careⁱⁱⁱ (LTC) resources in these two countries and describe both health and LTC systems in Portugal and in England, focusing on provision and accessibility of services and respective funding mechanisms. Particular emphasis is given to acute care services, more precisely inpatient care where the majority of delayed discharges occur, and to LTC services available to older people after discharge from acute hospitals. Finally, I describe a common clinical condition associated with ageing – the proximal femoral fracture (PFF) – which will be used to inform the case studies at the *Hospital de Santa Maria* (HSM) in Portugal and the John Radcliffe Hospital (JRH) in England, as well as the healthcare pathways for this condition in these two countries.

3.2 Ageing populations and their health and long-term care needs

It is recognised that older people are at greater risk of delayed hospital discharges. In order to avoid unnecessary hospital stays, it is therefore crucial to understand the health and LTC needs of ageing populations. LTC services (defined by the World Health

ⁱⁱⁱ Long-term care includes help with domestic tasks (such as shopping and preparing meals), assistance with personal care tasks (such as dressing and bathing) and nursing care. It also includes innovative services such as hospital at home, intermediate care beds and early supported discharges.

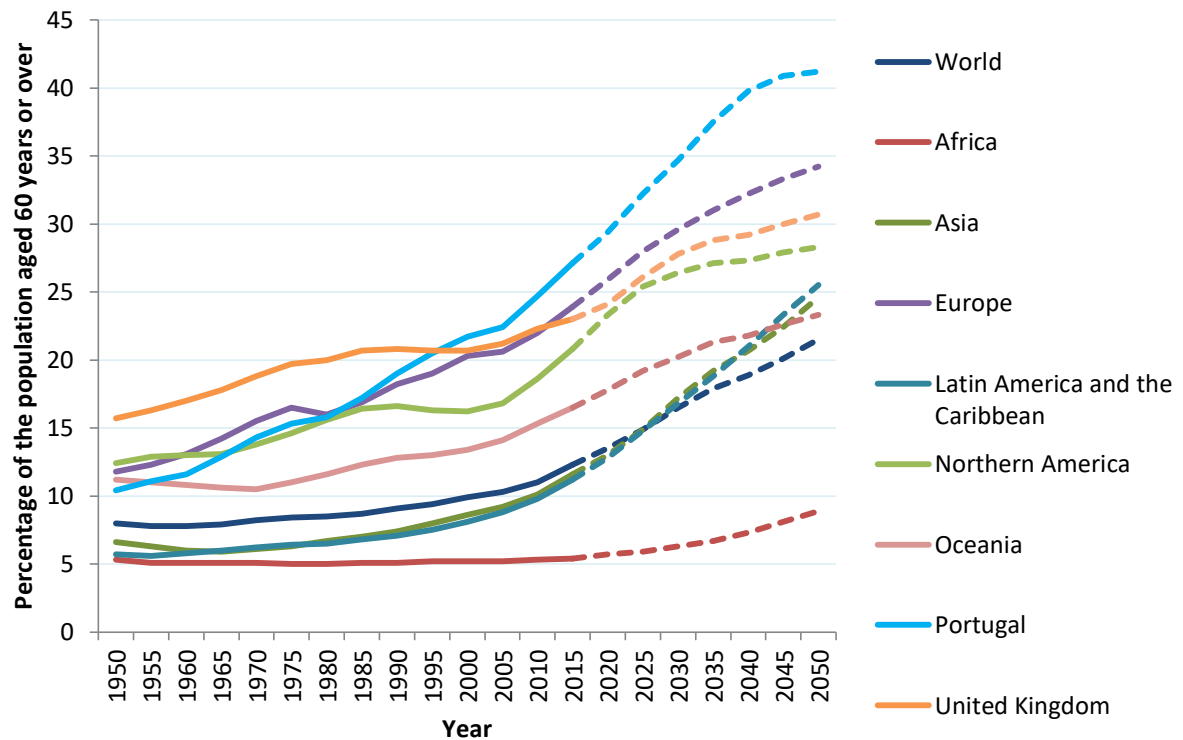
Organisation (WHO) as “(...) *all these caregivers and the settings they may operate in, as well as the governance and support services that can help them in their roles*”) are expected to address losses in capacity that older people face due to disability, chronic condition, trauma, or illness, which limit their ability to perform activities of daily living (ADLs). These services entail both health-related services (i.e. palliative care, long-term nursing care, personal care services, and health services in support of family care) and social services (i.e. home help and care assistance, residential care services, and other social services).

Demographic trends are intensifying pressures on healthcare and LTC services. This section provides an overview of the economic impact of ageing populations on health and LTC systems, with emphasis on Portugal and England.

3.2.1 Demographic changes worldwide

It is well recognised that the world population is ageing. The United Nations (UN) proposed the cut-off age of 60 years to refer to the older population¹⁰³. In 2015, 12.3% of the world population was aged 60 years or over and 1.7% was aged 80 years or over (oldest-old) but these numbers are expected to increase to 21.5% and 4.5% by 2050, respectively¹⁰³. Currently, older people represent a larger share of the population in more developed regions of the world. Europe is the region in which people aged 60 years or over account for the highest proportion of the population, representing 23.9% of the total in 2015, with this value expected to rise to 34.2% by 2050¹⁰³ (**Figure 8**).

Figure 8: Percentage of the population aged 60 years or over by world region (1950-2050)



Source: UN (2015), World Population Prospects: the 2015 revision (visited on 3 January 2017)

In parallel to what is observed in Europe as a whole, Portugal and United Kingdom (UK)^{iv} also have ageing populations. In 2015, 27.5% of the Portuguese population was aged 60 years or over and by 2050 this segment of the population is expected to represent 41.2% of the total population. In the UK, the proportion of people aged 60 years or over increased at a lower rate than in Portugal representing 15.7% of the total population in 1950 and 23.0% in 2015 and is expected to reach 30.7% in 2050¹⁰⁴. A description of the demographic drivers of population ageing in these two countries is presented in Appendix 7.

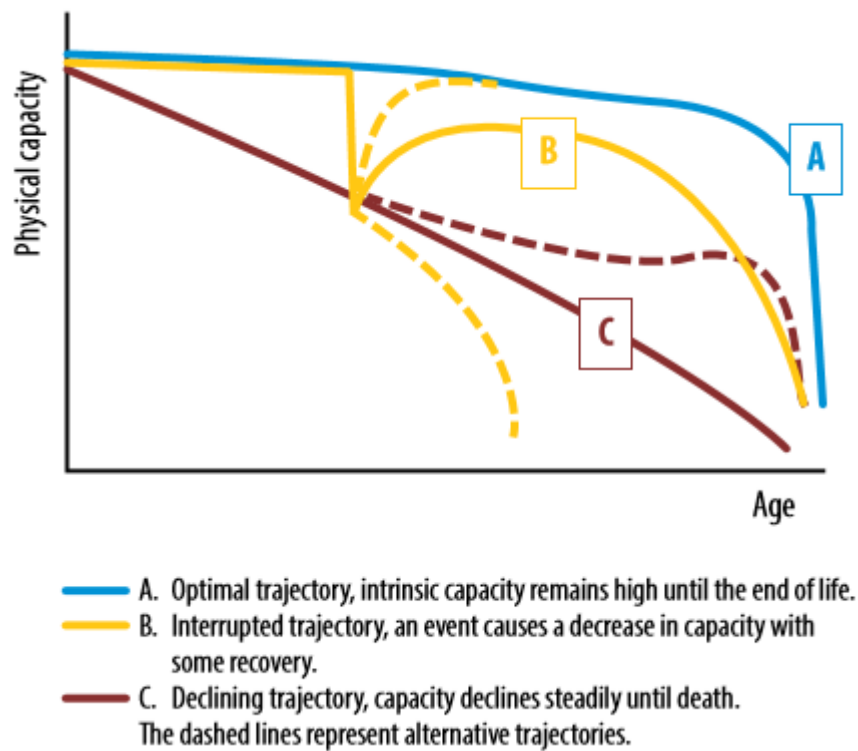
^{iv} When data for England was not available, data for the United Kingdom was used.

3.2.2 Provision of health and long-term care services for ageing populations

Most people in the world can now expect to live beyond 60 years of age¹⁰⁵. Such demographic changes have implications for healthcare and LTC since care requirements increase with age, the most powerful predictor of a person's health state. These care arrangements are also associated with prevailing risks of morbidity and mortality¹⁰³. Therefore, the key question behind the impact of population ageing on consumption of healthcare and LTC resources is: how are older people experiencing these extra years of life?

Whilst later life will inevitably involve a decline in health and functioning, specific health trajectories may vary widely from person to person. Some older people will experience a sudden and rapid decline in health that is ultimately fatal, while others will undergo a more gradual decline, potentially over many years. Meanwhile others may experience a less stable cycle of periods of health and illness¹⁰⁶. These trajectories in intrinsic capacity and functional ability are illustrated in **Figure 9**.

Figure 9: Three hypothetical trajectories of physical capacity



Source:WHO (2015), World report on ageing and health 2015 (visited on 7 January 2017)

As life expectancy increases, it is important to note that increased life span is not necessarily accompanied by an extended period of good health: added years in older age may be experienced differently in terms of health. The existing evidence in this field is unclear and inconsistent, with studies suggesting contradictory data regarding the levels of disability, chronic disease, and comorbidity in the older population¹⁰⁷⁻¹¹⁰. The literature also suggests that healthy life expectancy may also differ significantly between countries¹¹¹. In high-income countries it does seem that the prevalence of some forms of disability at a given age may be decreasing slightly, but this is unlikely to account for all the added years people are living.

The percentage of years lived in healthy life in relation to total life expectancy is low in Portugal (65.7% for females and 74.8% for males in 2014 – **Table 9**) compared to the European Union (EU) average of 73.9% for females and 78.6% for males. In the UK, these percentages are above the EU average but people are still expected to live approximately 20% of their lives in poor health. The percentage of people having a long-standing illness or health problem accounted for 39.8% in Portugal and 32.5% in the UK in 2014 (EU average: 32.5%)¹¹².

Table 9: Percentage of healthy life years at birth and people having a long-standing illness or health problem in Portugal and the UK (2005-2014)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Portugal										
Healthy life years at birth (% of the total life expectancy) – females	70.2	70.4	70.1	69.6	68.3	68.1	70.0	74.9	74.1	65.7*
Healthy life years at birth (% of the total life expectancy) – males	78.2	79.5	77.1	77.8	76.2	77.2	78.5	83.4	82.3	74.8*
People having a long-standing illness or health problem (% of the population)	32.2	30.9	33.2	33.3	34.1	33.9	34.7	37.1	39.8	n.a.
UK										
Healthy life years at birth (% of the total life expectancy) – females	80.6	79.4	80.7	81.0	80.1	79.5	78.5	77.8	78.2	77.1
Healthy life years at birth (% of the total life expectancy) – males	83.2	83.8	83.2	83.6	83.0	82.6	82.5	81.7	81.3	79.7
People having a long-standing illness or health problem (% of the population)	37.4	38	35.8	33.9	35.8	34.5	36	32.9	32.5	n.a.

* The observed decline in healthy life years at birth for both females and males in Portugal is due to a break in the statistical time series (i.e. change in the standards for defining and observing a variable over time).

Source: Eurostat. <http://ec.europa.eu/eurostat/data/database> (visited on 23 January 2017)

The percentage of the older population reporting limitations in instrumental activities of daily living (IADL) in 2014 is below the EU average in the UK (IADL: 37.1%). This is not the case for Portugal where more than half of the older population is limited in performing IADLs (50.4%)¹¹² (**Table 10**). The percentage of older people limited in basic activities of daily living (BADL) is below the EU average in both countries but still very high (21.8% in Portugal and 18.2% in the UK).

Table 10: Percentage of the population aged 65 and above reporting being limited in basic and instrumental activities of daily living in 2014

	European Union	Portugal	United Kingdom
Basic activities of daily living			
Feeding oneself	5.5	3.1	2.2
Getting in and out of a bed or chair	17.5	14.5	11.3
Dressing and undressing	15.3	13.7	9.2
Using toilets	9.6	7.3	3.9
Bathing or showering	17.9	16.3	12.3
Total	23.7	21.8	18.2
Instrumental activities of daily living			
Preparing meals	14.8	15.5	9.1
Using the telephone	9.6	8.6	5.1
Shopping	23.6	25.4	18.1
Managing medication	10.0	10.5	4.9
Light housework	21.0	23.0	14.4
Occasional heavy housework	43.7	52.8	33.8
Taking care of finances and everyday administrative tasks	17.1	11.6	7.8
Total	46.1	50.4	37.1

Source: Eurostat. <http://ec.europa.eu/eurostat/data/database> (visited on 23 January 2017)

Ageing is a biological process that comprises a great many changes to the body and mind, resulting in diminished bodily functioning, increased vulnerability to environmental challenges, psychosocial changes, and increased risk of disease and ultimately death¹¹³.

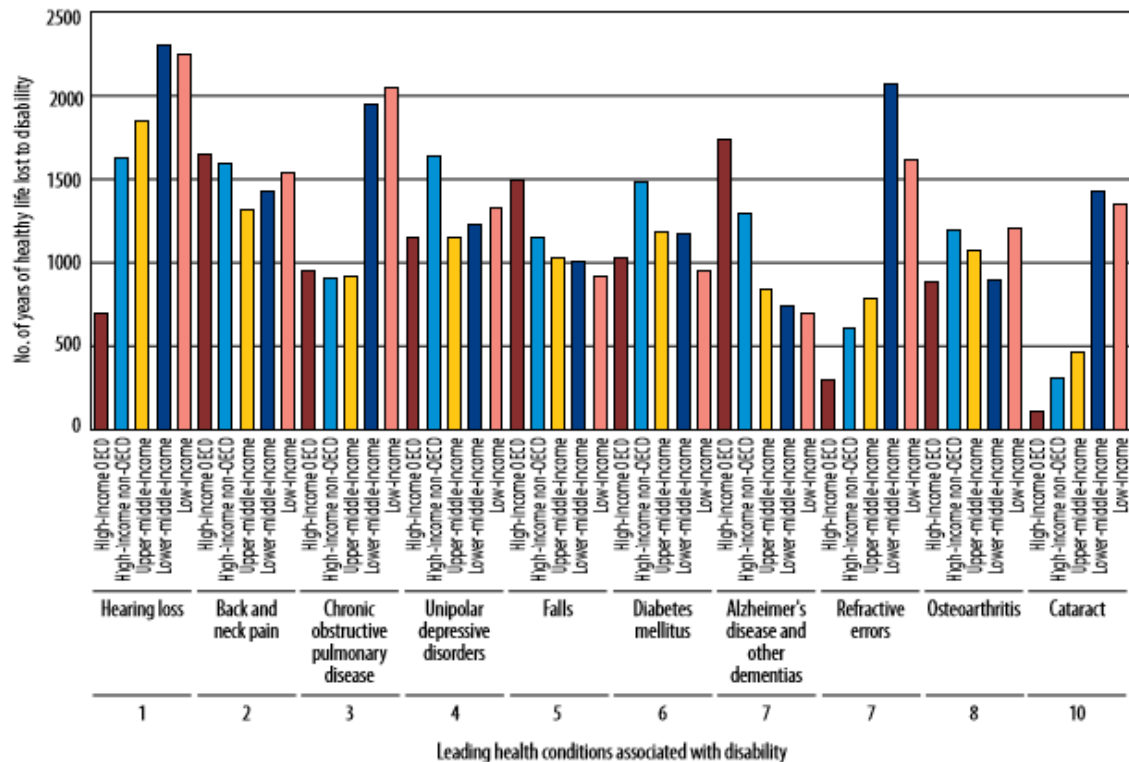
Some specific changes tend to occur in all individuals as they age:

- Decline in strength and musculoskeletal function;

- Decline in vision and hearing;
- Deterioration in cognitive function;
- Sexual dysfunction;
- Decline in immune function;
- Decrement of the skin.

According to the Global Burden of Disease project¹¹⁴, the main health conditions associated with years of healthy life lost due to disability in older age, in high income countries, are diabetes, depressive disorders, falls and dementia (**Figure 10**), reflecting both an older average age of the population and a greater awareness and diagnosis of these conditions in these countries. On the other hand, in low and lower middle income countries, the greatest burden of disability comes from sensory impairments, respiratory diseases and back and neck pain, reflecting greater exposure to indoor and outdoor air pollutants as well as to noise and sunlight across the life course.

Figure 10: Number of years of healthy life lost due to disability per 100,000 population, and top 10 health conditions associated with disability, in populations aged 60 years and older in 2012



Source: WHO (2015), World report on ageing and health 2015 (visited on 7 January 2017)

The overwhelming burden of mortality in older age is attributable to non-communicable diseases (NCDs) regardless of where people live¹¹⁴.

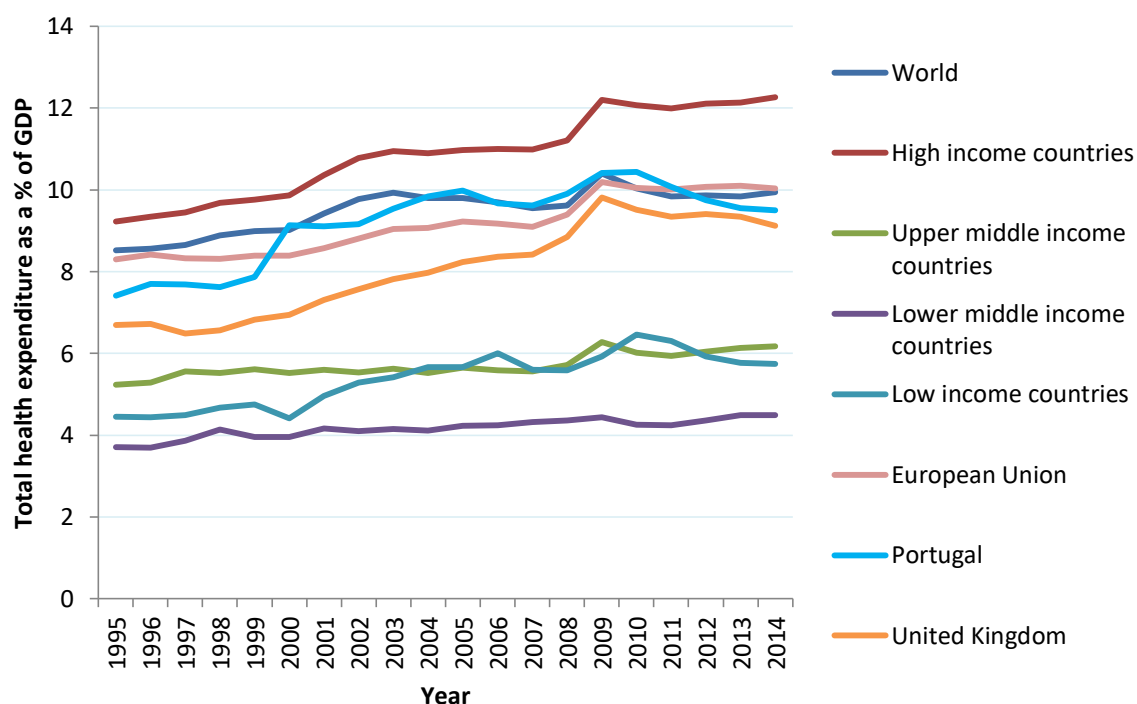
Multimorbidity and geriatric symptoms are also very prevalent in older age¹⁰⁶.

Multimorbidity is characterised by the simultaneous presence of multiple chronic conditions having a significantly greater impact on functioning, quality of life and risk of mortality than the sum of the effects that might be expected from these conditions individually¹¹⁵. Furthermore, it is also associated with higher rates of healthcare utilization and higher costs¹¹⁵. The most common geriatric symptoms are: frailty, urinary incontinence, falls, delirium, and pressure ulcers^{116,117}. These symptoms seem to be better predictors of survival than the presence or number of specific diseases^{118,119}.

3.2.3 Population ageing and health: provision of health and long-term care services in Portugal and England

Similarly to what has been observed worldwide, the total expenditure on healthcare has been progressively increasing in Portugal and in the UK, though when analysed as a percentage of gross domestic product (GDP), a decline has been observed since the 2008 financial crisis (**Figure 11**). In Portugal, total healthcare expenditure represented 9.5% of the GDP in 2014, a value just slightly below the 10.0% average observed across the whole of the EU and also worldwide. In the same year, total expenditure on health accounted for 9.1% of the GDP in the UK¹²⁰.

Figure 11: Total expenditure on health as a percentage of the Gross Domestic Product (1995-2014)



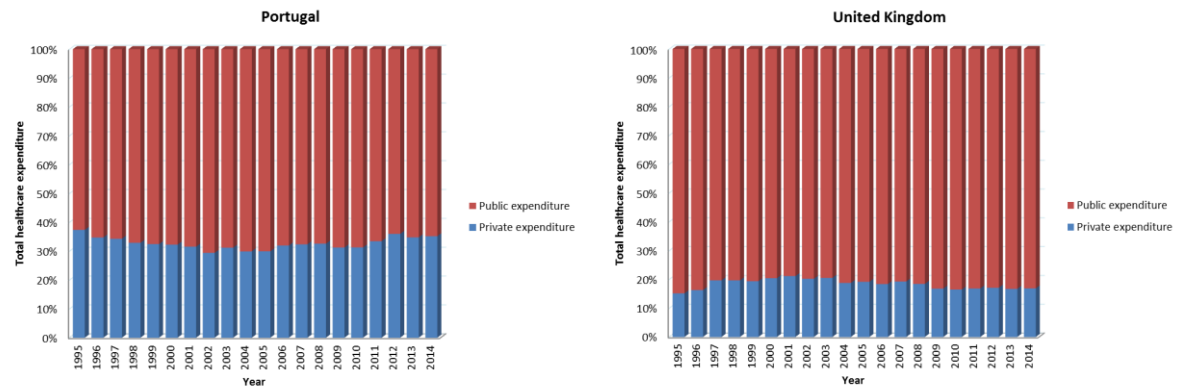
Source: The World Bank database (visited on 18 January 2017)

Healthcare in Portugal and in England

Both Portugal and the UK have a National Health Service (NHS) providing healthcare services to all residents and national citizens.

The Portuguese NHS was created in 1979 as a universal, tax-financed system that tends towards being free of charge at the point of delivery¹²¹. Currently, the Portuguese healthcare system is mainly funded by taxes (65% in 2015), as shown in **Figure 12**, with the remaining 35%¹²⁰ of the expenditure being funded by special public and private voluntary health insurance schemes for certain professional groups (health subsystems covering about 14.4% of the population¹²² such as health subsystem for civil servants (ADSE), health subsystem for the police (SAD), health subsystem for banking and associated insurance employees (SAMS)), private voluntary health insurance, and out-of-pocket payments. These out-of-pocket payments (representing 26.8% of total expenditure on health in 2014 versus a EU average of 13.9%¹²⁰) are applicable to primary care and specialist consultations, hospital care, home care and emergency care but some population groups (around 55% of the population¹²²) are exempt from payment.

Figure 12: Percentage of public and private expenditure of total health expenditure in Portugal and United Kingdom (1995-2014)



Source: The World Bank database (visited on 18 January 2017)

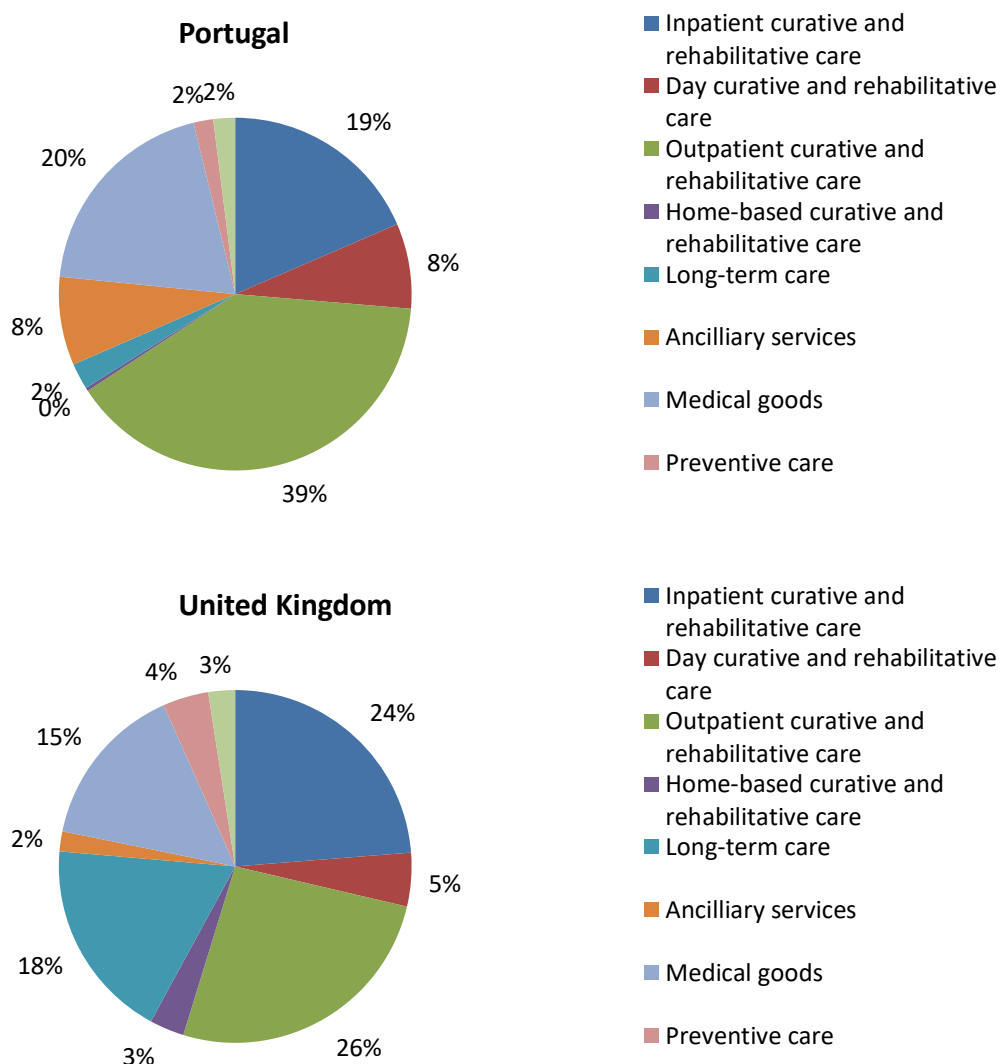
The NHS in the UK was created much earlier in 1948 as a social goal arising from the post-World War II reconstruction and it is a universal, tax financed system that is free at the point of care for all UK residents. Spending from public sector healthcare accounted for 83% of total healthcare expenditure in the UK in 2014¹²⁰. Private healthcare expenditure has remained mostly static in recent years, with out-of-pocket expenditure accounting for 9.7% of total health expenditure in 2014¹²³, below the 13.9% observed in the EU¹²². Out-of-pocket costs are limited to prescription drugs, dental and optical services but these vary across the four countries¹²².

In terms of service provision, the Portuguese NHS includes primary healthcare services, considered gatekeepers to specialists and other medical resources. Secondary care (acute and non-acute services) is mainly provided in NHS hospitals. Tertiary care is provided by the National Continuous Care Network (*Rede Nacional de Cuidados Continuados Integrados* – RNCCI) that combines teams providing long-term care, social support and palliative care. The formal provision of social care, personal care and domestic aid is

mostly made by private providers, including not-for-profit and for-profit organizations¹²⁴. Additional services such as diagnostic services, renal dialysis, and physiotherapy treatments are also provided either directly or through contracts with private providers¹²⁴. In the UK, the NHS services are modelled on a three-tiered system: primary, secondary, and tertiary care. Primary care includes services rendered by general practitioner practices, walk-in clinics, urgent care clinics and sexual health clinics as well as dentists and opticians. Secondary care comprises acute hospital care services as well as outpatient appointments and investigations. LTC, rehabilitation facilities and mental health hospitals also fall under the umbrella of the secondary care boundary. Finally, tertiary care services are rendered in highly specialised hospitals focusing on treatment of illnesses that are uncommon or particularly complex, or that require highly specialised and expensive equipment, the widespread provision of which would be uneconomical¹²⁵.

The composition of total current healthcare expenditure is detailed in **Figure 13**. Inpatient curative and rehabilitative care represented 18.5% of the current healthcare expenditure in Portugal and 23.2% in the UK, while LTC accounted for 2.4% in Portugal and 18.0% in the UK. However, the greatest spending on LTC, both in Portugal and in the UK, is not included in healthcare expenditure, as it mainly comes from social care budgets and private spending.

Figure 13: Current health expenditure by function in 2014



Source: OECD. OECD.Stat (visited on 17 January 2017)

The total number of hospital beds per 1,000 inhabitants has been declining slowly in Portugal (-12% between 2000 and 2014) and, at a faster pace, in the UK (-50% between 2000 and 2014), mainly driven by a reduction in the number of acute hospital beds in both countries¹²⁶ (**Table 11**). This has been accompanied by a decline in length of stay (LOS) in curative beds in both countries¹²³. Acute care bed occupancy rates have been higher in the UK (84% in 2010) than in Portugal (76% in 2016)¹²⁶ and, in 2014/15, 3.8% of the total LOS in hospital in England was due to delayed discharges.

Table 11: Total number of hospital beds, length of hospital stay, acute care bed occupancy rate and proportion of delayed discharges in Portugal and United Kingdom (2000-2014)

Portugal															
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total hospital beds per 1,000 inhabitants*	3.71	3.65	3.57	3.58	3.59	3.56	3.48	3.44	3.39	3.37	3.37	3.37	3.41	3.39	3.32
Acute care beds*	3.66	3.59	3.51	3.53	3.53	3.49	3.41	3.36	3.33	3.3	3.29	3.3	3.34	3.32	3.25
Rehabilitative care beds*	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.04
Other*	0.01	0.02	0.02	0.01	0.02	0.03	0.03	0.04	0.02	0.03	0.04	0.02	0.03	0.03	0.03
LOS: inpatient care (all hospitals)*	9.4	8.9	8.6	8.5	8.8	8.7	8.6	8.5	8.4	8.6	8.7	8.7	9.0	8.9	8.9
LOS: curative care*	7.8	7.4	7.2	7.1	7.1	7.0	7.1	6.9	6.8	7.0	7.0	7.0	7.5	7.2	7.2
Acute care bed occupancy rate (%)**	75	74	74	74	73	74	75	75	75	76	76	75	77	75	76
Proportion of delayed discharges (as a % of total LOS)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

United Kingdom															
Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total hospital beds per 1,000 inhabitants*	4.10	4.04	3.98	3.95	3.86	3.72	3.54	3.39	3.33	3.26	2.93	2.88	2.81	2.76	2.73
Acute care beds*	3.17	3.16	3.13	3.12	3.07	2.99	2.85	2.73	2.7	2.66	2.39	2.36	2.31	2.28	2.27
Rehabilitative care beds*	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Other*	0.93	0.88	0.85	0.83	0.79	0.73	0.69	0.66	0.63	0.6	0.54	0.52	0.5	0.48	0.46
LOS: inpatient care (all hospitals)*	10.7	10.6	10.3	9.5	9.2	8.9	8.6	8	8	7.8	7.7	7.3	7.2	7.2	7.1
LOS: curative care*	n.a.	7.7	7.5	7.3	7.1	6.9	6.6	6.4	6.3	6.2	6.1	6.0	6.0	6.0	6.0
Acute care bed occupancy rate (%)[§]	n.a.	83	84	84	84	84	83	84	85	84	84	n.a.	n.a.	n.a.	n.a.
Proportion of delayed discharges in England (as a % of total LOS)[‡]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3.1% ¥	3.2% ¥	3.2% ¥	3.8% ¥

Sources: *OECD. OECD.Stat (visited on 18 January 2017)

[§]WHO European Data Warehouse (visited on 18 January 2017)

[¥]Proportion of delayed discharges for the NHS England financial year

[‡]NHS England: delayed transfers of care (visited on 20 January 2017)

In Portugal, public hospital activity has been paid on a contract based approach (*contratos programa*) since 2003¹²⁷. These contracts, set for one-year periods, stipulate the overall payment and expected production level of the hospital by broad lines of activity (admissions, outpatient consultations, emergency department episodes, ambulatory care cases, domiciliary services and days spent in nursing home for *Instituto Português de Oncologia*) and negative financial results are to be borne by the hospital¹²⁴. In general, public hospitals in Portugal do not have in place a costing system that would allow them to determine the cost of a hospital admission per patient¹²⁸. Instead, Diagnostic Related Groups (DRGs) are used to estimate the costs and prices of hospital activity¹²⁸. As such, hospital contracts are defined based on their expected activity (for instance, for hospital admissions, the value is estimated by using: the number of equivalent patients by type of product –medical or surgical – calculated using DRGs, the volume estimated by the buyer based on prospective needs, and the case-mix index), convergence (value given to the hospital in case it registered an operational deficit in a given year), incentives (5% of the total available budget), and other programmes (such as treatment of patients with human immunodeficiency virus and training of foundation doctors and registrars)¹²⁸.

England utilizes a payment by results system¹²⁹ in which healthcare providers are paid for each patient seen or treated, taking into account the complexity of the patient's healthcare needs. Payment by results is based on the unit of healthcare for which a payment is made (currency) and the set prices paid for each currency (tariff), and it covers the majority of acute healthcare provided in hospitals. The prices for NHS public hospital services are calculated using the national tariff payment system (NTPS). The

NTPS is a fixed diagnosis-related case-based tariff based on healthcare resource groups (HRGs) that reimburses hospitals for the amount and type of care provided. It is aimed to reward efficiency, choice, diversity, and reduced waiting times. Hospitals are reimbursed for both volume and type of cases (income = activity × price). As prices are essentially set at an average (reference cost), services are not reimbursed at the exact cost of the treatment. Therefore, hospitals benefit if the actual cost of treating a patient is below the tariff and need to look for efficiency savings when cost is above the tariff^{130,131}.

In England, each HRG has a specified “trim-point” in the LOS covered by the flat-rate tariff, beyond which hospitals are paid on a per diem basis. The value paid for an excess bed day beyond the trim-point is lower than that of an HRG associated to another patient and therefore discourages hospital stays longer than clinically necessary. In acute hospitals in Portugal, each DRG is covered by a flat-rate tariff adjusted for the case-mix index^v, regardless of the LOS of the patient. Despite this, delayed hospital discharges have been recognised as an issue in both healthcare systems.

In Portugal, limited action has been taken at governmental level to reduce delayed hospital discharges. The most significant step to decrease unnecessary hospital stays was the creation of the RNCCI¹³², a national network created in 2006, aiming to facilitate intermediate care between hospital admission and the community. It is comprised of intermediate care units providing services to people who are deemed to be dependent, frail or in advanced or terminal phase of illness. It aims to facilitate the discharge process through the use of multidisciplinary discharge management teams who co-ordinate

^v Except for chronic psychiatry which is paid on a *per diem* basis.

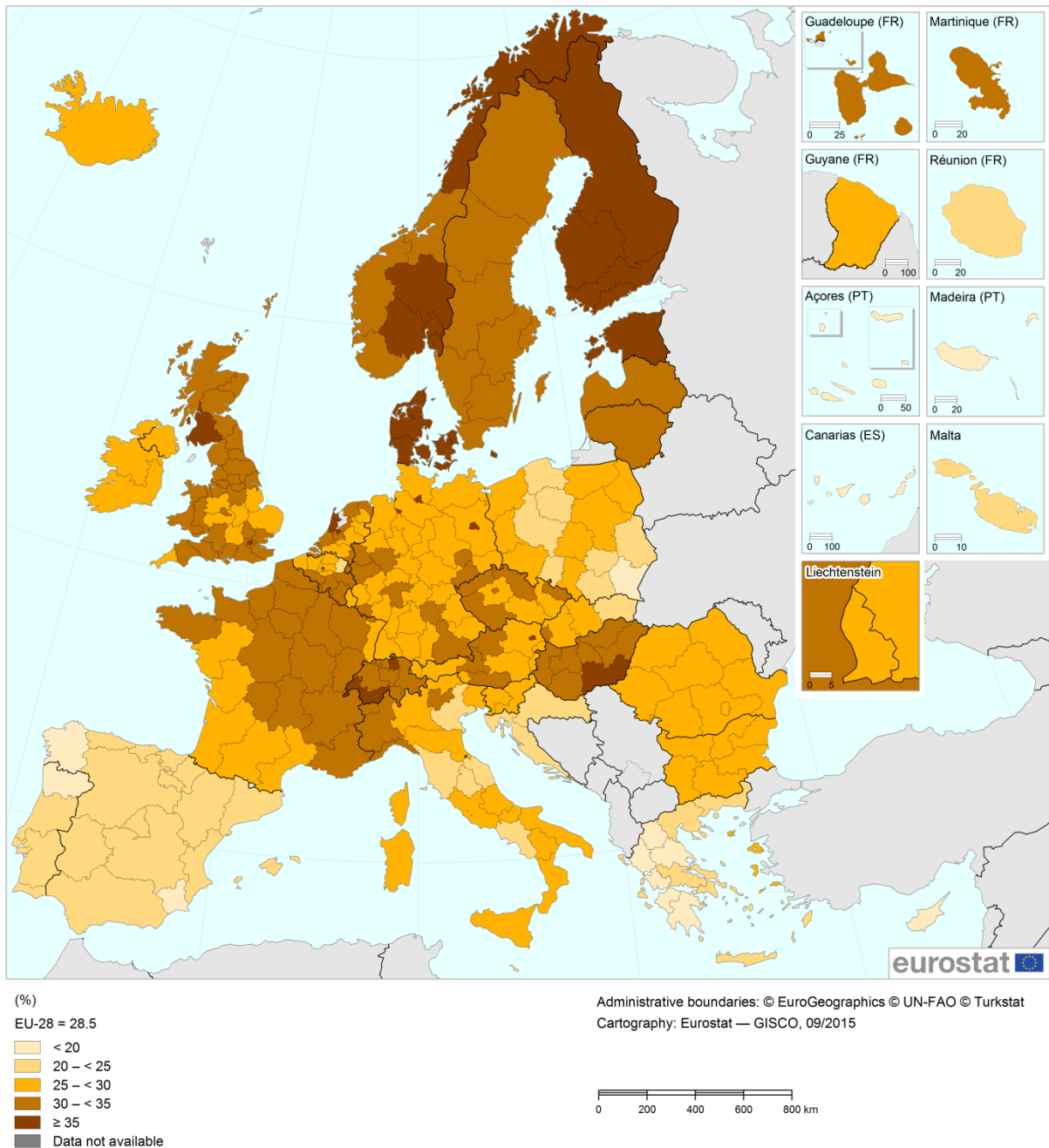
continuing care/rehabilitation. Additionally, the yearly financing contracts for each hospital have a component associated with the achievement of the defined targets, representing 5% of the value of *contratos-programa* in 2017¹³³. Two specific objectives of these *contratos-programa* are associated with incentivising timely discharges from hospitals: percentage of patients with a timely referral to the RNCCI in the total number of patients referred; and, percentage of patients discharged with a LOS above the defined maximum limit for LOS.

On the other hand, in England, a significant body of legislation and guidance attempting to tackle delayed discharges has been in place since 1957 (summarised in Appendix 8). Nonetheless, despite all these attempts to reduce delayed discharges, they continue to increase⁶⁸.

The hypothesis brought forward in this thesis is that these delays in discharge from hospitals are associated with a reduced support network of patients in later stages of life. In 2013, 13.4% of the EU population living in private households aged 65 and above lived alone¹³⁴ (**Figure 14**). In Portugal, 19.8% of the population aged 65 and above lived alone in 2011, representing an increase of 28.7% over one decade¹³⁵. In the same period, 31% of those aged 65 and over were living in one person households in England and Wales, representing an increase of 9.7% in a decade¹³⁶. These living arrangements of this population group pose challenges to health and social care services at discharge from hospital. Most of the patients may still need some care to be provided upon discharge which traditionally was provided by the spouse or co-inhabitant children. The increasing

number of older people living alone may delay discharges from hospital as they have no support at home.

Figure 14: Percentage of the population aged 65 and above living alone, by NUTS level 2 region, in 2011



Source: [http://ec.europa.eu/eurostat/statistics-explained/index.php/People in the EU statistics on household and family structures#Single-person households](http://ec.europa.eu/eurostat/statistics-explained/index.php/People_in_the_EU_statistics_on_household_and_family_structures#Single-person_households) (visited on 23 January 2017)

Long-term care in Portugal and in England

LTC services are increasingly necessary to meet older people's needs at discharge from hospital, especially in the context of an ageing population.

LTC costs are driven by several demographic and non-demographic determinants: number of dependent people in the population; income developments; and demand for publicly-funded LTC services (dependent on changes in the provision of informal care).

In Portugal, LTC has been neglected in terms of public sector investment until recently (**Table 12**), with care being provided mainly by not-for-profit institutions such as *Misericórdias* and other non-governmental organisations and mainly financed through social care budgets and private spending¹²⁴. In 2006, following an increasing awareness over the period 2003–2006 of the very limited role of the public sector in LTC given the population needs, the RNCCI was set up¹²⁴. The financial responsibility for the public sector is shared between the Ministry of Health (77% of the total in 2015) and the Ministry of Solidarity, Labour and Social Security (23% in 2015). The public per capita expenditure on LTC is significantly higher in the UK than in Portugal, as is the expenditure on LTC as a percentage of the GDP in 2013 and 2014.

Table 12: Public expenditure on long-term care in Portugal and the UK (2004-2014)

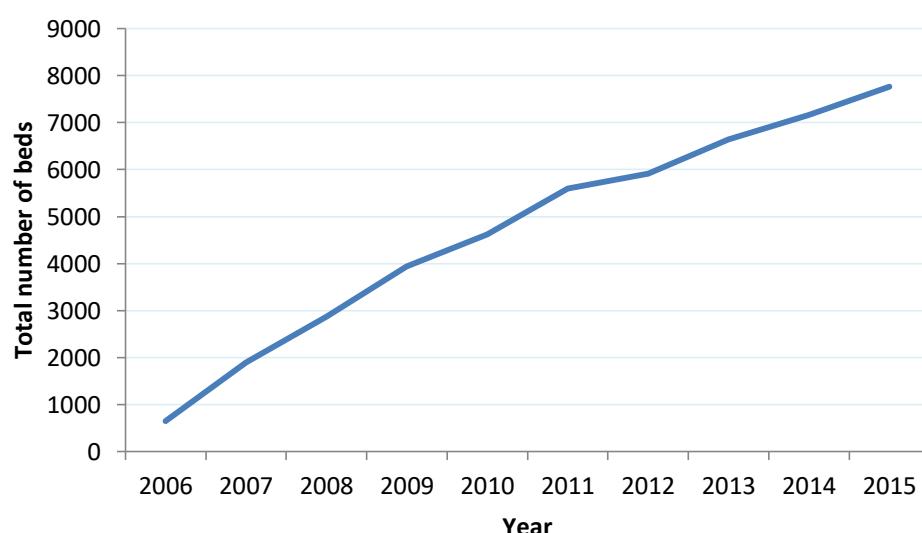
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Portugal											
Government schemes and compulsory contributory healthcare financing schemes expenditure on long-term care (Per capita USD 2010 PPPs)	12.9	13.3	15.1	17.2	23.3	29.2	32.8	38.2	43.5	44.7	48.9
Government schemes and compulsory contributory healthcare financing schemes expenditure on long-term care (% of GDP)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
United Kingdom											
Government schemes and compulsory contributory healthcare financing schemes expenditure on long-term care (Per capita USD 2010 PPPs)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	480.2	478.1
Government schemes and compulsory contributory healthcare financing schemes expenditure on long-term care (% of GDP)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1.2	1.2

Source: OECD. OECD.Stat (visited on 24 January 2017)

In Portugal, LTC is provided through the RNCCI, care homes (*Estruturas Residenciais para Pessoas Idosas - ERPI*), domiciliary care services (*Serviços de Apoio Domiciliário - SAD*), meals and day care centres (*Centros de Dia*). All these LTC services can be provided by publicly-funded institutions or by private or social organisations (including *Misericórdias* and other non-governmental organisations).

The RNCCI provides post-acute care to people who are dependent. These services are rendered by publicly-funded, private and social sector organisations (largely not-for-profit) in four different types of units: convalescence (*unidade de convalescença*), medium-term and rehabilitation (*unidade de média duração e reabilitação*), long-term and maintenance (*unidade de longa duração e manutenção*) and palliative care (*unidade de cuidados paliativos*). But these services can also be rendered at home by domiciliary integrated continued care teams (*equipas domiciliarias de cuidados continuados integrados - EDCCI*). In 2015, the total number of beds in the RNCCI had increased by 1,101% since its creation in 2006 (**Figure 15**) but with some regional asymmetries. In absolute numbers, the North was the region with highest number of beds and Algarve the region with the lowest number in 2015. However, when the number of beds per person aged 65 and above is considered, the Lisbon area had the lowest number of beds per person aged 65 and above (219 beds per 100,000 inhabitants aged 65 and above) and Alentejo had the highest. In terms of EDCCI teams, the Lisbon area had the highest absolute number and Alentejo the lowest. But when the analysis is made in terms of the number of beds per person aged 65 and above, the North has the lowest number; the second lowest number of places for services rendered by EDCCI teams (306 places per 100,000 inhabitants aged 65 and above)¹³⁷ is observed in Lisbon and Algarve is the region with the highest number (**Table 13**).

Figure 15: Total number of beds in the RNCCI (2006-2015)



Source: Serviço Nacional de Saúde. <https://www.sns.gov.pt/sns/reforma-do-sns/cuidados-continuados-integrados-2/gestao-de-recursos/> (visited on 21 January 2017)

Table 13: Total number of beds and places in EDCCIs team in the RNCCI in 2015

Region	No. inhabitants aged ≥65 years	No. beds	No. beds per 100,000 inhabitants aged ≥65 years	No. places in EDCCI	No. of places in EDCCI per 100,000 inhabitants aged ≥65 years	Total number of places	No. of total places per 100,000 inhabitants aged ≥65 years
North	631,439	2,009	318	1,720	272	3,729	591
Centre	393,338	1,850	470	1,313	334	3,163	804
Lisbon area	696,815	1,524	219	2,129	306	3,653	524
Alentejo	128,427	762	593	541	421	1,303	1,015
Algarve	87,769	497	556	1,350	1,538	1,847	2,104
Total	1,937,788	6,642	343	7,053	364	13,695	707

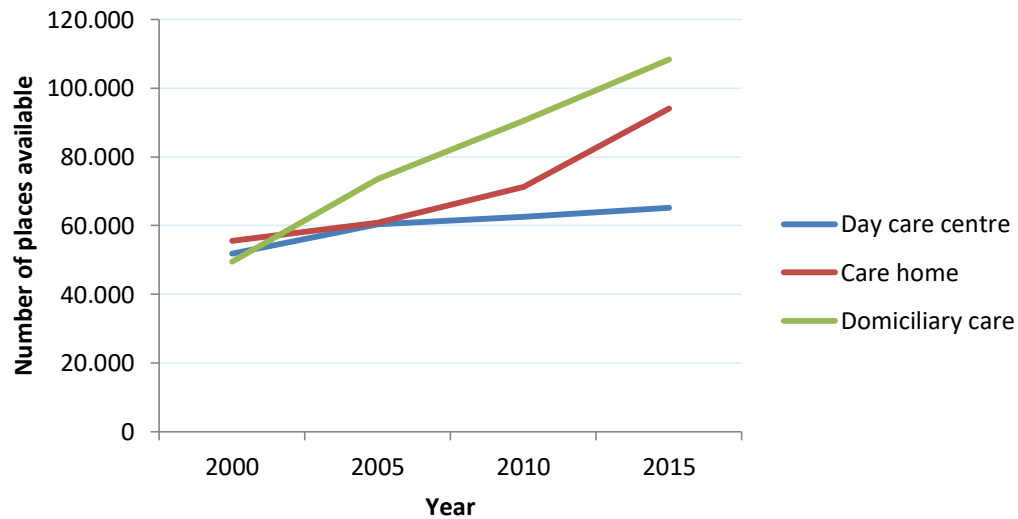
Source: Serviço Nacional de Saúde. <https://www.sns.gov.pt/sns/reforma-do-sns/cuidados-continuados-integrados-2/gestao-de-recursos/> (visited on 21 January 2017)

The observed discrepancies in the number of beds available in RNCCI are a result of investment decisions of the private and social sector over which the public sector has little control. Such investment decisions have been based on profit potential, local financial incentives and available labour resources, and do not necessarily consider the needs of the local population. This has been recognised as a problem and potential

alternatives are under analysis, such as publicly-funded hospitals having their own rehabilitation units¹³⁸.

LTC for older people is also provided through three main frameworks. Firstly, care homes, which are residential structures providing permanent or temporary accommodation as well as personal care and, in certain cases, nursing care (mostly publicly-funded but in eight districts, including Lisbon, 20% of the places are offered by profit-making organisations). Secondly, domiciliary care services, in which assistance with basic needs and/or daily living activities are provided at home, usually, in addition to delivery of meals at home (mostly publicly-funded but Lisbon and Porto already have a significant number of profit-making organisations in this sector). Lastly, day care centres, where older people can go during the day and be rendered services such as food and hygiene, transport to and from home, social and physical activities, among others¹³⁹. The number of places available in these three types of services has increased significantly over the last 16 years (**Figure 16**), especially the number of places in care homes (increase in number of places 2000-2015: 41.0%; occupancy rate in 2014: 91.5%) and in domiciliary services (increase in number of places 2000-2015: 54.3%; occupancy rate in 2014: 73.9%), revealing a need for more intensive services provision compared to day centres (increase in places 2000-2015: 20.5%; occupancy rate in 2014: 66.0%)¹³⁹.

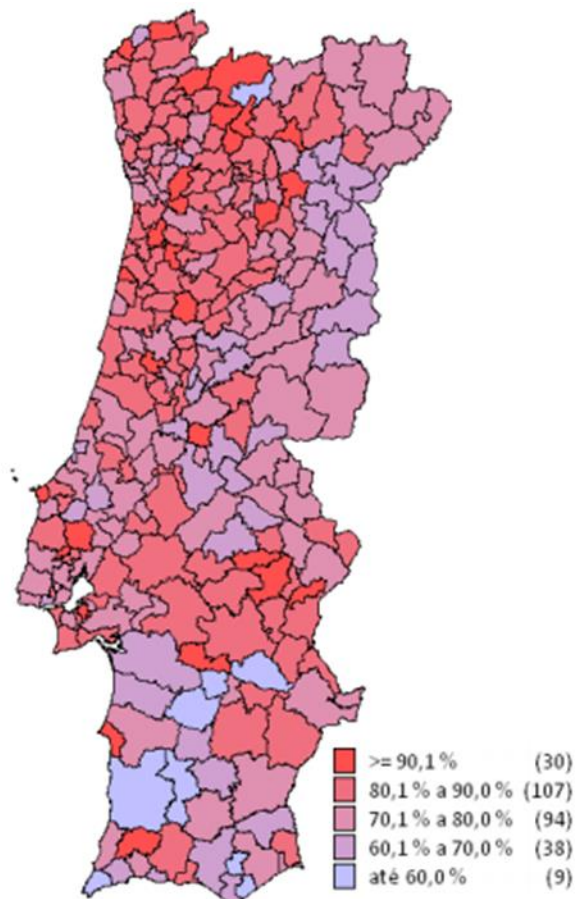
Figure 16: Number of places available in publicly-funded and private care homes, day care centres and domiciliary care services in Portugal (2000-2015)



Source: Carta social. http://www.cartasocial.pt/elementos_quantitativos.php?img=0 (visited on 23 January 2017)

The average usage rate for these LTC services by the older population was 78 % (81 % for not-for-profit places), but regional asymmetries are again observed with the Lisbon area registering usage rates above 70%¹³⁹ (**Figure 17**).

Figure 17: Rate of use of long-term care by older people by municipality in Portugal in 2014



Source: Gabinete de Estratégia e Planeamento - Ministério da Solidariedade, Emprego e Segurança Social (2014), Carta social 2014 (visited on 23 January 2017).

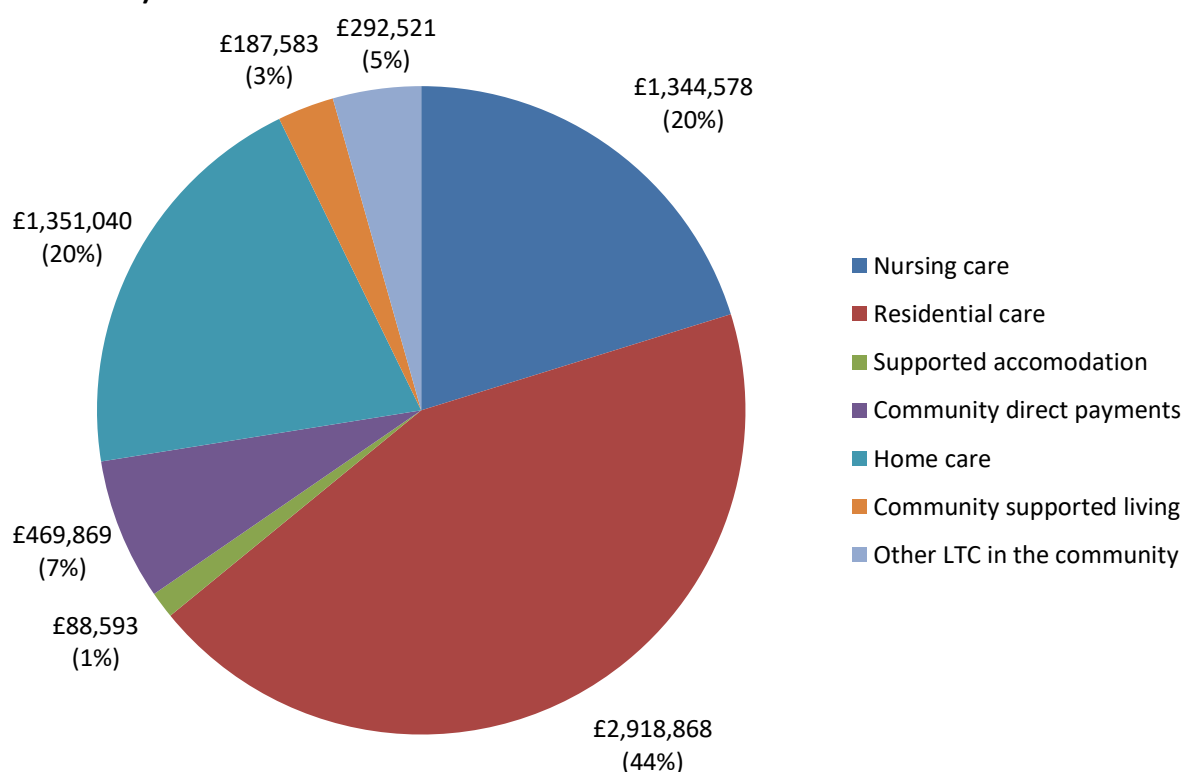
When publicly-funded LTC is provided, a co-payment is made by the beneficiary, depending on his/her income or that of his/her family¹²². Usually, private LTC is fully financed by the beneficiary of the services but voluntary health insurance schemes, such as ADSE, can contribute towards the costs of these services¹²².

In England, unlike most other European countries, sourcing and funding for LTC is largely the responsibility of the local authorities under their social care system, rather than a direct part of the healthcare system. This came about as part of the health and social care reforms in the late 1940s.

LTC services are not free: users are expected to make contributions to their own care. Therefore, around 48% of expenditure on LTC was from user contributions in 2015/2016¹⁴⁰. Given that the large majority of care is due to chronic illness, the NHS also makes a contribution which accounted for around 38% of costs in that same year¹⁴⁰. This has largely come about since the 2012 Health and Social Care act and the resulting “Better Care Fund”^{141,142}. The remaining expenditure is funded by joint arrangements – money paid to the Councils with Adult Social Service Responsibility (CASSR) by third parties as part of a joint arrangement to provide services – (6%) and by other sources of income – the amount paid to CASSRs from any other source of provision of services – (8%).

The social care budget covers the provision of short-term care (i.e. care required for less than six-weeks such as to give extra support when a person comes out of hospital or respite care) as well as LTC. LTC accounts for the biggest proportion of costs: in 2015-16, LTC in England accounted for £13 billion compared to short-term support of £554 million¹⁴⁰. People aged 65 years or over accounted for 50.9% of LTC expenditure and 72.4% of short-term expenditure in 2015/16¹⁴⁰. The social care expenditure on LTC is divided into seven categories: nursing care; residential care; supported accommodation; direct payments (for people living in the community); domiciliary care; supported living (for the people in the community); and other LTC for people in the community. In 2015-2016, the largest proportion of expenditure on LTC for people aged 65 and above was for residential and nursing care (care homes), accounting for 64% of total LTC expenditure¹⁴⁰ (**Figure 18**) followed by domiciliary care (20%).

Figure 18: Long-term care expenditure by support setting in England in 2015-2016 (£ thousands)



Source: NHS Digital, <http://www.content.digital.nhs.uk/catalogue/PUB22240/pss-exp-eng-15-16-fin-rep.pdf> (visited on 20 January 2017).

As mentioned above, users of LTC services are expected to pay for their care, although the local authorities will give advice and support with how to do this. Currently, local authorities will not provide care services for people with more than £23,250 in savings and property assets. These people are expected to use their savings to fund their care or liquidise their assets to pay the full amount for care. However, there are some schemes which allow “deferred payments” whereby the person can remain in their home initially and pay for the care at a deferred date (e.g. when they die)¹⁴³. The 2014 Care Act has made steps to improve this by putting a cap on the amount that they have to pay for care up to £72,000 and that they can apply for means tested funding up to an asset total of

£118,000¹⁴⁴. However, a study from Hancock et al¹⁴⁵ estimated that this act could add £2 billion to public expenditure by 2030 and add 115,000 more users to the system. Consequently, local authorities have expressed concern regarding this Act but, as it is, the local authorities spending on personal care has fallen in real terms compared to 2005/2006 levels¹⁴⁰, although this was mainly due to a reduction in funding from central government and not to lower demand or needs.

In terms of the number of places available in care homes in the UK, the highest number is found in the private sector (**Table 14**) with only a small proportion of the places being provided by Local Authorities or the NHS (9.7%)¹⁴⁶.

Table 14: Number of places available in care homes in the UK in 2010

Residential homes	
Private	190,800
Voluntary	48,000
Local Authorities	29,143
Nursing homes	
Private	172,500
Voluntary	16,900
Local Authorities	1,557
Residential/nursing homes	
NHS owned	15,500
Total	474,400

Source: Laing et al, Care of elderly people UK market survey 2010-11, in Forder et al, 2011, Competition in the care home market¹⁴⁶

The number of care home places increased by 49.7% between 1987 and 2010, but with some periods of decline in between (**Table 15**). The observed reduction in the number of care home beds between 2003 and 2005 was the result of a government policy to replace care home places, especially residential home places, with domiciliary services¹⁴⁶.

Table 15: Number of places available in care homes in the independent sector in the UK (1987-2010)

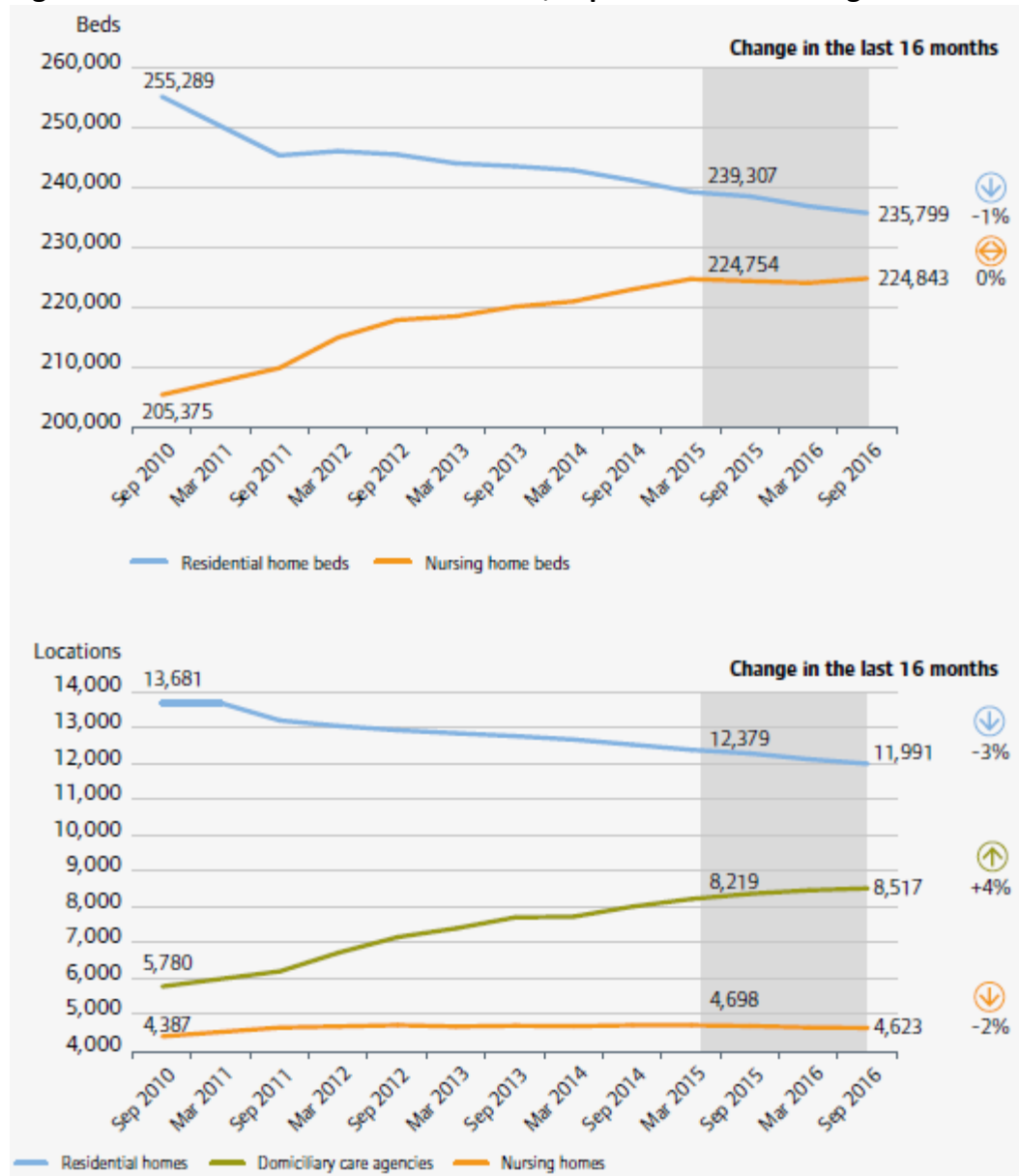
		1987	2003	2005	2008	2010
Residential homes	For-profit	112,279	146,687	147,628	149,786	151,952
	Not-for-profit	38,524	47,098	47,248	45,000	42,404
Nursing homes	For-profit	54,455	199,413	192,144	198,070	211,358
	Not-for-profit	10,136	24,800	20,630	21,214	22,527
Total		215,394	417,998	407,650	414,070	428,241

Source: Laing et al, Care of elderly people UK market survey 2010-11, in Forder et al, 2011, Competition in the care home market¹⁴⁶

Since 2010, the number of residential home beds has been declining in England, balanced by an increase in the number of domiciliary care agencies¹⁴⁷. On the other hand, the number of nursing home beds increased by 9% between September 2010 and March 2015 (

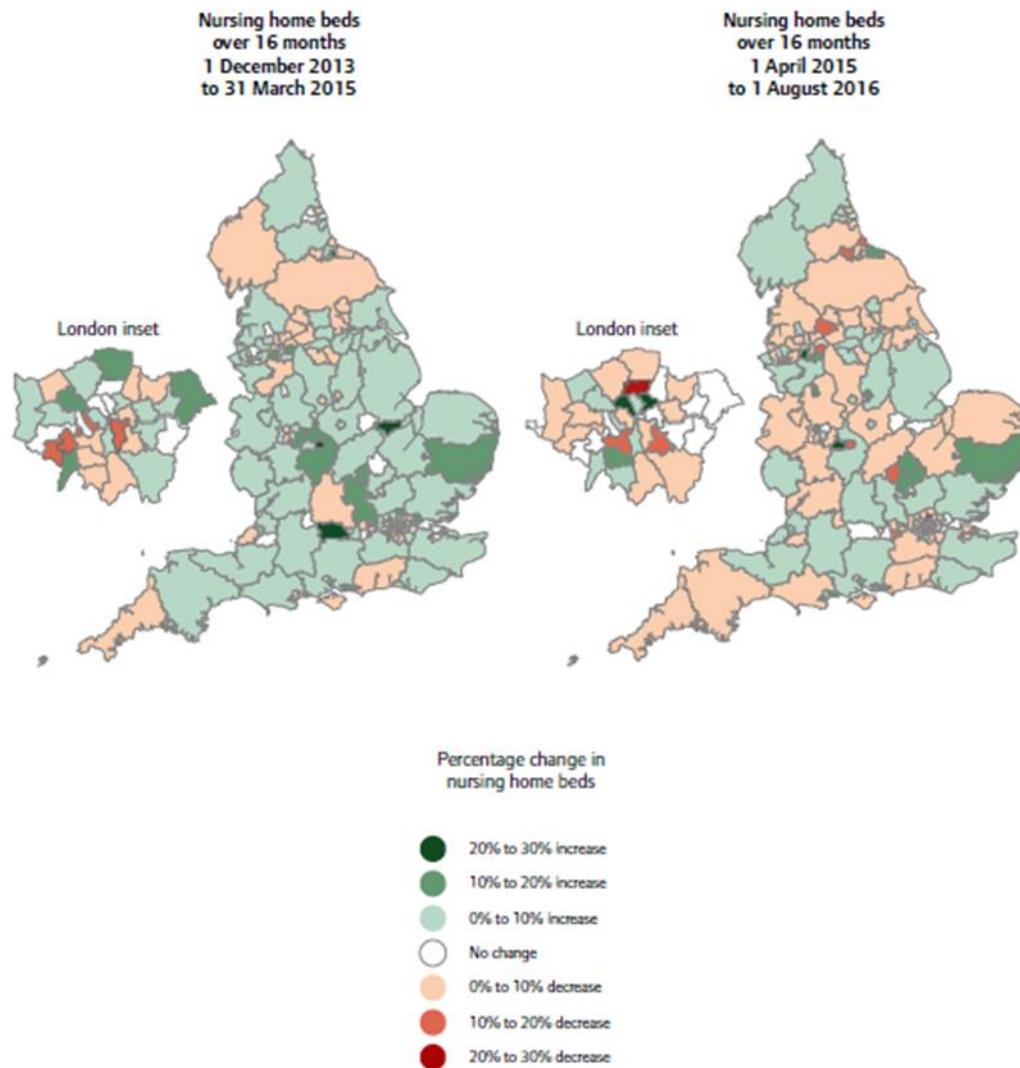
Figure 19) as a response to a greater number of people living longer and with more complex needs¹⁴⁷. However, this came to a halt in April 2015 with the number of nursing homes declining by 1.6% between March 2015 and October 2016. Nevertheless, significant variance was observed across the country with some parts registering an increase in provision and others a decline (**Figure 20**)¹⁴⁷.

Figure 19: Adult social care market trends, September 2010 to August 2016



Source: Care Quality Commission (2016), The state of health care and adult social care in England 2015/16¹⁴⁷ (visited on 20 January 2017)

Figure 20: Net change in nursing home beds in England between December 2013 to April 2015 compared with April 2015 to August 2016



Source: Care Quality Commission (2016), The state of health care and adult social care in England 2015/16¹⁴⁷ (visited on 20 January 2017).

Additionally, between November 2015 and October 2016, approximately 700 publicly-funded contracts in residential and nursing home were terminated because care homes felt they could no longer remain profitable with the prices offered by Local Authorities while maintaining the fundamental standards of care¹⁴⁷.

On the other hand, domiciliary care agencies increased by 47% in England between September 2010 and September 2016¹⁴⁷ (**Figure 19**). However, domiciliary care providers have also terminated publicly-funded contracts with Local Authorities affecting approximately 3,700 people between November 2015 and May 2015 given the impossibility of maintaining the binomial current price/quality of care¹⁴⁷.

3.3 Proximal femoral fractures

PFFs are an important cause of disability and death affecting mainly older people, with the peak number of PFFs occurring in the age group 75-79 years for both sexes¹⁴⁸. They were estimated to have affected 1.6 million people worldwide in 1990¹⁴⁹ and this number is expected to rise to over 6 million in 2050 due to population ageing¹⁵⁰. This condition is associated with physical and mental disability and high mortality and hospital costs¹⁵¹⁻¹⁵⁵.

3.3.1 Fractures

PFFs, also known as hip fractures, can be caused by a high impact force, such as a road traffic accident, or can occur in diseased bone when they are referred to as pathological fractures. According to the International Classification of Diseases¹⁵⁶, pathological fractures occur in bones weakened as a result of a disease, such as osteoporosis, with the fracture occurring under circumstances that would not result in a break in a normal, healthy bone. The risks for PFF are multifactorial and whilst osteoporosis is the most frequently implicated, general frailty and falls risks also play a significant role¹⁵⁷.

Fractures: the numbers

PFFs are currently considered a major public health issue and, with the increasing ageing of the population they are expected to become an even larger problem⁴³. The risk of fracture is greater in older adults given that they are more likely to experience frequent falls and have compromised bone strength, mostly due to metabolic and hormonal changes that people go through in the latter stages of life^{158,159}. Age and female gender are therefore non-modifiable risk factor highly associated with an increased risk of a PFF, with most cases occurring in people aged over 75¹⁶⁰. The average age of people sustaining a hip fracture was 83 years in 2013 in England, and the age distribution was skewed to the left¹⁶¹. In terms of gender, the incidence rates of PFFs among females were reported to be three times higher than in men in a southern European population¹⁶² and, in 2013, 71.9% of the PFFs in England occurred in females¹⁶¹. A previous PFF, a family history of PFF, and low socioeconomic status are also associated with an increased risk of PFF¹⁶³⁻¹⁶⁶.

In Portugal, in 2006 there were 9,523 PFFs reported, which accounted for €52 million spent in healthcare¹⁵⁹. According to the national statistics, 85% of patients with a PFF can never return to previous functionality levels and 40% end up with serious incapacity¹⁶⁷. The first Portuguese summit for the discussion of osteoporotic fractures highlighted the need for the creation of clinical pathways for PFF management in order to reduce the number of days of hospital stay. In terms of prevention, even though the number of cases has remained stable over the past few years, the efforts on risk assessment and early detection and treatment of osteoporosis still need to be increased¹⁶⁸. The information on

costs regarding post-discharge of patients is not available but the real cost of PFFs to the Portuguese NHS and patient's families is likely to be significant¹⁶⁹.

In the UK, approximately 80,000 PFFs are treated every year at an estimated annual cost of £2 billion in direct healthcare costs alone¹⁷⁰. However, projections estimate that, due to the ageing of the population, by 2020 this figure will reach 101,000, based on current trends¹⁵⁷.

It has also been reported that 10% of the people who sustain a PFF die within one month and around one third within a year, mainly due to age and the complexity of their clinical condition, which encompasses more than just fragile bones^{43,157,169}.

Furthermore, numerous studies have demonstrated that a person who suffered a prior fragility fracture, regardless of the anatomical location, doubles the risk of suffering a further fracture in the future; the effect is so disastrous that even up to ten years later the risk of a secondary fracture is higher when compared to a person with no previous pathological fracture history¹⁵⁸.

The occurrence of PFFs carries a twofold cost to society: human (in the form of pain, deformity, severe loss of functionality and self-esteem, social isolation, depression, etc.) and economic costs^{157,169}, mostly coming from the hospital stay and rehabilitation services after discharge.

Treatments

In the last decade, a number of professional bodies have published guidelines for the management of PFF patients: British Orthopaedic Association Blue Book¹⁵⁷, Scottish Intercollegiate Guidelines Network¹⁷¹, National Institute for Health and Care Excellence (NICE)^{43,172}. Even though evidence shows that clinical practice diverges from guidance in some cases¹⁷³, the NICE guidelines are still the most consulted for guidance on management of PFFs¹⁷⁴. Performance targets were introduced in England with management of PFFs being associated with a “Best Practice Tariff”. This essentially provides the hospital with an additional £1,500 per case as long as the patient is managed according to a specific set of criteria. These include (but are not limited to) receiving the operation to repair the PFF within two days of admission, being seen by an orthogeriatrician, having an osteoporosis assessment and being considered for the benefits of bisphosphonates⁴³. In Portugal, on the other hand, there are no national clinical guidelines for this clinical condition but the NICE guidelines are used as they are seen as the gold standard (Brito J.S. 2013, personal communication, 12th July).

NICE guidelines⁴³ recommend that PFF patients should be admitted to an orthopaedic ward within four hours of presentation of symptoms. The National Hip Fracture Database (NHFD)¹⁷⁵ collects annual information on patients admitted to almost all hospitals across the country with hip fracture. Included in the data collected is information on the proportion of patients sustaining a PFF who are admitted to an orthopaedic ward within four hours. During those initial hours a definite diagnosis should have been established, full medical history assessed, pressure relieving mattress used, pain relief provided and

pre-operative assessment details completed (blood analysis, group & save, electrocardiogram, X-ray, intravenous fluids, etc. as per local protocol).

The guidelines also stipulate that further mobility and falls assessments should be carried out in addition to discharge preparations. These include a complete medication review, a dual energy X-ray absorptiometry scan (if no prior history of osteoporosis or if deemed necessary after a fracture risk assessment is performed) as well as referrals to physiotherapists, social workers and occupational therapists where applicable. These measures guarantee the patient's safety and good quality of life after discharge¹⁵⁷, and ensure that all equipment is delivered and home care services are negotiated and made available prior to discharge. A more detailed description on the treatment of this clinical condition can be found in Appendix 9.

A timely discharge plan is of extreme importance so that social support or placement in a short/medium-term rehabilitation unit can be ready by the time the patient becomes medically fit for discharge.

3.3.2 Discharge process in Portugal and England

The most common guidelines followed in Portuguese and English hospitals for the management of PFF patients are those defined by NICE⁴³. In terms of the discharge process for these patients, the NICE guidelines state that multidisciplinary management of these patients should be offered including:

- *“Early supported discharge (describes pathways of care for people transferred from an inpatient environment to a primary care setting to continue a period of*

rehabilitation, re-enablement and recuperation at a similar level of intensity and delivered by staff with the same level of expertise as they would have received in the inpatient setting) should be considered as part of the Hip Fracture Programme, provided the Hip Fracture Programme multidisciplinary team remains involved, and the patient:

- *Is medically stable and;*
 - *Has the mental ability to participate in continued rehabilitation and;*
 - *Is able to transfer and mobilise short distances and;*
 - *Has not yet achieved their full rehabilitation potential, as discussed with the patient, carer and family.*
- *Intermediate care (continued rehabilitation in a community hospital or residential care unit) should only be considered if all of the following criteria are met:*
 - *Intermediate care is included in the Hip Fracture Programme and;*
 - *The Hip Fracture Programme team retains the clinical lead, including patient selection, agreement of length of stay and ongoing objectives for intermediate care and;*
 - *The Hip Fracture Programme team retains the managerial lead, ensuring that intermediate care is not resourced as a substitute for an effective acute hospital programme.*
- *Patients admitted from care or nursing homes should not be excluded from rehabilitation programmes in the community or hospital, or as part of an early supported discharge programme”.*

Briefly, in the England, PFF patients can be discharged from acute hospital to:

- Home (either as part of an early discharge programme or not) with or without supporting services such as domiciliary care and meals;
- Care or nursing homes (hereafter collectively designated as “care homes”);
- Community hospitals;
- Other locations (such as private rehabilitation units or sheltered accommodation).

Regardless of the discharge destination, patients will be offered rehabilitation provided they have not yet achieved their full rehabilitation potential.

In Portugal, PFF patients are assessed by a social worker while on the ward and together with the clinical team and the family, a decision is made on discharge destination based on the patient and family profile. If the family cannot or refuses to be part of the patient rehabilitation programme on an outpatient basis, the social worker will refer the patient to a specific publicly-funded rehabilitation unit. In Portugal there are three different kinds of facilities: convalescence units are more readily available and are suitable for patients with a high chance for recovery in a short period of time; the medium-term and rehabilitation units are suitable for more complex patients, needing a longer rehabilitation period, and for that reason are harder to get admitted to (a given patient could have to wait weeks or even months for a vacancy in such a facility); the long-term and maintenance units are reserved for patients with very low potential for recovery (the waiting list for these facilities is very long and a patient could have to wait several months for a bed to become available). In conclusion, Portuguese patients with PFF can be discharged from acute hospital to:

- Home (always with need for family support, with a private carer or publicly-funded carer or domiciliary care with meals – these can be combined);
- Care home (most of the care homes have some kind of rehabilitation programmes);
- Publicly-funded rehabilitation units operating under the RNCCI¹²⁴ (these inpatient services include rehabilitation and psychosocial support. They consist of daily medical care, permanent nursing care, physiotherapy and occupational therapy, prescription and administration of pharmaceutical products, psychosocial support, hygiene, comfort, nutrition, socialization and leisure. The estimated duration of stay is from 30 days to 90 days);
- Other locations (such as private rehabilitation units or mental health institutions, which in the majority of times are supported by the patient's family).

3.4 Conclusion

This chapter has provided an overview of how population ageing impacts on the consumption of health and LTC resources worldwide but with a special focus on Portugal and the UK. Special consideration has been given to acute hospital resources available and LTC services offered after discharge, especially for PFF patients.

The healthcare and LTC services available in Portugal and England have many parallels in terms of service provision. The main difference is in the available number of publicly-funded LTC services to meet the needs of older people, which is very low in Portugal compared to England. Investment has been gradually increasing in this area over recent decades in both countries but the overall lack of investment in this sector is likely to

result in difficulties with discharge from acute hospital, especially in the context of an ageing and more socially isolated population.

PFF patients still retain a high level of dependency when declared medically fit for discharge from acute hospitals and will therefore rely on social networks or, in the absence of these, LTC services to function. As such, PFFs will be used as the clinical condition for analysis of delayed hospital discharges in the following chapters.

Chapter 4 : Delayed discharges in proximal femoral fracture patients at the Hospital de Santa Maria

4.1 Introduction

From Chapter 2, I showed that even though social support networks are expected to drive delays in discharge of older patients, no study has yet assessed the full impact of social isolation of patients on delayed hospital discharges. Also, the systematic review of the literature presented in that chapter shows that very few studies have been conducted looking at disease type.

This chapter builds on Chapters 2 and 3 by conducting a case study to illustrate how social isolation, measured with a validated tool, impacts on delayed hospital discharges in older proximal femoral fracture (PFF) patients treated at the *Hospital de Santa Maria* (HSM) in Portugal.

The chapter begins by describing the HSM and detailing the data collection and analysis methodology. Two models are presented: one to determine whether social isolation is associated with delayed discharges and a second model to estimate the impact of social isolation on the number of days of delayed discharge in PFF patients. Costs of delayed discharges for the study participants are then estimated from a societal perspective. The chapter ends with a discussion of these results.

4.2 Delayed discharges at the Hospital de Santa Maria

In 2013, 43,814 patients underwent treatment as inpatients at *Centro Hospitalar Lisboa Norte* (CHLN), mostly at the HSM, corresponding to 351,775 bed days⁴⁷. This represented an occupancy rate of 81.5% with 37.0 patients treated per bed (-1.9% when compared with the previous year). The mean length of stay (LOS) per patient treated was 8.2 days, which represented a decrease of 0.4% compared with the previous year. However, little is known about the numbers and drivers of delayed discharges in the HSM and Portugal. The aim of this chapter is, therefore, to determine the impact of social isolation on delayed hospital discharges in PFF patients at HSM; to estimate the number of days attributed to delayed discharges in this patient population; and to estimate the costs of these delays.

4.3 Data collection and analysis

4.3.1 Study design, setting and participants

I carried out a prospective cohort study in the orthopaedics department of HSM. This department consisted of 51 orthopaedic beds (45 in the orthopaedics ward and six in the intensive care unit) supervised by a team of 27 orthopaedic surgeons. I approached all patients aged 75 and above who were admitted with a PFF via Accident and Emergency (A&E) to the orthopaedics department between 1st July 2012 and 30th June 2013 as soon as they were transferred to the ward. Patients who died before being declared medically fit for discharge were excluded from the study. Subsequent fractures of patients already enrolled in the study were also not included, in order to align the design with the protocol used at the John Radcliffe Hospital (JRH) (Chapter 5). All patients were followed

from admission to discharge from hospital, and patients who were discharged but referred to a publicly-funded rehabilitation unit continued to be followed until availability of a place or admission to such a unit.

4.3.2 Ethics approval and consent

Permission to interview patients and carers and to review medical records was obtained from the Ethics Committee of the hospital (Appendix 10). Informed consent was obtained from all individual participants included in the study, or from next of kin when participants were not able to consent or preferred for the consent to be given by the next of kin.

4.3.3 Data collection

Constructing the questionnaire

I designed a case report form (CRF) in Portuguese which included the following sections:

- Mini-Mental State Examination (MMSE)¹⁷⁶;
- Socio-demographic questionnaire;
- Self-reported health appraisal and use of healthcare resources;
- Quality of life questionnaire (EQ-5D-5L)¹⁷⁷;
- Lubben social network scale (LSNS)¹⁰²; and
- The Barthel index¹⁷⁸.

Validated Portuguese versions of the above mentioned questionnaires were used. The CRF, detailed in Appendix 11, was completed either by the patients or by their next of kin.

Additionally, a social and clinical information form, detailed in Appendix 12, was filled in with information collected from the patients' medical records.

Administering the questionnaire

The notice boards on the orthopaedics ward were checked daily for admissions of PFF patients meeting the inclusion criteria of the study. I approached each patient and assessed them for any cognitive impairment using the MMSE (Portuguese cut-off scores for cognitive impairment: ≤ 15 points for patients with no schooling; ≤ 22 points for patients with one to 11 years of schooling; ≤ 27 points for patients with more than 11 years of schooling) in order to determine if he/she had capacity to consent. In case the patient had capacity to consent, I then proceeded to explain the study details and consented him/her into the study. If the patient lacked capacity to consent, the consent was requested through his/her next of kin. Data on the characteristics and self-perceived health status of patients were then collected via a personal interview with the structured questionnaire. For patients with a cognitive impairment (assessed using the MMSE), delirium, significant speaking or hearing impairment, the information was collected through the next of kin.

4.3.4 Resource use

Delayed discharges were identified by reviewing daily the medical records of each patient to check if they had been declared medically fit for discharge by the medical team. A patient was considered to be medically fit for discharge when: 1) he/she was able to stand up and be mobile with support unless bed-bound at admission; 2) haemoglobin was above 8.5 g/dL; and, 3) there was no evidence of active infection. LOS was calculated

as time from admission to discharge from the acute hospital. Intended discharge destination was determined immediately after surgery and before knowing whether a patient was medically fit for discharge. This is therefore a pre-determined characteristic which was not influenced by the LOS of a patient after being declared medically fit for discharge. The number of days of delayed discharge was calculated as the difference between the date a patient was deemed medically fit for discharge and the actual date of discharge. The proportion of the total days of hospital stay that could be attributed to delayed discharge was also calculated. The mean days of delayed discharges was only estimated for patients who had delayed discharges. Length of medically-necessary hospital stay was estimated as the number of days between admission and being declared medically fit for discharge.

4.3.5 Costs

The costs of delayed discharges were estimated from a societal perspective, which included hospital costs while the patients were in the acute hospital, and costs incurred by patients or informal carers while the patients were waiting for a place in a publicly-funded rehabilitation unit. For these patients, costs were estimated up to the point where they were offered a place in a publicly-funded rehabilitation unit. The costs incurred by patients waiting for a placement in a rehabilitation unit were included in the analysis because, in other acute hospitals outside the Lisbon area, patients would have been waiting in the acute hospital until a bed became available in a publicly-funded rehabilitation unit and the days spent in a temporary setting would have been counted as days of delayed discharge.

The reference year for costs was 2013. Unit costs are presented in **Table 16**. The hospital costs of delayed discharge were estimated based on the mean daily cost of a hospital stay in an orthopaedics ward in Portugal, which was €348 in 2013¹⁷⁹. The daily cost included direct costs (personnel costs, costs of pharmaceutical products, costs of ward/clinical supplies and equipment, depreciation and other expenses) and indirect costs (costs of administrative sections, such as management and board of directors, technical and administrative services, and costs of auxiliary sections rendering general support, such as facilities and equipment, hotel services, and costs of auxiliary services rendering clinical support, such as: associated diagnostic tests and procedures, anaesthetics, operating theatre and other clinical support services). If patients were discharged from hospital while waiting for a placement in a publicly-funded rehabilitation unit, the costs incurred from hospital discharge until a place became available were included in the analysis. These included the costs of private care homes, private rehabilitation units, domiciliary care services, formal carers (e.g. home care assistant), informal care provided by a family member and specific equipment such as articulated bed, chair for the bath and walking frames. The cost of a care home was estimated to be €1,500 per month according to information provided by the social services at the HSM. The costs of a private rehabilitation unit were calculated based on the hotel cost for a single room and the average cost of physiotherapy three times a week at the hospital to which patients were discharged to for rehabilitation. Domiciliary care service costs were calculated based on the average monthly operational costs for non-statutory organisations (*Instituições Privadas de Solidariedade Social*)¹⁸⁰ which are the main providers of domiciliary care services in Portugal. The available costs report to 2003 and were inflated to 2013 prices using the consumer price index from *Instituto Nacional de Estatística* (INE)¹⁸¹. The costs

for equipment, transport and formal paid carers were those reported by patients and families. The costs of informal care were calculated based on the hours that family members reported having dedicated to looking after the patients since they were discharged from hospital until they were offered a place in a publicly-funded rehabilitation unit. The costs of informal care were estimated by multiplying the hours of informal care by the respective opportunity costs - a monetary value based on the best alternative foregone by the informal carers (e.g. lost production). As such, it was assumed that when informal carers were retired or unemployed the minimum national wage would be used to value the time they spent looking after the patients, while the national mean annual gross earnings was used to value the time of informal carers who were employed¹⁸². This follows the costing methodology defined in previous cost of illness studies^{183,184}. The daily cost of informal care was consequently estimated for each patient who received informal care by multiplying the reported daily hours of informal care by the opportunity cost of informal care. The mean daily cost of informal care was estimated as the average of daily cost of informal care for all patients receiving informal care. Total hospital costs per patient were also estimated by multiplying the total LOS by the mean daily cost (€348) and adding the unit cost for an emergency admission in Portugal, which was €119 in 2013, as all of these patients were admitted via A&E. Costs of ambulance transportation to A&E were excluded from the analysis. As the time horizon was one year, no discounting was performed.

Table 16: Unit costs used to estimate the costs of hip fractures and delayed discharges

Type of cost	Unit cost	Source
Mean daily cost of an orthopaedics bed	€348	Administração Central do Sistema de Saúde, I.P.
Mean cost of an emergency admission	€199	Administração Central do Sistema de Saúde, I.P.
Mean daily cost of a bed in a care home	€49	Social Services at CHLN
Mean daily cost in a private rehabilitation unit*	€181	Private rehabilitation hospitals where the patients were discharged to
Mean daily co-payment made by users of domiciliary services	€10	Instituto da Segurança Social, I.P.
Mean cost of a walking frame	€40	Reported by the patients
Mean cost of an adjustable bed	€700	Reported by the patients
Mean cost of a bath chair	€110	Reported by the patients
Mean cost of transport per journey	€30	Reported by the patients
Mean daily cost of formal care	€22	Reported by the patients
Mean daily cost of informal care	€28	Hours of care reported by carers. Cost estimated using minimum wage or mean annual gross earnings.

*Includes cost of a bed day and rehabilitation services only

4.3.6 Statistical analysis

In order to test the impact of social isolation on delayed hospital discharges, I firstly examined whether social isolation is a determinant of delayed discharges and, secondly, I assessed the impact of social isolation on the number of days of delayed discharge.

A one-way analysis of variance (ANOVA) was used to compare the mean of the total LOS, the mean of the medically-necessary LOS and the mean days of delayed discharge (for patients with a delay in discharge) across the four levels of social isolation (i.e. low risk, moderate risk, high risk for social isolation and socially isolated).

A univariate logistic regression was conducted to assess the impact of each potential explanatory variable, selected based on an *a priori* clinical decision, on the odds of having a delayed hospital discharge. These results are presented as univariate models. A

multivariable logistic regression model was then used to examine the effect of social isolation on delayed discharges, controlling for other variables.

Social isolation was the main explanatory variable. This was assessed with the Portuguese version¹⁸⁵ of the 10-item LSNS (1988)¹⁰², which measures perceived social support in older adults received from family, friends and neighbours. This scale consists of an equally weighted sum of 10 items used to measure size, closeness and frequency of contacts of a person's social network. The LSNS is mainly used in older populations and has been employed in both clinical practice and research settings. A wide range of study designs, including cohort studies, conducted in the community, in assisted living facilities and in hospitals have used this scale¹⁸⁶ and the fact that it was translated into Portuguese and previously used in Portuguese studies in older populations¹⁸⁷⁻¹⁹⁰ made it preferable over other scales such as the Duke Social Support Index¹⁹¹ or the Social Disconnectedness 8-items scale²² identified in the literature as also appropriate to assess social isolation¹⁹².

According to the LSNS, patients can either have a low (score above 30 points), moderate (score between 26 and 30 points) or high risk of social isolation (score between 21 and 25 points) or be socially isolated (score below 21 points). All four levels of social isolation were included in the logistic model. Furthermore, source of admission was included as it is expected that patients that were in a care home or mental health facility prior to admission have a lower probability of having a delay in discharge as they usually have a secured place in the institution they came from, regardless of their level of dependency at discharge. I also included the intended discharge destination as it is expected that patients who are referred to publicly-funded rehabilitation units are more likely to have

delays given the reduced number of existing beds in the Lisbon area. Having a diagnosis of dementia was also included as it was hypothesised that patients with dementia may have some arrangements in place (i.e. either they were institutionalised or had carers) prior to admission and would most likely return to those arrangements after discharge. Finally, age and gender were also included in the model as they could be potential confounders. **Table 17** shows how each of these variables was coded for the logistic and negative binomial regression models.

Table 17: Coding of the variables included in the analysis

Variable name	Coding of the variable
Level of social isolation	0 = Low risk of social isolation 1 = Moderate risk of social isolation 2 = High risk of social isolation 3 = Socially isolated
Source of admission	0 = Own home 1 = Care home / mental health facility
Dementia	0 = No record of dementia 1 = Having dementia
Age	Continuous: 75 to 102 years
Gender	0 = Female 1 = Male
Intended discharge destination	0 = Other than publicly-funded rehabilitation unit 1 = Publicly-funded rehabilitation unit

Patients were assessed for cognitive impairment using the Portuguese version¹⁹³ of the MMSE or Folstein test¹⁹⁴, a 30-point questionnaire used in clinical and research settings as a screening tool for cognitive impairment and dementia^{195,196}. According to this version of the test, scores of 15 or lower for illiterate patients, 22 or lower for those with 1 to 11 years of schooling and 27 or lower for those with more than 11 years of schooling were proposed as cut-offs for cognitive impairment¹⁹³. The results of this test were used to determine whether the patient had capacity to consent to take part in the study. As these

results are highly correlated with the dementia variable, cognitive impairment determined using the MMSE was not used as an explanatory variable in the models.

Data were also collected using the EQ-5D-5L, a generic instrument to measure health-related quality of life based on preferences, developed by the EuroQoL group¹⁹⁷. The five-level version of this instrument was introduced in 2009 in order to improve the sensitivity of the three-level version and to reduce ceiling effects¹⁹⁷. The descriptive system of this instrument, used in the CRF, is composed of five dimensions (mobility, self-care, usual activities, pain/discomfort, anxiety/depression) each comprising five levels (no problems, slight problems, moderate problems, severe problems and extreme problems). The patient is asked to indicate one of the above mentioned levels for each of the five dimensions. Consequently, each patient's health state will be defined by a five digit number ranging from 11111 (having no problems) to 55555 (having extreme problems in all dimensions). This allows for the existence of 3,125 different health states which can be converted into health utilities using a value set. A descriptive analysis of the dimensions and levels of this variable was performed. The health states were not converted into utilities to inform the regression models because of significant variation when the questionnaires were completed (e.g. some patients filled in the questionnaire before surgery and others after surgery). Due to the emergency admission nature of PFFs, it was not always possible to have patient consent and collect the EQ-5D-5L questionnaire at admission before surgery. Furthermore, no information was collected concerning the date of completion of the EQ-5D-5L questionnaire, which renders the results of this questionnaire non-comparable across patients as they may be measuring different stages of the PFF.

The level of dependency of a person before the PFF occurred was assessed using the Portuguese version¹⁹⁸ of the Barthel Index¹⁹⁹, which assesses ability to perform ten activities of daily living. According to this scale, a patient can be considered: completely independent (score of 100 points); with a light dependency (score between 99 and 76 points); with a moderate dependency (score between 75 and 51 points); with a severe dependency (score between 50 to 26 points); or completely dependent (score below 26 points). The results of this variable are presented but the variable itself was not included in the model. It was not considered to be relevant to the analysis since, after the PFF, the level of dependency of patients changed significantly, with all being either severely dependent or completely dependent. Therefore, it was considered that inclusion of this variable would not improve the fit of the models.

A model predicting the number of days for which discharge was delayed for all patients was estimated. Five different models were considered: Poisson, negative binomial with a mean dispersion parameter, negative binomial with a constant dispersion parameter, two-part or hurdle model (part 1 logistic regression; part 2 Poisson) and the zero inflated Poisson model. The model selection was based on common specification tests²⁰⁰ (modified Park's test to identify the appropriate variance and Hosmer-Lemeshow and Pregibon link tests for the link functions). The model performance was assessed using common metrics for fit, in particular mean error, mean absolute error and root mean squared error and mean squared deviation. The univariate and multivariate negative binomial regression model examined the same covariates as the logistic model. The exponentiated model coefficients are presented in incidence rate ratios (IRRs). The model

coefficients were converted into days of delayed discharge using the “`margins dydx(*)`” command in STATA, which estimates the marginal effects for the explanatory variables in the model.

A covariate was judged to be statistically significant if $p < 0.05$. All calculations were carried out in the statistical package STATA version 12.

4.4 Results of the Hospital de Santa Maria case study

4.4.1 Study population

In total 288 patients were admitted with a diagnosis of PFF. Two patients (0.7%) declined to take part in the study, and eight patients (2.8%) died before discharge and were therefore excluded from the study. Thus, 278 (96.5%) patients were included in this study. **Table 18** reports the characteristics of the population.

Table 18: Socio-economic and health characteristics of the patients

Variables	No. patients (%)
Age (years)	85.5 (5.8)†
Gender	
Male	57 (20.5%)
Female	221 (79.5%)
Marital status	
Single / widowed / separated / divorced	200 (71.9%)
Married / living together	78 (28.1%)
With children	
Yes	218 (78.4%)
No	60 (21.6%)
Source of admission	
With family or others	159 (57.2%)
Home alone	57 (20.5%)
Care home or mental health facility	62 (22.3%)
Level of social isolation	
Low risk	144 (51.8%)
Moderate risk	49 (17.6%)
High risk	39 (14.0%)
Socially isolated	46 (16.6%)
Educational level	
No formal education / primary schooling	179 (64.4%)
Secondary schooling / university	99 (35.6%)
Net monthly income	
Less than €500	162 (58.3%)
Between €500 and €1,000	65 (23.4%)
Above €1,000	51 (18.3%)
Mini-Mental State Examination	
With a cognitive impairment	78 (28.1%)
Without a cognitive impairment	200 (71.9%)
Dementia	
Has no diagnosis of dementia	225 (80.9%)
Has a diagnosis of dementia	53 (19.1%)
Charlson co-morbidity index	1.2 (1.5)†
Functional status prior to PFF (Barthel index)	
Completely independent or light dependency	236 (84.9%)
Moderate dependency	27 (9.7%)
Severe or total dependency	15 (5.4%)
EQ-5D-5L	
Mobility	
No problems in walking about	0 (0.0%)
Slight problems in walking about	0 (0.0%)
Moderate problems in walking about	0 (0.0%)
Severe problems in walking about	216 (77.7%)
Unable to walk about	62 (22.3%)

Variables	No. patients (%)
Self-care	
No problems washing or dressing oneself	0 (0.0%)
Slight problems washing or dressing oneself	0 (0.0%)
Moderate problems washing or dressing oneself	0 (0.0%)
Severe problems washing or dressing oneself	0 (0.0%)
Unable to wash or dress	278 (100.0%)
Usual activities	
No problem doing one's usual activities	0 (0.0%)
Slight problem doing one's usual activities	0 (0.0%)
Moderate problem doing one's usual activities	0 (0.0%)
Severe problem doing one's usual activities	0 (0.0%)
Unable to do usual activities	278 (100.0%)
Pain/discomfort	
No pain or discomfort	69 (24.8%)
Slight pain or discomfort	68 (24.5%)
Moderate pain or discomfort	69 (24.8%)
Severe pain or discomfort	68 (24.5%)
Extreme pain or discomfort	4 (1.4%)
Anxiety/depression	
Not anxious or depressed	95 (34.2%)
Slightly anxious or depressed	48 (17.3%)
Moderately anxious or depressed	52 (18.7%)
Severely anxious or depressed	71 (25.5%)
Extremely anxious or depressed	12 (4.3%)
Number of days waiting for surgery	4.1 (3.4)†
Intended discharge destination	
Another acute hospital / care home / mental health facility	96 (34.5%)
Referred to a publicly-funded rehabilitation unit	22 (7.9%)
Private rehabilitation unit	14 (5.1%)
Home	146 (52.5%)

†These data presented refer to mean and standard deviation(SD)

The mean age of our population was 85.5 years (SD 5.8), mainly women (79.5%) and mostly without a partner (71.9%) but with descendants (78.4%). 20.5% of these patients lived alone prior to admission and another 22.3% were admitted either from a care home or a mental health facility with the remaining 57.2% living at home either with family or with a carer. According to the LSNS, one sixth (16.6%) of these patients were socially isolated at admission, 14.0% had a high risk of social isolation, 17.6% had a moderate risk

and 51.8% had a low risk. Culturally, these patients had a low level of formal education with 64.4% having no formal education or primary schooling. This is reflected in the low income level of these patients, with 58.3% of these patients receiving less than €500 per month. Some degree of cognitive impairment was present in 28.1% of patients at admission and 19.1% had a diagnosis of dementia. On average, these patients had 1.2 comorbidities as measured by the Charlson Comorbidity Index (CCI). The vast majority of the patients (84.9%) were completely independent or had a light dependency before admission to hospital with only 5.4% having a severe or total dependency level (measured with the Barthel Index). Patients' health-related quality of life assessed was assessed using with the EQ-5D-5L. Differences were observed in terms of mobility with 77.7% of the patients reporting having severe problems in walking about and 22.3% reporting being unable to walk. As referred in section 4.3.6. EQ-5D-5L data were collected for some patients before surgery and for others after surgery. At HSM, patients who had not yet undergone surgery were subject to pre-operative traction and were therefore unable to walk about. On the other hand, patients who had undergone surgery were still unable to walk about or had severe problems in walking about. All patients reported extreme problems in self-care and usual activities. Complaints about pain and discomfort had a higher variance, ranging between no pain or discomfort and extreme pain, as did complaints about anxiety and depression, but it is not possible to estimate the extent to which these results are due to a pre-operative state. On average, these patients waited 4.1 days for surgery (SD: 3.4 days).

The 278 patients spent a total of 3,647 days in hospital, corresponding to a mean LOS of 13.1 days (SD 10.8, median 10.0 days, interquartile range 7.0 days, range 3 to 100). In

total there were 62 (22.3%) patients with a delay in discharge, representing a total of 419 excess bed days: 11.5% (95% CI: 7.7%-15.2%) of all hospital days. Among the patients with delayed discharge the average delay was 6.8 days (SD 11.2 days, median 3.0 days, interquartile range 5.0 days, range 1 to 70).

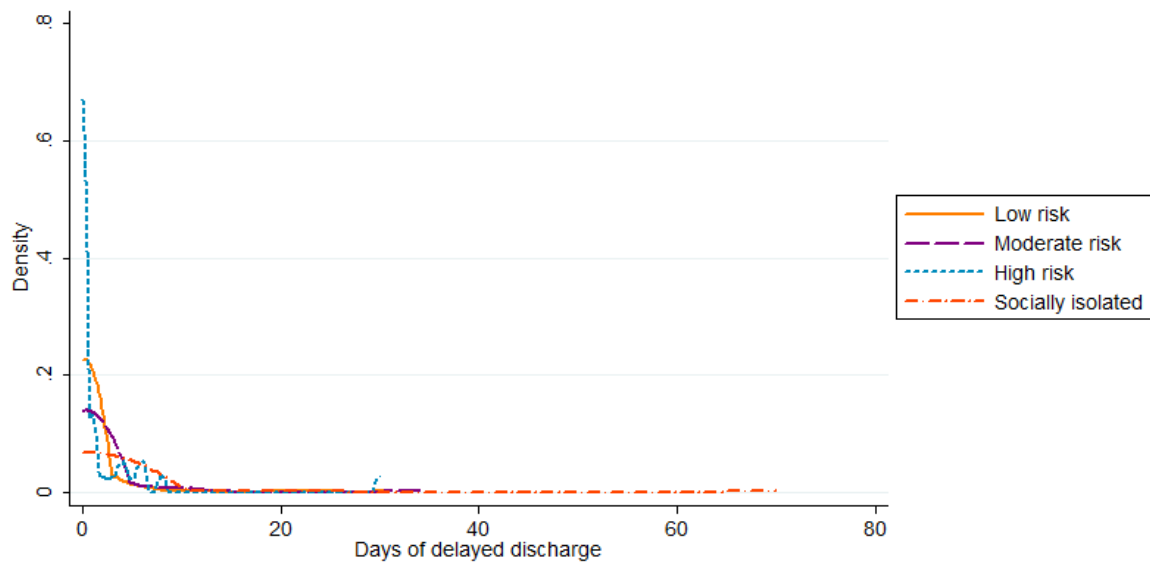
Table 19 shows LOS stratified by level of social isolation. The mean LOS was lower in patients with a low risk of social isolation and increases progressively with the risk of social isolation, although there was little difference between moderate and high risk patients. The one-way ANOVA test found no evidence of differences in mean LOS by level of social isolation ($F(3,274)=2.28$, $p=0.08$). The difference in mean length of medically-necessary stay, measured as total LOS minus number of days of delayed discharges, by level of social isolation was also not statistically significant ($F(3,274)=2.16$, $p=0.09$).

Table 19: LOS, length of medically-necessary stay and days of delayed discharges by level of social isolation

	Low risk	Moderate risk	High risk	Socially isolated
Total sample	144	49	39	46
Mean LOS (SD)	11.6 (6.8)	14.3 (13.7)	13.7 (8.6)	16.0 (16.8)
Median LOS	10.0	12.0	11.0	11.0
Mean length of medically-necessary stay	10.5 (5.3)	12.9 (9.2)	11.9 (6.8)	13.3 (12.0)
Median length of medically-necessary stay	10.0	11.0	10.0	10.5
Patients with delayed discharges	29 (10.4%)	10 (3.6%)	14 (5.0%)	9 (3.2%)
Mean days of delayed discharges for patients with a delayed discharge	5.3 (7.4)	7.1 (10.1)	5.2 (7.5)	13.3 (22.5)
Median days of delayed discharges for patients with a delayed discharge	2.0	3.0	3.5	4.0

Table 19 and **Figure 21** show the number of days of delayed discharge, for patients with a delay in discharge, stratified by level of social isolation. As determined by the one-way ANOVA, the mean days of delayed discharge do not differ significantly by level of social isolation ($F(3,58)=1.29$, $p=0.29$).

Figure 21: Kernel density plot of days of delayed discharges by level of social isolation



Family members were the main providers of care after hospital discharge, with 52.5% of the patients intending to return home with family support (either with or without domiciliary care). The number of patients with an intended discharge to an institution (either another acute hospital, care home or mental health facility) was 34.5%, in contrast to the percentage of admissions from such institutions of 22.3%. All patients admitted from a care home or mental health institution were discharged to the same institutions. 5.1% of the patients intended to be discharged to a private rehabilitation unit and 7.9% to a publicly-funded rehabilitation unit. Intended discharge destination was

determined immediately after the surgery and before the patient was deemed medically fit for discharge and it did not always coincide with the actual discharge destination.

Given the limited number of publicly-funded rehabilitation beds in the area of Lisbon, the HSM is allowed by *Administração Regional de Saúde de Lisboa e Vale do Tejo* to transfer patients to temporary settings (e.g. a care home, home with family, a private rehabilitation) while they are waiting for a bed in one of these units. This is unique to Lisbon: in other regions patients referred to a publicly-funded rehabilitation unit would have to wait in hospital until a place became available in such unit. Hence, out of the 22 patients discharged and referred to a publicly-funded rehabilitation unit, 15 had delayed hospital discharges. Three (1.1% of the total) were admitted directly from the HSM into a publicly-funded rehabilitation unit, and 19 (6.8% of the total) waited for a place to become available at a publicly-funded rehabilitation unit either at home with family, or at a care home, or at a private rehabilitation unit. This would have been equivalent to 1,241 days of delayed discharges if the patients had not been discharged from hospital. On average these patients waited 65.3 days (SD 52.4 days, median 48.0 days, interquartile range 30.5 days, range 1 to 172) for a placement, and by the time they were offered one, 5.3% (1/19) had died and 42.1% (8/19) declined the placement.

The proportion of patients readmitted within one month of discharge was 10.8% (30/278), but only two of these 30 patients were readmitted to the orthopaedic ward, with the remainder being readmitted to internal medicine wards.

4.4.2 Predictors of delayed discharges

The univariate analysis suggested that having a high risk of social isolation, being admitted from home, intending to be discharged to a publicly-funded rehabilitation unit and having a diagnosis of dementia were significantly associated with delayed discharges (see **Table 20**). Adjusting for other covariates, the odds of having a delayed discharge were 3.6 (95% CI: 1.2 – 10.7) times higher for patients who were isolated and 3.4 (95% CI: 1.4 – 8.4) times higher for patients who were at a high risk of social isolation than for patients with a low risk of social isolation (see **Table 20** and Appendix 13). Patients who had a moderate risk of social isolation were also more likely to have a delay in discharge compared to low risk patients, but this was not found to be statistically significant (OR: 1.4, 95% CI: 0.6-3.4). On the other hand, patients who were admitted from an institution had a lower risk of having a delay in their discharge compared to those admitted from home (OR: 0.2, 95% CI: 0.1-0.6). The interaction between the levels of social isolation and being admitted from an institution was assessed but no statistically significant evidence for such interactions was found, although this may be partly explained by lack of statistical power. Being referred to a publicly-funded rehabilitation unit was a statistically significant predictor of delayed discharges (OR: 7.6, 95% CI: 2.8–20.6). Dementia was associated with a significant decrease in the likelihood of a delayed discharge (OR: 0.3, 95% CI: 0.1-0.9). Age and gender were not found to be significantly associated with delayed discharges.

Table 20: Logistic regression model on the occurrence of delayed discharge

	OR (95% CI)	
	Univariate model	Multivariate model
Level of social isolation*		
Low risk	Reference	Reference
Moderate risk	1.02 (0.45-2.27)	1.39 (0.57-3.38)
High risk	2.22 (1.03-4.80)	3.42 (1.40-8.37)
Socially isolated	0.96 (0.42-2.22)	3.55 (1.17-10.74)
Source of admission		
Own home	Reference	Reference
Care home / mental health facility	0.19 (0.07-0.54)	0.17 (0.05-0.57)
Dementia		
No record of dementia	Reference	Reference
Having dementia	0.39 (0.16-0.95)	0.29 (0.10-0.85)
Age (in years)		
	1.01 (0.96-1.06)	1.02 (0.97-1.08)
Gender		
Female	Reference	Reference
Male	1.17 (0.96-1.06)	0.92 (0.43-1.96)
Intended discharge destination		
Other	Reference	Reference
Publicly-funded rehabilitation unit	9.53 (3.68-24.67)	7.57 (2.78-20.61)
Number of observations		278
Akaike's Information Criterion		267.60
Bayesian's Information Criterion		300.24
Pseudo R ²		0.15

* The association between the level of social isolation and delayed discharges was estimated using three levels of social isolation as covariates.

4.4.3 Number of days of delayed discharges

The negative binomial model with mean dispersion parameter was the best fitting model and was therefore used for this analysis. The univariate analysis suggested that source of admission and intended discharge destination were significantly associated with the number of days of delayed discharge. Adjusting for other covariates, relative to an individual with low risk of social isolation, having a moderate or high risk of social isolation or being socially isolated were associated with significant increases in the

number of days of delayed discharge (see **Table 21** and Appendix 14). Patients with moderate risk of social isolation spent, on average, an additional 1.2 days of delayed discharge in hospital compared to patients with a low risk of social isolation, holding all else constant, while those with high risk spent, on average, an additional 1.6 days and those socially isolated spent, on average, an additional 6.0 days. Holding all else constant, the average patient admitted from an institution had 6.0 fewer days of delayed discharge relative to the admissions of patients from their own home. Patients with a diagnosis of dementia had, on average, 2.2 fewer days of delayed discharge than patients without a diagnosis. Patients referred to a publicly-funded rehabilitation unit were estimated to have an additional 4.9 days of delayed discharge adjusting for other covariates. Age and gender were not found to be statistically significant predictors of the number of days of delayed discharge.

Table 21: Negative binomial regression model on the number of days of delayed discharge

	IRR* (95% CI)	IRR* (95% CI)	Days of delayed discharge
	Univariate model	Multivariate model	Multivariate model
Level of social isolation**			
Low risk	Reference	Reference	Reference
Moderate risk	1.35 (0.42-4.31)	2.45 (1.09-5.51)	1.18
High risk	1.73 (0.62-4.86)	2.97 (1.37-6.42)	1.60
Socially isolation	2.42 (0.64-9.22)	8.32 (2.42-28.56)	5.96
Source of admission			
Own home	Reference	Reference	Reference
Care home / mental health facility	0.03 (0.01-0.10)	0.04 (0.01-0.13)	-6.04
Dementia			
No record of dementia	Reference	Reference	Reference
Having dementia	0.42 (0.12-1.50)	0.30 (0.13-0.68)	-2.20
Age (in years)	0.95 (0.88-1.03)	1.05 (1.00-1.10)	0.08
Gender			
Female	Reference	Reference	Reference
Male	2.03 (0.66-6.28)	1.12 (0.46-2.73)	0.20
Intended discharge destination			
Other	Reference	Reference	Reference
Public-funded rehabilitation unit	20.44 (10.03-41.66)	14.99 (7.47-30.07)	4.89
Number of observations		278	
Akaike's Information Criterion		568.08	
Bayesian's Information Criterion		604.36	

* Incidence rate ratio

** The association between the level of social isolation and delayed discharges was estimated using three levels of social isolation as covariates.

4.4.4 Costs of delayed discharges

The mean LOS for a patient with a PFF was 13.1 days, corresponding to a hospital cost of €4,684 per patient (SD €3,748) and a total of €1,302,238 for the whole sample. The mean LOS for a patient without a delay in discharge was 11.1 days corresponding to a hospital cost of €3,994 (SD €2,508) whereas the mean LOS for a patient with a delay in discharge was 20.0 days, corresponding to a hospital cost of €7,090 (SD €5,834). Hence, the mean

hospital cost of a patient with a delay in discharge was 77.5% higher than that of a patient without a delay. The mean hospital cost of each delayed discharge was €2,352 (6.8 days, SD €3,915), equivalent to more than half of the mean hospital cost of a PFF. The total annual hospital cost of delayed discharges for patients with a PFF was €145,812, or 11.2% of total costs.

These costs would have been significantly higher if the 19 patients waiting for a placement in the publicly-funded rehabilitation unit had not been discharged to a temporary setting such as home with family, care home or private rehabilitation unit for an average of 65.3 (52.4) days, giving a total waiting time of 1,241 days across all patients. If all of these patients had remained in hospital until a place at the publicly-funded rehabilitation unit became available, the mean LOS in hospital would have been 17.6 days and this would have increased the annual hospital cost of delayed discharges by €431,868 to a total of €577,680 (€9,317 per patient with a delayed discharge) and the impact of delayed discharges from 11.2% to 30.7% of total hospital costs (€1,879,918). However, these 19 patients still incurred costs while in a temporary setting of €83,036, or €4,370 per patient (see **Table 22**). Adding these costs increases the societal costs of delayed discharges to €228,848, or 16.5% of total costs (€1,385,274).

Based on the results of the negative binomial model with a mean dispersion parameter detailed in section 4.4.3 above, the additional costs per patient corresponding to the extra days in hospital are €411 for the moderate risk group, €557 for the high risk group and €2,074 for the socially isolated group, compared to the low risk for social isolation group. Holding all else constant, the average patient admitted from an institution had

€2,102 fewer hospitals costs than patients admitted from their own home. Patients with a diagnosis of dementia had €766 fewer hospital costs than patients without a diagnosis of dementia. Patients referred to a publicly-funded rehabilitation unit were estimated to cost an additional €1,702 to the hospital, adjusting for other covariates.

Table 22: Costs incurred by patients waiting for a bed in a publicly-funded rehabilitation unit while in a temporary setting (n=19) (Euros, 2013)

Resource use	Total number of days	Total equipment/trips	Mean daily cost	Total cost
Care home	572	-	€49	€28,208
Private rehabilitation unit	177	-	€181	€31,961
Domiciliary care services	301	-	€10	€3,034
Walking frame	-	3	€40*	€120
Adjustable bed	-	1	€700*	€700
Bath chair	-	1	€110*	€110
Transport	-	4	€30*	€120
Formal care	144	-	€22	€3,886
Informal care	492	-	€28	€14,896
Total cost	-	-	-	€83,036

* Mean unit cost

4.5 Discussion of the results

4.5.1 Main findings and interpretations

The results presented in this chapter show that social isolation is associated with both the probability of delayed hospital discharge and an increase in the number of days of delay for older PFF patients. Furthermore, being referred to a public-funded rehabilitation unit was found to significantly increase the odds of having a delayed discharge, as well as the number of days of delay. However, being admitted from a care home or a mental health facility and having a diagnosis of dementia were found to be protective factors for delayed discharge.

This is the first study to examine the impact of social isolation on delayed hospital discharges using a validated tool (LSNS). Other cohort studies have examined the association between delayed discharges and living alone or having formal/informal help prior to hospital admission, which could be construed as a proxy for social isolation. However, the number of studies is small^{6,41,49,71,82}, their results are contradictory and social isolation is better informed by additional dimensions such as friends and family network and patients' contribution to the wider society, as discussed in Chapter 2. A study conducted in Switzerland⁷¹ found a statistically significant positive association between delayed discharges and patients living alone while studies conducted in England⁶ and Italy⁴¹ reported a negative association between having formal/informal help prior to admission and delayed discharges. Conversely, another Italian study⁴⁹ reported a negative association between delayed discharges and patients living alone, whereas studies based in Singapore⁸² and England⁶ reported that living alone did not significantly predict delayed discharges, which is in line with a secondary analysis looking at the impact of living alone prior to admission (rather than social isolation) on delayed discharges in a multivariate model (OR: 1.2; .95% CI: 0.6–2.4).

In this study, older patients, both with and without delays, were mostly discharged home with family support (41.9% and 55.6%, respectively). The family structure is still very present in Portuguese society but this is changing with a higher number of women entering the job market²⁰¹, increasing retirement age²⁰², a reduction in family size and the ageing population²⁰³. These factors, combined with life in the city, have led to an increase in the number of older isolated people. Despite being isolated or at a high risk for isolation, most of these older people are organised and can cope with the normal aspects

of their daily life. However, when faced with an adverse event like a PFF, that significantly reduces their independence, the lack of social support becomes more relevant and, in the absence of support from social networks, alternative ways of providing care after the acute hospital discharge have to be found.

Admission to a care home would be the traditional solution for post-acute care and in fact, being admitted from a care home or mental health facility was found to be a protective factor for delayed discharges, mainly because these patients have secured a place to return to after discharge. It is worthwhile noting that 45.2% of the patients admitted from a care home or mental health facility were cognitively impaired. However, despite preventing delayed discharges, discharge to a care home is not necessarily a solution as it fosters further social isolation²⁰⁴. The majority of the delayed discharged patients are not cognitively impaired (72%) and, given the right to choose, they preferred not to be discharged to a care home.

I found that being referred to a publicly-funded rehabilitation unit delays the discharge of patients from hospital. A study by Mayo et al.³⁸ also shows that discharge destination is strongly associated with delayed discharges, with patients being discharged to a rehabilitation facility having 5.7 times higher odds of having more than 7 days of delayed discharge than patients discharged home. Rehabilitation in a specialised unit can significantly reduce the level of dependency of these patients and allow them to return home. Taking into account that the income level of these patients is very low, not many are able to afford private rehabilitation units. Furthermore, as described in this chapter and reported in Chapter 3, there is currently a shortage of beds in publicly-funded

rehabilitation units in the Lisbon area. This, combined with the fact that sometimes patients are not referred to the correct units, causes delays in the admission process of those patients whilst blocking the entrance of others, resulting in long waiting times for older people that are referred to publicly-funded rehabilitation units. Therefore, being referred to a publicly-funded rehabilitation unit significantly increases the odds of having a delayed discharge and the number of days of delay. Occasionally, patients are not referred to these units because it is known that they will be waiting in hospital for a long time before a place becomes available at one of these units and, therefore, other alternative forms of care are sought. The percentage of patients referred to this type of unit in this study (7.9%) contrasts with that seen, for instance, in the United Kingdom where, in 2013, 18.9% of PFF patients were discharged to a rehabilitation unit (National Hip Fractures Database (NHFD) 2013)²⁰⁵.

The mean cost of the hospital stay for patients with a delayed discharge was 77.5% (€3,096) higher than that of a patient with no delay. Delayed discharges represent both an inappropriate and inefficient use of acute hospital beds that, if prevented, could have led to potential hospital cost savings of €145,812 in our sample. However, the costs of delayed discharges are underestimated due to the fact that 86.4% of the patients referred to a publicly-funded rehabilitation unit waited for a placement in a temporary setting. If the costs incurred by these patients while waiting for a placement are considered, then the costs of delayed discharges amount to €226,636, increasing to €577,680 if they had not been discharged from the acute hospital in the first place. Furthermore, patients with delayed discharges could benefit from another level of care that is much less expensive than an acute hospital bed and more appropriate to their

needs. Publicly-funded rehabilitation units received €88 per patient per day in 2013 to cover healthcare services rendered, medicines, auxiliary diagnostic tests, wound dressing packs for pressure sores and social care services²⁰⁶, which is significantly lower than the cost of a bed day in acute care (€348). While waiting for a placement in a publicly-funded rehabilitation unit, delayed discharge patients also spend a significant amount of time in acute wards that are not prepared to provide the level or expertise of care that they need and this will have a detrimental impact on their rehabilitation.

It is important to note though that delayed discharges shift the costs from rehabilitation units to the acute hospital provider. This means that costs increase for the acute hospital provider and decrease for the rehabilitation units. From an NHS perspective, however, this shift in costs due to delayed discharges translates into an increase in overall costs given the difference in opportunity costs between the two types of providers.

4.5.2 Strengths and limitations

There are some limitations to this study. First, the criteria used to determine whether a patient was medically fit for discharge are based on clinical judgement made on three clinical indicators in section 4.3.4, all of which are objective but are not recognised as an evaluation tool. However, it is unlikely that internationally used tools, such as the Appropriateness Evaluation Protocol (AEP)⁸⁰, would have changed the relationship between social isolation and delayed discharges.

Secondly, no national hospital costs were available for PFF patients. Micro-costing would have provided more accurate results for bed day costs but this was not possible. Instead,

the national daily cost of a hospital stay in an orthopaedics ward¹⁷⁹ was used as the best available option. Although the average daily cost of an orthopaedics bed accounts for more than just hotel costs, its usage is appropriate to estimate the costs of delayed discharges as they represent the use of an acute bed when no longer necessary. Furthermore, PFF patients remaining in an orthopaedics ward after being deemed medically fit for discharge consume more resources than just hotel costs. These patients are very dependent and therefore still require nursing care and rehabilitation (although these services would be better provided in another setting, such as a rehabilitation unit). Therefore, the use of the cost of an orthopaedics bed day is appropriate for this specific patient group.

Thirdly, it was not possible to calculate the opportunity cost of the beds used by the delayed discharge patients, i.e., how many patients were not admitted for elective surgery due to beds being occupied by patients with delayed discharges. The foregone opportunities this represents are expected to be high, as there is a long waiting list for elective procedures in this orthopaedics department and the average bed occupancy rate in 2012 and 2013 was above 80% (value after which blockages in admissions are expected to occur at the HSM).

Finally, intended discharge destination is not pre-determined at admission. However, the intended discharge destination is determined immediately after surgery and always before the patient is deemed medically fit for discharge and, therefore, this variable was included in the model as its omission of the variable could have introduced bias and allowing for it improved the fit of the model. I did run two models, one with being

discharged to a publicly-funded rehabilitation unit as an explanatory variable and the other one without this variable. The coefficients for social isolation were not significantly affected by the inclusion of intended discharge destination in the model.

4.5.3 Policy implications

Social isolation among older adults is increasing in Portugal²⁰⁷. Having a high risk of social isolation, being socially isolated and being referred to a public-funded rehabilitation unit increases delays in patients' discharges from acute care hospitals. Moreover, after receiving rehabilitation in an adequate setting, even patients who are isolated or with a high risk of social isolation could return home to live independently²⁰⁸. Taking these factors into account, an increase in the number of beds in publicly-funded rehabilitation units would reduce the number of days of delayed discharge of these patients. It is important to a patient's recovery to have quick access to rehabilitation, but it is also important that they return quickly to the community, where they should have adequate services available and strategies in place to promote social inclusion. These results may be particularly applicable to countries where family support is still very prevalent, as in most southern European, Latin American and some Asian countries, or where there is a limited supply of post-acute care rehabilitation units.

4.6 Conclusions

This chapter has described the design and results of a prospective cohort study examining the impact of social isolation on delayed discharges of PFF patients at the HSM in Portugal and estimating the costs associated with these delays. The results suggest that social isolation is associated with delayed discharges. A dose-response relationship was

observed in terms of the number of days of delay, with days increasing as the level of social isolation increases. However, results also indicate that while being admitted from a care home was a protective factor in terms of delays, being referred to a publicly-funded rehabilitation unit increased significantly the chances of having a delay as well as the number of days of delayed discharge.

These results have implications in terms of policy since increasing the number of beds available in publicly-funded units could reduce delayed discharges and prevent further isolation of the patients. Furthermore, given that lack of a support network has a significant impact in terms of LOS, there is a need for policies aiming at alleviating social isolation to be devised in order to prevent unnecessary hospital stays.

Chapter 5 : Delayed discharges of proximal femoral fracture patients at the John Radcliffe Hospital

5.1 Introduction

In Chapter 4 I presented a case study showing that social isolation is a predictor of both the occurrence of delayed discharge and the number of days of delayed discharge in older proximal femoral fracture (PFF) patients at a Portuguese hospital. Since countries differ, e.g., with respect to the social networks of older people as well as health and social care service provision (described in Chapter 3), this chapter will focus on how social isolation affects delayed discharges of older PFF patients at the John Radcliffe Hospital (JRH) in Oxford, England, following the same methodology used in Chapter 4.

This chapter starts by providing a rationale for analysing delayed discharges at the JRH in England. The methodology for data collection and analysis is then described and models examining the impact of social isolation on delayed discharges and on the number of days of delayed discharges for older PFF patients are presented. The costs of these delays are estimated using two different approaches. Finally, the chapter finishes with a discussion of the findings.

5.2 Delayed discharges at the John Radcliffe Hospital

Delayed hospital discharges, or delayed transfers of care as defined and categorised by National Health Service (NHS) England, are a longstanding issue in England and an important area of policy. At a time of significant pressure to reduce NHS expenditure, it is

important to understand why and to what extent acute hospital beds are inappropriately used. According to NHS England⁶⁸, 1.6 million bed days were lost to delayed transfers of care in England in 2014/15, an average of just under 4,500 beds lost per day of which 66.1% occurred in acute hospitals. Despite the policy measures implemented to reduce delayed discharges (described in Chapter 3), such as the NHS and Community Care Act 1990^{209,210}, the NHS Plan²¹¹, the National Service Framework for Older People¹³, the Community Care Act 2003⁶⁶, the Better Care Fund²¹² and the Care Act 2014²¹³, evidence suggests that delayed discharges have remained persistently high and may in fact have increased over time (see Chapter 3). Studies conducted in older patients in the United Kingdom (UK) before the 1990s reported that delayed discharges accounted for between 4.8% and 16.2% of total length of stay (LOS) whereas studies conducted after 2005^{55,59,60,85,98,101} reported proportions of delayed discharges that varied between 16.0% and 60.0% suggesting that, despite the introduction of several measures, delayed discharges still accounted for a large percentage of the total LOS in this patient group.

In 2014/15, Oxford University Hospitals NHS Foundation Trust (OUH Trust) was the English Trust with the highest reported number of days of delayed discharges (43,794), representing 10.1% of the total LOS in the Trust for that year⁶⁸. In that same year, 202,502 patients were admitted to this Trust, corresponding to 498,811 finished consultant episode (FCE) bed days. The occupancy rate was 87.9%, above the 85% threshold defined by the National Audit Office as the point above which hospitals can expect to have regular bed shortages. The mean LOS per patient treated was 4.4 days (this includes 90,330 day case admissions). However, given the high number of delayed discharges reported by the Trust, this indicator could be significantly improved.

As described in Chapter 2, patients facing delayed discharges tend to be older and have complex health and social care needs⁶, which may arise from a lack of informal support from family and friends due to the high levels of social isolation in this population. This chapter aims to estimate the number of days that can be attributed to delayed discharges among older patients with a PFF at the JRH; to assess whether social isolation has an impact on these delays; and, finally, to estimate the costs of such delays.

5.3 Data collection and analysis

5.3.1 Study design, setting and participants

The study was designed as a prospective cohort study. Patients were recruited between 7 March 2014 and 6 March 2015 in the Trauma Unit of the JRH, the main unit providing treatment for emergency trauma patients in the catchment area. This study was integrated into the Fracture Free study which, over a five-year period, collected data on patients aged 50 years and over presenting with a fragility fracture in order to identify the predictors of re-fracture (see Appendix 15). All patients admitted via the Accident and Emergency (A&E) department, as well as those transferred from other units, aged 75 and above with a diagnosis of a PFF were identified by the study team using the electronic patient management system. Patients who died before being declared medically fit for discharge were excluded from the study, as were subsequent fractures requiring hospital admission in patients who were already enrolled in the study. All patients were followed up from admission to discharge from the OUH Trust.

5.3.2 Ethics approval and consent

UK NHS ethical approval was obtained in 2014 from the National Research Ethics Service Committee South Central – Oxford D Research Ethics Committee (12/SC/0091) (Appendix 16). Informed consent was obtained from all individual participants included in the study, or their next of kin, when participants were not able to consent.

5.3.3 Data collected

Constructing the questionnaire

The case report form (CRF) designed for the *Hospital de Santa Maria* (HSM) study, described in Chapter 4, was partially incorporated into the Fracture Free CRF. As such, the Fracture Free CRF was composed of:

- Bone health questionnaire;
- Charlson Comorbidity Index(CCI)²¹⁴;
- Socio-demographic questionnaire;
- Income and health questionnaire;
- Quality of life questionnaire (EQ-5D-5L)¹⁷⁷;
- Nottingham Extended Activity of Daily Living Scale(NEADLS)²¹⁵;
- Lubben Social Network Scale(LSNS)¹⁰².

The CRF, detailed in Appendix 17, was completed either by the patients or by their next of kin. An additional social and clinical information form, detail in Appendix 18, was filled in by the recruitment team with information collected from the patients' medical records. The CRF was in English. If patients were not able to understand the language, a translator

(a member of the team or a healthcare professional at the JRH) was identified to assist the patient.

Administering the questionnaire

Data were collected by a research team supervised by me, and composed of two research nurses, 15 foundation doctors and three public health registrars. Eligible patients were approached for enrolment as soon as they were transferred to a ward. The Abbreviated Mental Test (AMT) conducted at admission was used to guide whether patients had capacity to consent. If patients had capacity to consent, they were asked whether they wished to take part in the study. If patients did not have capacity to consent, the next of kin was contacted to act as a consultee. To minimize non-response bias, patients or patients' next of kin were contacted, while the patient was still in hospital, if they failed to return the questionnaires. Patient records were reviewed to extract information on: age, gender, postcode, marital status, usual place of residence, type of fracture, comorbidities, AMT score, date of admission, date of surgery, date of being declared medically fit for discharge, date of discharge, discharge destination and hospital readmission at one month. The Index of Multiple Deprivation (IMD)²¹⁶ was derived from patients' postcodes using GeoConvert™.

5.3.4 Resource use

Patients were followed up from admission to discharge from the admitting acute hospital trust, and the difference between these two dates provided the total LOS. Delayed discharges were calculated as the difference between the date of being assessed medically fit for discharge and the actual date of discharge. The guidelines used by the

orthogeriatricians in this Unit to inform the clinical decision on when a patient was considered to be medically fit for discharge were: 1) the patient did not need any oxygen or intravenous treatment; 2) the haemoglobin was above 8.0 g/dL; and 3) the patient was able to stand up or be mobile with the support of a walking frame (except if bedbound at admission). However, oxygen therapy and intravenous treatment were not a barrier to declaring a patient medically fit for discharge for certain community hospitals. The proportion of delayed discharges was calculated as total days of hospital stay that could be attributed to delayed discharges expressed as a percentage of total LOS. Length of medically-necessary hospital stay was estimated as the number of days between admission and being declared medically fit for discharge.

5.3.5 Costs

Patient-level data on diagnosis using the International Classification of Diseases (ICD-10) codes and on procedures using the Classification of Surgical Operations and Procedures (OPCS-4) codes were extracted from hospital records by FCE (i.e. a period of care under a particular consultant) for all patients enrolled in this study, in addition to information on treatment specialty, duration of admission, admission and discharge methods, and use of any specialist services, namely palliative care, critical care, or rehabilitation. All FCEs incurred by the patients from admission to discharge were considered. Each FCE within an overall hospital spell was assigned to a Healthcare Resource Group (HRG) via the 2013/2014 Casemix Grouper software (HRG4+)²¹⁷. HRGs are standard groups of clinically similar treatments that consume common levels of healthcare resources. Once allocated to an HRG, 2013/2014 prices obtained from the schedule of reference costs for NHS trusts²¹⁸ were used to attach a value to each HRG. Total hospitalisation costs of PFFs,

including A&E costs, were calculated in two ways. The base case used the reference cost for each FCE within an overall hospital spell. A sensitivity analysis was conducted using the spell HRG costs for each overall hospital spell. A&E costs were calculated using the costs for the respective attendance. The cost of delayed discharges was calculated in two ways. The base case used the cost for an excess bed day for the FCE in which the delayed discharge occurred, as this is the closest cost available to “hotel cost”; when the delay continued in another episode, the reference costs for the subsequent FCEs were added to the excess bed days cost of the previous FCE. A sensitivity analysis explored an alternative approach using the daily cost of the spell HRGs, calculated as the total cost divided by the total LOS in each spell.

5.3.6 Statistical analysis

The impact of social isolation on delayed discharges was assessed in two ways: firstly, by examining whether social isolation was a determinant of delayed discharges and, secondly, by estimating the impact of social isolation on the number of days of delayed discharges.

Analysis of variance (ANOVA) was used to compare the mean of the total LOS, the mean of the medically-necessary LOS and the mean days of delayed discharge (for patients with a delay in discharge) across the four levels of social isolation (i.e. low risk, moderate risk, high risk of social isolation and socially isolated).

Logistic regression was used to model whether or not the patient experienced a delay in discharge. A generalized linear model (GLM) was used with the family and link function

being selected based on common specification tests²⁰⁰, namely, the modified Park's test, to identify the appropriate variance function, and the Hosmer-Lemeshaw, Pregibon link and Pearson correlation tests to assess the appropriateness of the specified link function. The model performance was assessed using common metrics of fit, in particular mean error, mean absolute error and root mean squared error. Univariate and multivariate analysis were conducted. The exponentiated coefficients (arithmetic mean ratios – AMR) were used to describe the effects of relevant variables on the number of days of delayed discharge. The model coefficients were converted into days of delayed discharge using the “margins dydx(*)” command in STATA, which estimates the marginal effects for the explanatory variables in the model.

The main explanatory variable was level of social isolation (see Chapter 4 for additional information on this scale), categorised using the LSNS as: low risk of social isolation (≥ 31 points), moderate risk (26-30 points), high risk (21-25 points), and socially isolated (≤ 20 points). Low risk of social isolation was chosen as the reference category because the aim of the study was to find out how patients with a lack of social network compare to patients who have a low risk of social isolation in terms of delayed discharges. This was further adjusted for a range of potentially confounding variables, selected based on previous studies^{2,6,45}, namely age, gender, residential status prior to admission, and dementia (as documented in medical records). **Table 23** shows how each of these variables was coded for the logistic model and in the GLM.

Table 23: Coding of the variables included in the analysis

Variable name	Coding of the variable
Level of social isolation	0 = Low risk of social isolation 1 = Moderate risk of social isolation 2 = High risk of social isolation 3 = Socially isolated
Source of admission	0 = Own home 1 = Care home / warden controlled flat
Dementia	0 = No record of dementia 1 = Having dementia
Age	Continuous: 75 to 102 years
Gender	0 = Female 1 = Male

Patients were screened for cognitive impairment using the AMT, a 10 question test assessing short and long-term memory commonly used in older populations in hospital settings. A score of eight or more is considered normal mental status. The results of this test were used to determine whether a patient had capacity to consent to take part in the study. As these results are highly correlated with the dementia variables, cognitive impairment determined using the AMT score was not used as an explanatory variable in the model.

Data were also collected on EQ-5D-5L (additional information about this questionnaire is provided in Chapter 4). A descriptive analysis of the dimensions and levels of this variable was performed. However, the health states were not converted into utilities to inform the regression models because of the significant variation when the questionnaires were completed (e.g. some patients filled in the questionnaire immediately after surgery and some others months after discharge from hospital). Given that some questionnaires were posted to patients (at their request) or to their next of kin (when patients could not consent and the next of kin was not present in hospital), it was not always possible to

consent and collect the EQ-5D-5L questionnaire immediately after surgery (at the JRH, patients were not approached before surgery). Furthermore, no information was collected on the date of completion of the EQ-5D-5L questionnaire, which renders the results of this questionnaire non-comparable across patients as they may be measuring different stages of the PFF.

Functional ability to perform instrumental activities of daily living was assessed using the Nottingham Extended Activities of Daily Living Scale (NEADLS). This scale evaluates an individual's ability to perform 22 activities, which fall into four subscales: mobility (6 questions), ability in the kitchen (5 questions), ability to perform domestic duties (5 questions), and ability to undertake leisure activities (6 questions). Responses are recorded using four options: on your own, on your own with difficulty, on your own with help, not at all. NEADLS was design to function as a dichotomous scale and therefore a score of one was attributed to "on your own" or "on your own with difficulty", and a score of zero was attributed to "on your own with help" or "not at all". The total score for this scale ranges from zero to 22 points. The results of this variable are presented but the variable itself was not included in the model. It was not considered to be relevant to the analysis because, as described in Chapter 4, the functional ability of the patients to perform instrumental activities of daily living changed significantly after the PFF.

A covariate was judged to be statistically significant if $p < 0.05$. All calculations were carried out in the statistical package STATA version 12.

5.4 Results

5.4.1 Study population

424 patients were admitted to hospital with a diagnosis of PFF. 26 died before planned discharge and 137 declined to take part in the study, leaving 261 in the study. The mean age of the sample population was 86.2 years (SD 5.7), and participants were mainly women (184; 70.5%), mostly had no partner (169; 64.8%) and were living at home prior to hospital admission (216; 82.8%) (**Table 24**). At admission over half of the sample was socially isolated (139; 53.3%) and only 28 patients (10.7%) had a low risk of social isolation. 70 patients (26.8%) had a cognitive impairment at admission, and 46 (17.6%) had a clinical diagnosis of dementia. On average, each patient had 1.7 (SD 1.7) comorbidities according to the CCI and a functional status score of 12.9 (SD 7.1) before the fracture according to the NEADLS. Significant variance was observed in terms of the answers to EQ-5D-5L. In the mobility dimension, 73.0% of the patients reported having severe problems or being unable to walk about and 20.1% reported having none to moderate problems. In other dimensions, 54.7% and 72.3% of individuals reported having severe to extreme problems in performing self-care and usually activities, respectively. In the pain and discomfort dimension, and the anxiety and depression dimension, the variance in replies was higher with answers ranging from no problems to extreme problems. However, EQ-5D-5L questionnaires were not all collected at hospital admission prior to surgery, with some being completed after surgery or even after discharge (if completed by next of kin), and as a result the EQ-5D results reflect different stages of the PFF for this patient population.

The average IMD score was 10.8 (SD 8.2), indicating a low level of deprivation compared to the national population. 167 patients (64.0%) were discharged to a community hospital or another rehabilitation unit and 68 (26.0%) were discharged home. The readmission rate at one month post-discharge was 12.3% (32/261). There were no missing data for the main explanatory variables.

Table 24: Socio-economic and health characteristics of the sample patients

Variables	No patients (%)
Age (years)	86.2 (5.7) [†]
Gender	
Male	77 (29.5%)
Female	184 (70.5%)
Level of social isolation	
Low risk	28 (10.7%)
Moderate risk	37 (14.2%)
High risk	57 (21.8%)
Socially isolated	139 (53.3%)
Marital status	
Single / widowed / separated / divorced	169 (64.8%)
Married / living together	92 (35.2%)
Residential status prior to admission	
Own home	216 (82.8%)
Care home / warden controlled flat	45 (17.2%)
Abbreviated Mental Test	
Without a cognitive impairment	191 (73.2%)
With a cognitive impairment	70 (26.8%)
Charlson Comorbidity Index	1.7 (1.7) [†]
Dementia	
Has no diagnosis of dementia	215 (82.4%)
Has a diagnosis of dementia	46 (17.6%)
Functional status at admission (NEADLS)	12.9 (7.1) ^{†‡}
EQ-5D-5L	
Mobility	
No problems in walking about	13 (4.7%)
Slight problems in walking about	11 (4.0%)
Moderate problems in walking about	32 (11.5%)
Severe problems in walking about	119 (42.8%)
Unable to walk about	84 (30.2%)
No answer provided	2 (0.7%)

Variables	No patients (%)
Self-care	
No problems washing or dressing oneself	34 (12.2%)
Slight problems washing or dressing oneself	24 (8.6%)
Moderate problems washing or dressing oneself	49 (17.6%)
Severe problems washing or dressing oneself	96 (34.5%)
Unable to wash or dress	56 (20.1%)
No answer provided	2 (0.7%)
Usual activities	
No problem doing one's usual activities	18 (6.5%)
Slight problem doing one's usual activities	17 (6.1%)
Moderate problem doing one's usual activities	23 (8.3%)
Severe problem doing one's usual activities	90 32,4%
Unable to do usual activities	111 (39.9%)
No answer provided	2 (0.7%)
Pain/discomfort	
No pain or discomfort	66 (23.7%)
Slight pain or discomfort	54 (19.4%)
Moderate pain or discomfort	77 (27.7%)
Severe pain or discomfort	43 (15.5%)
Extreme pain or discomfort	16 (5.8%)
No answer provided	5 (1.8%)
Anxiety/depression	
Not anxious or depressed	123 (44.2%)
Slightly anxious or depressed	57 (20.5%)
Moderately anxious or depressed	49 (17.6%)
Severely anxious or depressed	19 (6.8%)
Extremely anxious or depressed	7 (2.5%)
No answer provided	6 (2.2%)
Index of Multiple Deprivation	10.8 (8.2) [†]
Discharge destination	
Own home	68 (26.0%)
Care home / warden controlled flat	26 (10.0%)
Community hospital / another rehabilitation unit	167 (64.0%)

[†]The data presented refers to mean and standard deviation

[‡]The data presented refers to 248 patients only

Mean LOS was 16.5 days (SD 11.5, median 14.0, interquartile range 11, range 3 to 80) and this represented a total of 4,306 hospitalisation days for the sample population. 227 patients (87.0%) experienced delays in their discharge corresponding to 1,897 excess days in hospital (44.1% of the total LOS). Patients with delayed discharges experienced

8.4 mean days of delayed discharge (SD 9.2, median 6.0, interquartile range 8) with a minimum of one and a maximum of 75 days. The mean days of delayed discharges across the whole sample was 7.3 (SD 9.0, median 4.0, interquartile range 8.0).

Table 25 shows LOS stratified by level of social isolation. The mean LOS is lower in patients with a low risk for social isolation and increases progressively with the risk for social isolation. However, the one-way ANOVA test found no evidence of difference in mean LOS by level of social isolation ($F(3, 257)=1.00, p=0.40$). This test also did not identify a significant difference in mean length of medically-necessary stay by level of social isolation ($F(3, 257)=0.97, p=0.41$).

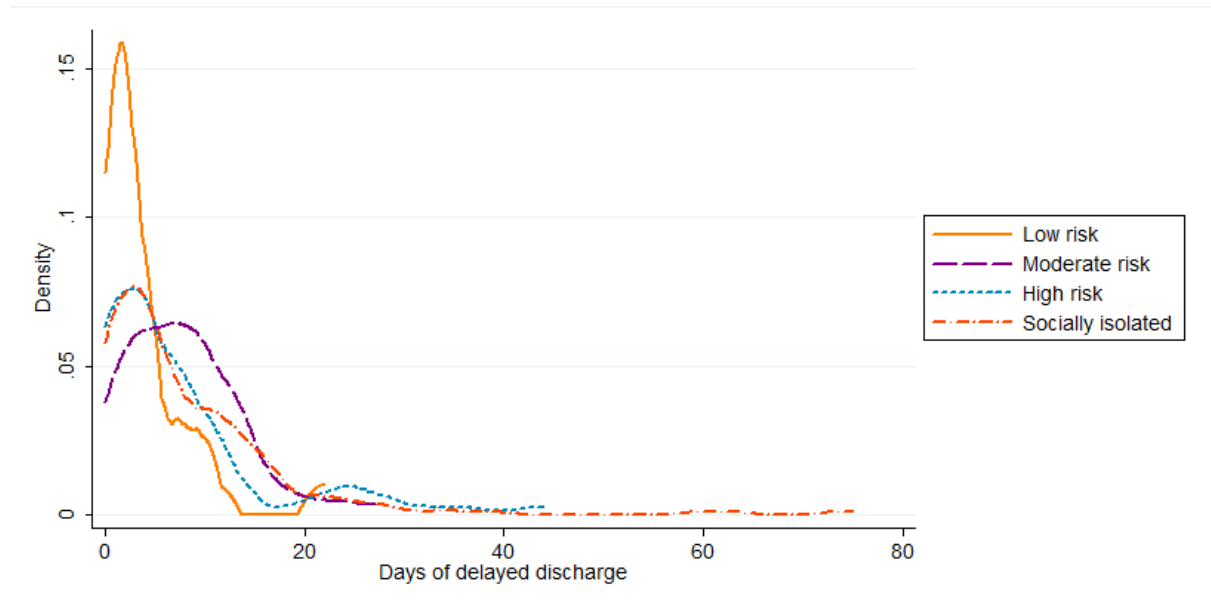
Table 25: LOS, length of medically-necessary stay and days of delayed discharges by level of social isolation

	Low risk	Moderate risk	High risk	Socially isolated
Total sample	28	37	57	139
Mean LOS (SD)	13.6 (6.7)	15.1 (7.3)	16.9 (14.5)	17.3 (11.8)
Median LOS	13.5	15.0	12.0	14.0
Mean length of medically-necessary stay	9.9 (5.9)	7.4 (4.0)	9.7 (9.9)	9.4 (6.7)
Median length of medically-necessary stay	9.0	7.0	7.0	7.0
Patients with delayed discharges	23 (8.8%)	34 (13.0%)	45 (17.2%)	125 (47.9%)
Mean days of delayed discharges	3.7 (4.7)	7.6 (5.9)	7.2 (9.3)	7.9 (10.1)
Median days of delayed discharges	2.5	6.0	4.0	5.0

Table 25 and **Figure 22** show the number of days of delayed discharge stratified by level of social isolation for all patients. Patients with a low risk of social isolation have lower

mean days of delayed discharge than other patients (less 4.0 days of delayed discharges, $p=0.03$). However, as indicated by the one-way ANOVA, mean days of delayed discharge do not differ significantly by level of social isolation ($F(3, 257)=1.71, p=0.16$).

Figure 22: Kernel density plot of days of delayed discharges by level of social isolation



Patients discharged to community hospitals had, on average, fewer days of delayed discharges than patients discharged to their own home or to a care home/warden controlled flat (**Table 26**). However, the difference in means was not statistically significant. The mean number of days of delayed discharges is higher for patients with some level of social isolation when they are discharged to their homes (6.6 extra days of delay, $p=0.04$).

Table 26: Delayed discharge by level of social isolation and discharge destination

	Own home		Care home/warden controlled flat		Community hospital/another rehabilitation unit	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
Low risk	13	3.5 (3.4)	0	n.a. (n.a.)	10	5.8 (6.1)
Moderate risk	12	8.9 (6.5)	1	8.0 (n.a.)	21	8.0 (5.4)
High risk	12	10.8 (11.6)	4	18.0 (17.8)	29	7.3 (6.4)
Socially isolated	27	10.3 (14.6)	19	7.5 (5.8)	79	8.6 (9.3)
Total	64	8.8 (11.3)	24	9.3 (9.1)	139	8.0 (8.0)

5.4.2 Probability of having a delayed discharge

Univariate logistic regression models were used to examine potential predictors of delayed discharges but the results show that level of social isolation was not a significant predictor of delayed discharges (see **Table 27** and Appendix 19). Only age was found to be a significant predictor of delayed discharges (OR=1.08). For the multivariate logistic model, only level of social isolation, age and gender were included given the power of the sample. Source of admission and dementia were not included but these were not found to be significant in the univariate analysis. No covariate was found to be a predictor of delayed discharges in the multivariate model.

The interaction between level of social isolation and source of admission was checked but no significant association was found.

Table 27: Univariate and multivariate logistic regression model on the occurrence of delayed discharge

	Odds ratio (95% CI)	
	Univariate model	Multivariate model
Level of social isolation*		
Low risk	Reference	Reference
Moderate risk	2.46 (0.54 to 11.33)	2.20 (0.46 to 10.39)
High risk	0.82 (0.26 to 2.60)	0.66 (0.20 to 2.20)
Socially isolated	1.94 (0.64 to 5.91)	1.33 (0.41 to 4.30)
Source of admission		
Own home	Reference	n.a.
Care home/warden controlled flat	0.78 (0.31 to 1.91)	
Age	1.08 (1.01 to 1.16)	1.07 (0.99 to 1.15)
Gender		
Female	Reference	Reference
Male	0.48 (0.23 to 0.99)	0.51 (0.24 to 1.09)
Dementia		
No record of dementia	Reference	n.a.
Having dementia	0.76 (0.34 to 1.74)	
Number of observations		261
Akaike Information Criterion		201.74
Bayesian Information Criterion		223.12
Pseudo R ²		0.06

* The association between the level of social isolation and delayed discharges was estimated using three levels of social isolation as covariates.

5.4.3 Number of days of delayed discharges

The GLM model using the gamma family and the log link function (log-gamma GLM model) was the best fitting model. **Table 28** and Appendix 20 report the estimates of additional days of delayed discharge by level of social isolation using the log-gamma GLM model. The exponentiated coefficients (AMR) describe the relative increase in the number of days of delayed discharge for the category of interest compared to patients in

the reference category for the variable of interest (e.g. social isolation or source of admission). According to this model, AMRs indicate that being at moderate, high risk or socially isolated approximately doubles a patient's days of delayed discharge compared to being at low risk of social isolation. And in terms of marginal effects, patients with a moderate risk, high risk or socially isolated have respectively 3.8, 3.1 and, 4.0 more days of delayed discharge than patients with a low risk of social isolation, after adjusting for other covariates. These increases are statistically significantly different from the low risk category, but not from each other ($p=0.84$). The effect sizes of being admitted from a care home or a warden controlled flat, age, gender and having dementia are very small compared to the level of social isolation and none of these confounders were found to be significantly associated with the number of days of delayed discharges.

Table 28: Univariate and multivariate log-gamma GLM on the number of days of delayed discharges

	AMR* (95% CI)		Days of delayed discharge
	Univariate model	Multivariate model	Multivariate model
Level of social isolation**			
Low risk	Reference	Reference	Reference
Moderate risk	2.06 (1.23 to 3.46)	1.96 (1.15 to 3.35)	3.77
High risk	1.95 (1.11 to 3.43)	1.79 (1.02 to 3.14)	3.10
Socially isolated	2.12 (1.28 to 3.52)	2.01 (1.17 to 3.45)	3.97
Source of admission			
Own home	Reference	Reference	Reference
Care home/warden controlled flat	1.03 (0.64 to 1.63)	1.02 (0.61 to 1.68)	0.11
Age	1.02 (1.00 to 1.05)	1.02 (1.00 to 1.04)	0.14
Gender			
Female	Reference	Reference	Reference
Male	1.02 (0.71 to 1.45)	1.03 (0.73 to 1.43)	0.19
Dementia			
No record of dementia	Reference	Reference	Reference
Having dementia	0.90 (0.59 to 1.37)	0.78 (0.10 to 5.73)	-1.77
Number of observations	261		
Akaike Information Criterion	1,557.87		
Bayesian Information Criterion	1,586.38		

*Arithmetic mean ratio

** The association between the level of social isolation and delayed discharges was estimated using three levels of social isolation as covariates.

5.4.4 Costs of delayed discharges

The mean hospitalisation cost for a PFF, including A&E costs, estimated using FCE HRG costs was £8,518 (SD £2,482), and it was slightly but not significantly higher (2.8%, p=0.61) amongst patients with a delayed discharge (£8,549) compared to those without a

delay in their discharge (£8,308) (**Table 29**), even though patients with a delayed discharge spent, on average, 9.4 extra days in hospital.

A sensitivity analysis was conducted using spell HRG costs. The mean hospitalisation costs for a PFF calculated using this approach was £9,546 for patients with delay (including A&E costs), just 1.0% higher than the cost for patients without a delay (£9,440), and this difference was not statistically significant ($p=0.82$).

However, when the cost of delayed discharges was calculated based on the number of the days of delayed discharge for each patient multiplied by the respective FCE excess bed day cost, the estimated mean cost of a delayed discharge, per patient with a delay was £2,328 (SD £2,575) (**Table 29**) or £2,094 for all patients.

A sensitivity analysis conducted using spell HRG costs per bed day showed that the mean potential savings in hotel costs related to delayed discharges per patient with delayed discharge could be £3,998 (or £3,477 if all patients were considered).

Total hospitalisation cost for PFFs amounted to £2,223,128 in this sample, estimated using FCE HRG costs. Using spell HRG costs, total hospitalisation costs for PFFs amounted to £2,434,594 in this sample.

Delayed discharges represented a total of £546,578 that could have potentially been saved as it refers to hotel costs for PFF patients who no longer require acute care. If

instead, spell HRG costs were used, the total potential savings in hotel costs related to delayed discharges could have ascended to a total of £907,619.

Table 29: Costs for total LOS (including A&E) and delayed discharges

	N	Mean LOS (SD)	Mean cost of PFF – FCE HRG cost (SD)	Mean cost of PFF – spell HRG cost (SD)	Mean days of delayed discharge (SD)	Mean cost of delayed discharge (SD) – FCE excess bed days cost	Mean cost of delayed discharges (SD) – daily spell HRG costs
Patients without delayed discharges	34	8.3 (5.5)	£8,308 (£2,621)	£9,440 (£2,569)	n.a.	n.a.	n.a.
Patients with delayed discharges	227	17.7 (11.7)	£8,549 (£2,465)	£9,546 (£2,162)	8.4 (9.2)	£2,328 (£2,575)	£3,998 (£4,268)
All patients	261	16.5 (11.5)	£8,518 (£2,482)	£9,532 (£2,214)	7.3 (9.0)	£2,094 (£2,618)	£3,477 (£4,202)

5.5 Discussion

5.5.1 Main findings and interpretations

The results of this study provide new evidence that social isolation is an important predictor of the number of days of delayed discharge. However, no evidence of a “dose-response” relationship between increasing levels of social isolation and delayed discharge was found, indicating that any social isolation leads to delayed discharge but the level of social isolation has little effect. Patients with low risk of social isolation had, on average, 4.8 fewer days of delayed discharges than patients with higher levels of social isolation.

Also, the mean number of days of delayed discharges was found to be higher for patients with some level of social isolation when they are discharged to their homes rather than being discharged to care homes, warden controlled flats, community hospitals or other rehabilitation units (6.6 extra days of delay), indicating the importance of social network support at discharge. However, discharge destination was not typically determined at admission but rather at a later point during a patient’s hospital stay, in contrast to what happened at the HSM (see Chapter 4). As such, the discharge destination of a patient may be influenced by the social isolation of the individual and also their risk of delayed discharge, and hence it would not be appropriate to adjust for it in this analysis. Consequently, discharge destination was not included as a variable in the models presented in this chapter.

In this sample, only patients who were admitted from care homes were discharged to care homes, but some patients were discharged to community hospitals for rehabilitation prior to returning to a care home. Some care homes can offer increased post-fracture

care and rehabilitation but others do not re-admit patients until they have reached the pre-fracture level of mobility. Short-term care home beds have been acquired by commissioning groups in order to temporarily alleviate delayed discharges in peak periods such as winter, and also because they are less expensive than acute hospital beds. However, for this particular patient group, the shortage of care home beds will most likely affect discharges from community hospitals and not necessarily from acute hospitals as most will require rehabilitation after acute discharge. Furthermore, Gaughan et al.²¹⁹ found that a 10% increase in the supply of care home beds would only reduce delayed discharges by 4-7%. However, he also found that Local Authorities with higher prices for care homes had higher numbers of delays in discharge, indicating that competition across care homes and price reductions may help reduce delays. Furthermore, older patients are increasingly revealing their preference for being treated in the community instead of in care homes²²⁰.

Preventing delayed discharges could have led to a £2,328 saving in hotel costs per patient with a delay in discharge. The mean cost of a PFF patient with delayed discharges was only slightly (2.8%) but not significantly higher than that of patients without delays which reflects a lack of sensitivity of the HRGs as a proxy for opportunity costs since there is an average difference in LOS of 9.4 days between patients with delays and without delays in discharge but there is almost no difference in average costs between these two patient groups. Hospitals then have a financial incentive to reduce delayed discharges since the trim points for PFF patients' HRGs are very large and therefore days of delayed discharges would, in most cases, not be remunerated. These costs could be even higher when taking into account the fact that bed occupancy rate for the OUH Trust in the year 2014/15 was

87.5%, in excess of the recommended occupancy rate of 85% above which the pressure on the hospital may affect the quality of care and cause disruption in patients' admissions. In the worst case scenario, assuming that patients with delayed discharges are actually blocking the admission of other patients, the opportunity cost in terms of patient-equivalents foregone would be 201 patients: that is, 201 patients with similar characteristics to those in this sample could have been treated in the 1,909 days lost to delayed discharges. It is also important to consider that the costs of delayed discharges might also include the loss in health of patients waiting for a hospital bed (i.e. patients waiting for an elective surgery).

However, it is also important to note that delayed discharges shift the from community hospitals to the acute hospital provider, as mentioned in Chapter 4. Consequently, the increase in costs for the acute provider is accompanied by a decrease in costs for the community hospital. From an NHS perspective, this translates into an increase in overall costs given the difference in opportunity costs between the two providers.

5.5.2 Strength and limitations of the study

This is the first study in England to examine the impact of social isolation on delayed hospital discharges, using a validated tool (LSNS). Victor et al⁶ looked at the association between delayed discharges and proxies for social isolation such as living alone or having informal help prior to hospitalisation. They found that living alone did not significantly predict delayed discharges, which is in line with the findings of this study, but patients without a family carer were reported to be more likely to have delayed discharges. However, as described in previous chapters (Chapters 2 and 4), social isolation is a larger

construct which takes into account not only these two dimensions but others such as friendship networks and patients' contribution to the wider society. The case study presented in Chapter 4 found that social isolation was a predictor of both delayed discharges and number of days of delayed discharges, at the HSM in Portugal. In this study, it was not possible to determine whether social isolation was a predictor of delayed discharges due to lack of power in the model (only 34 patients had a timely discharge). However, in this chapter I show that having any level of social isolation is associated with increases in the number of days of delayed discharge, even though a significant difference between patients at moderate risk, high risk or socially isolated patients was not observed.

Limited data are available on the 32% of the patients who declined to participate in this study. However, a comparison of demographic characteristics with other studies suggests that participants are representative of patients commonly admitted for a PFF. This study excluded those aged below 75 years, and so the mean age of this sample, at 86 years, is slightly higher than the mean age of 83 for all persons with a hip fracture in England, according to Hospital Episode Statistics (HES). The proportion of female patients in this study was 70.5%, close to the 73% reported by HES for England. The acute LOS of participants in this study was 16.8 days, compared to an average of 15.8 in 2013 for England as a whole, according to the National Hip Fracture Database⁴⁴. This relatively small difference could be related to delayed discharges, to slightly different measurement periods, or to the fact that this sample population excluded patients under 75 years, who may have shorter LOS. The generalisability of the findings from this study may be limited by the fact that the OUH Trust has previously been identified as having

high numbers of days of delayed transfers of care⁶⁸. However, the focus of this study is on the role of social isolation as a contributory factor in delayed hospital discharges, rather than the rate of delayed discharges per se.

The criteria used to assess medical fitness for discharge was based on clinical judgment of the medical team guided by three clinical indicators, as described in section 5.3.4. Even though these were explicit and objective, they are not recognised as an internationally used evaluation tool, such as the Appropriateness Evaluation Protocol (AEP)⁸⁰. However, it is not clear whether such tools would have changed the relationship between social isolation and delayed discharges.

5.5.3 Comparisons with other studies

A previous study conducted in an orthopaedics ward in Glasgow in 1998²⁵ reported that delayed discharges accounted for 8.0% of the total LOS, significantly lower than the 44.1% found in this study. Apart from the 15 years' gap between the two studies, Mohammed included all orthopaedic inpatients on the ward and not just hip fracture patients, who are older and have more complex health and social care needs. Regional differences may also have an impact on the number of days of delayed discharges, in particular variations in the availability of health and social care services upon discharge (i.e. community care beds, domiciliary services, care home beds, etc.). The ways in which data are recorded and entered in electronic hospital records is another likely source of variation between hospitals. Other cohort⁶⁰ and cross-sectional^{85,98} studies conducted in the UK after the introduction of the Community Care Act looking at surgical wards reported proportions of delayed discharges varying between 19.3% and 60.0% of LOS.

Turning to costs per case, a study by Leal²²¹ reported mean hospitalisation costs associated with an index admission for a proximal femoral fracture of £8,663 (SD 4,605) using 2012/13 unit costs in a cohort of over 33,000 patients aged over 60 admitted to hospital in the UK. These costs are in line with the mean hospitalisation costs excluding A&E costs of £8,314 (SD £2,481) estimated for this sample.

5.5.4 Other considerations

According to NHS England⁶⁸, in November 2015, 34.9% of the delayed transfers of care days at the OUH Trust were due to patients awaiting further NHS non-acute care. This acute care trust is not vertically integrated with the non-acute care trust, and so community hospital beds need to be negotiated on a monthly basis. The fact that over one third of the days of delayed transfer of care were lost due to lack of non-acute beds suggests that the supply of non-acute beds falls short of the demand. NHS England also reported that another 30.3% days of delayed transfer of care at OUH Trust were attributable to patients awaiting care packages in their own home. In this study, patients discharged home had the longest mean days of delayed discharge but the difference was not statistically significant. Given their level of dependency at discharge, these patients will have more complex health and social care needs, not only at discharge from acute hospitals but also after discharge from non-acute hospitals. It is therefore important that health and social care work together in order to better coordinate the delivery of care to older patients.

5.6 Conclusions

This chapter examined the impact of social isolation on delayed discharges of PFF patients at the JRH in England in a prospective cohort study and estimated the costs associated with these delays. The results indicate that the number of days of delayed discharges is significantly associated by the social isolation of the patients, although a dose-response relationship was not observed.

If the frequency and associated costs of delayed discharges are to be reduced, improved and better coordinated strategies are needed for the provision of post-acute care for individuals facing moderate risk, high risk, or who are socially isolated.

Chapter 6 : Delayed discharges and social isolation: a tale of two countries

6.1 Introduction

Chapters 4 and 5 described how social isolation impacts on delayed hospital discharges of proximal femoral fracture (PFF) patients in the *Hospital de Santa Maria* (HSM) and in the John Radcliffe Hospital (JRH), respectively. Even though these two case studies were conducted in countries with ageing populations, there are significant cultural and social differences between them in terms of the role of the family and friends in the provision of support for older people, which may impact on the discharge process of older patients from hospital. It is not surprising, therefore, to observe significant differences between these two countries in terms of social isolation and delayed discharges in older patients, as reported in the previous chapters. However, the differences observed allow the association between social isolation and delayed discharges to be contrasted in an objective and thorough manner as there are lessons to be learned from both countries.

Hence, in this chapter I use the data from the two case studies presented in Chapters 4 and 5 to estimate the number of days of delayed discharge and associated costs for PFF patients at a national level in Portugal and England, respectively. I will draw comparisons between the two countries in terms of baseline patient characteristics, with a special focus on social isolation, and also in terms of the days of delayed discharge, total length of hospital stay (LOS), costs of PFFs and costs of delayed discharges for this patient group.

The chapter concludes by discussing how differences in social isolation affect delayed hospital discharges in Portugal and England, teasing out interactions between social isolation and care organisations, and the financial impact that these delays have on each country's health services.

6.2 Defining the terms for the comparison on delayed discharges and respective costs between the two countries

The aims of this chapter are: 1) to compare the impact of social isolation on delayed hospital discharges of PFF patients in two university hospitals in Portugal and England; and, 2) to extrapolate the results from these two hospitals to a national level in order to estimate and compare the costs of delayed discharges for PFF patients at a national level in both countries. Patients with PFFs are suitable for direct comparisons across the two countries given the internationally standardised diagnosis and treatment (see Chapter 1).

The design of the two prospective studies used to inform this analysis has been presented in Chapters 4 (for Portugal) and 5 (for England). Briefly, the study samples consist of patients aged 75 and above admitted to hospital during a one-year period with a PFF diagnosis. In the HSM, 278 patients were included in the prospective cohort study between 1st July 2012 and 30th June 2013, and in the JRH 261 patients were recruited between 7th March 2014 and 6th March 2015.

6.2.1 Comparing days of delayed discharge in proximal femoral fracture patients

A χ^2 test and an independent-samples t-test (unequal variance) were used to assess the differences in baseline characteristics of the two patient samples in terms of categorical and continuous variables, respectively. The binomial proportion test was used to test the equality of two proportions.

The outcome variable used in the models was the number of days of delayed discharges. In both cases, a delay in discharge occurred when a patient remained in hospital after being deemed medically fit for discharge. However, the definition of medical fitness varied slightly between the two hospitals, as can be seen in **Table 30** below.

Table 30: Criteria used to determine medical fitness for discharge at the HSM and the JRH

Medical fitness for discharge	
HSM	JRH
The patient must be able to stand up and be mobile with support (unless if bedbound at admission)	The patient must be able to stand up and be mobile with support (unless if bedbound at admission)
Haemoglobin must be above 8.5 g/dL	Haemoglobin must be above 8.0 g/dL
The patient no longer needs oxygen or intravenous treatment	The patient no longer needs oxygen or intravenous treatment (this may not be a requirement to declare fitness for discharge if the patient is going to a community hospital)
There is no evidence of an active infection	n.a.

As discussed in Chapter 2, the literature review shows that the criteria used to determine when a patient is fit for discharge vary widely across studies. However, the criteria used in the two hospitals under analysis were sufficiently similar that it was considered appropriate to compare delayed discharges between them.

Two negative binomial models, adjusted for pre-admission factors, were used to estimate the number of days for which discharge was delayed for all patients within each cohort. The negative binomial models were chosen based on common specification tests²⁰⁰ to identify the appropriate variance (modified Park's test) and link functions (Hosmer-Lemeshow and Pregibon link tests). Social isolation, measured using the Lubben Social Network Scale (LSNS), was the main explanatory variable used in the models. It was expected that, patients with higher levels of social isolation would remain in hospital longer than necessary, since they will not have a support network to provide care after hospital discharge. Additionally, the association between social isolation and delayed discharge was adjusted for the following variables (Chapters 4 and 5):

- Source of admission (i.e. own or family home versus care home, warden controlled flat or other institutional care setting);
- Presence of dementia; and
- Age at admission and gender.

Statistical significance was set at $p < 0.05$.

6.2.2 Costs of proximal femoral fractures and delayed discharges

Cost of proximal femoral fractures

In England

The National Hip Fracture Database¹⁷⁵ (NHFD) was used to determine the number of cases of PFFs that occurred in England. As data were not available using an age cut-off of 75 and above, a cut-off age of 70 was used. According to this database, 58,605 cases of PFF were reported in England in 2014. Based on this data, the estimated number of hip

fractures in England for patients aged 70 and above was 53,389 (8.9% of the total occurred in patients below 70). In the absence of data, it was assumed that the mean LOS of 15.5 days (SD 3.8) reported for England in the NHFD was applicable to patients aged 70 and above.

As described in Chapter 5, the mean length of stay of a PFF in the English cohort was 16.5 days (SD 11.5). Each case was valued at £8,314 (€9,793) using the 2013-14 reference cost schedule²²², and for the purpose of this analysis, this mean cost of a PFF was assumed to be representative for this patient population at a national level. The daily inpatient cost of a PFF patient was estimated by dividing inpatient stay cost by the mean LOS for a PFF in England in 2014 (15.5 days). The cost was then converted to Euros using the British Pound Sterling to Euro 2013 average annual exchange rate of 0.849²²³. The daily cost of a PFF for an inpatient admission was estimated to be £536 (€632). The cost of an accident and emergency (A&E) episode (£207, €244)²²² was added to the inpatient stay cost of PFF patients.

In Portugal

In order to estimate the total national cost of PFFs, the total number of PFFs was obtained using the age-specific crude rates of hip fractures for patients aged 75 and above by gender for the year 2008 reported by Alves et al²²⁴, who used the National Hospital Data Register (an administrative database that is mandatory since 1997 in all public hospitals in Portugal, compiling information on all discharges). The paper reports mean age-specific incidence rates of hip fractures in Portugal between 2000 and 2008 and no significant differences were found in this period. Hence, incidence rates for the

last year reported (2008) were assumed to apply to 2013. Data on the resident population in Portugal by age and gender was retrieved from the national statistics office, *Instituto Nacional de Estatística* (INE), to estimate the total number of hip fractures for patients aged 75 and above in Portugal in 2013. Based on these data, the estimated number of hip fractures in Portugal for people aged 75 and above in 2013 was 9,040 (Table 31).

Table 31: Estimated number of hip fractures in Portugal in 2013 by age group and gender

Gender	Age group	Age-specific incident rates per 100,000 inhabitants for 2008	Resident population in 2013	Estimated number of hip fractures in 2013
Male	75 – 79	238	180,861	430
	80 – 84	436	122,062	532
	> 84	1,056	78,880	833
Female	75 – 79	542	254,689	1,379
	80 – 84	1,004	197,485	1,982
	> 84	2,285	169,931	3,883
Estimated number of hip fractures in Portugal for patients aged 75 and above in 2013				9,040

For the purposes of this analysis, it is assumed that the mean LOS of 13.1 days (SD 10.8) observed in PFF patients aged 75 and above in the HSM (Chapter 4) is representative for this patient population at a national level. Following on the methodology used in Chapter 4, the hospital cost of PFFs for patients admitted to the HSM was estimated using national reference costs provided by *Administração Central do Sistema de Saúde* (ACSS) for the year 2013 (ACSS 2015, personal communication, 28th May). According to this schedule, the national mean daily cost of a hospital stay on an orthopaedics ward in Portugal was €348. The inpatient cost of treating a PFF was calculated to be €4,559 by multiplying the national mean daily cost of hospital stay in an orthopaedics ward by the

mean LOS at the HSM for each patient. In order to estimate the full cost of the admission for treatment of a PFF, the mean cost of an A&E episode¹⁷⁹ (£119) was added to the orthopaedics admission cost as all of these patients were admitted through A&E.

Cost of delayed hospital discharges

In England

The total number of delayed discharges for PFF patients aged 70 and above in England was estimated using data on delayed transfers of care for NHS England for the financial year 2014/15⁶⁸. In this year, the total number of days of delayed discharges (or delayed transfers of care) reported for England was 1,624,977, for all patients of which 4.1% (43,793 days) occurred at the Oxford University Hospitals NHS Foundation Trust (OUH Trust). The proportion that delayed discharges in Oxford represented in the total for England was used in conjunction with the number of days of delayed discharges observed in the PFF sample at the JRH to determine the total number of delayed discharges in PFF patients aged 70 and above in England, x , using the following formula:

$$x = \frac{\text{Days of delayed discharge at JRH} \times \% \text{ of the total delayed discharges in England}}{\% \text{ of delayed discharges in Oxford out of the total delayed discharges in England}}$$

The JRH sample was used to estimate the weighted average cost of an excess bed day for PFFs. The proportion that an excess bed day cost represented out of a daily finished consultant episode (FCE) healthcare resource groups (HRGs) cost was calculated using FCE HRG national average unit costs, FCE HRG average LOS and excess bed day costs from the NHS reference costs schedule²²². The weights were obtained from the frequency of

the FCE HRGs observed in the JRH (**Table 32**). The weighted average of the cost of an excess bed day for PFFs in the JRH sample of £278 (€327) was used to estimate the cost of delayed discharges. This corresponds to 48.1% of the bed day cost for PFF (£578) which was used to inform the excess bed day costs in Portugal (see below).

Table 32: Excess bed day costs calculated using the FCE HRGs for the JRH sample

FCE HRG code	% of each FCE HRG in the JRH sample out of the total FCE HRGs	FCE HRG national average unit cost	FCE HRG average LOS	Daily FCE HRG cost	Excess bed day cost
EA03A	0.4%	£7,545	13.21	£571	£267
EB07C	0.4%	£2,068	5.01	£413	£242
HA11A	4.6%	£13,408	24.96	£537	£312
HA11B	0.8%	£8,791	13.16	£668	£299
HA11C	2.7%	£7,337	9.02	£813	£311
HA12B	30.7%	£8,210	14.27	£575	£282
HA12C	9.2%	£6,417	9.34	£687	£267
HA13A	19.9%	£8,237	16.15	£510	£290
HA13B	6.1%	£6,570	11.57	£568	£292
HA13C	10.0%	£5,551	8.63	£643	£262
HA14A	0.8%	£7,312	16.76	£436	£256
HA91Z	2.3%	£4,024	11.34	£556	£256*
HB12A	0.4%	£9,435	16.65	£567	£282
HB12C	0.4%	£5,997	6.40	£937	£275
VA10B	0.4%	£2,634	6.05	£436	£263
VA10C	1.2%	£3,460	8.41	£411	£262
VA11C	0.4%	£4,780	8.92	£536	£246
VA11D	3.1%	£7,832	16.00	£490	£247
VA12A	0.4%	£5,050	6.29	£802	£262
VA12B	0.4%	£6,075	9.01	£674	£202
VA12C	1.2%	£7,377	12.16	£585	£256
VA12D	3.8%	£9,857	18.98	£519	£240
VA13D	0.8%	£14,074	19.88	£708	£294
Total	100%			£578	£278

* There is no excess bed day cost for the HRG HA91Z (hip trauma diagnosis without procedure) and therefore the excess bed day cost of the HRG HA14A (minor hip procedures for trauma, with major comorbidities) was used.

A scenario sensitivity analysis was conducted assuming a day of delayed discharge to cost the same as a bed day for a PFF in the JRH sample (£536, €632).

In Portugal

In order to estimate the total number of days of delayed discharges for PFF patients aged 75 and above in Portugal, the proportion of 11.5% of days of delayed discharge out of the total LOS observed in the HSM sample was used. The total number of delayed discharges for PFF patients aged 75 and above in Portugal, x , was calculated using the following formula:

$$x = \text{Total number of bed days for PFFs in Portugal} \times 11.5\%$$

The cost of an excess bed day is not available in Portugal. Hence, I assumed the proportion that an excess bed day cost represented out of a daily FCE HRGs cost estimated for England to apply in Portugal. Therefore, the cost of an excess bed day in Portugal was estimated to be €167 (48.1% of €348).

A sensitivity analysis was conducted assuming a day of delayed discharge to cost the same as a bed day for a PFF (€348).

Adjustments for differences in the cost of living in Portugal and England were made using the Purchasing Power Parity (PPP) method²²⁵ for hospital services in order to compare the mean cost of a delayed discharge in these two countries.

6.3 Results

6.3.1 Baseline characteristics of the two samples

Two hundred and seventy eight and 261 patients with PFFs were recruited at the HSM and the JRH, respectively. **Table 33** provides information on the baseline characteristics of these two samples.

Table 33: Socio-demographic characteristics of sample patients recruited from HSM and JRH

Variables	Number of patients (%)		<i>p</i> -value
	HSM	JRH	
Age (years)	85.5 (5.8) [†]	86.2 (5.7) [†]	<i>p</i> = 0.13
Gender			<i>p</i> = 0.02
Male	57 (20.5%)	77 (29.5%)	
Female	221 (79.5%)	184 (70.5%)	
Marital status			<i>p</i> = 0.07
Single / widowed / separated / divorced	200 (71.9%)	169 (64.8%)	
Married / living together	78 (28.1%)	92 (35.2%)	
Source of admission			<i>p</i> = 0.14
Own home	216 (77.7%)	216 (82.8%)	
Care home / warden controlled flat	62 (22.3%)	45 (17.2%)	

[†] The data presented refer to mean and SD

The demographic data show that the mean age of the sample populations, in both countries, was 86 years. However, even though both samples were mainly composed of females, there was a significant difference (*p*=0.02) with a higher proportion of men in the English sample (29.5% at the JRH versus 20.5% at the HSM).

Most of the patients in both samples had no partners and there was no significant difference (*p*=0.07) between the 71.9% observed in Portugal and the 64.8% observed in England. The number of patients admitted from a care home or warden controlled flat in

Portugal was higher than that observed in the English sample (22.3% and 17.2%, respectively) but this difference was not statistically significant ($p=0.16$).

According to the LSNS (**Figure 23**), 51.8% (144/278) of the patients at the HSM were at low risk of social isolation. The remaining individuals were approximately evenly distributed across the other risk groups, namely, moderate, high risk, and socially isolated. In contrast, only 10.7% (28/261) of the patients at the JRH were at low risk. 14.2% (37/261) were at moderate risk, 21.8% (57/261) at high risk, and 53.5% (139/261) were socially isolated. The distribution of patients by risk group differed significantly between the two hospitals ($p<0.01$).

Figure 23: Level of social isolation of the patients at the HSM and the JRH

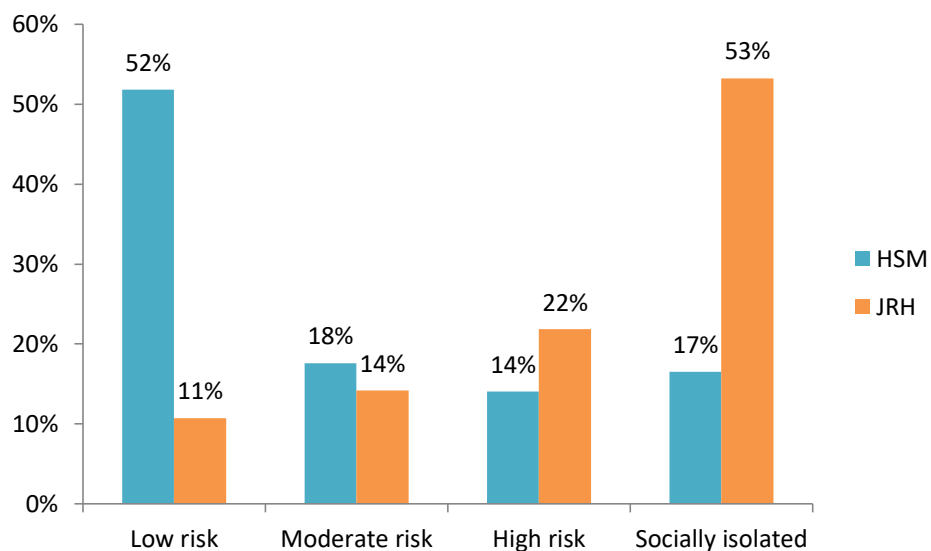


Table 34 shows the results of the questions on LSNS on family and friends support. In both countries, PFF patients tended to see or hear from more than two relatives at least once a month and no significant difference was observed between the countries. However, the results were significantly different when PFF patients were asked how often they saw the relative with whom they had the most contact, with 75.9% (211/278) of the patients in Portugal having daily contact with this relative compared to 49.8% (130/261) in England. The results between countries were again significantly different when patients were asked how many of these relatives did they feel at ease with to talk about private matters or call for help. The proportion of patients with one close relative was 27.3% (76/278) in Portugal compared to 19.9% (52/261) in England, reflecting a greater dependence on a single person in Portugal than in England. Regarding the number of close friends PFF patients had, there was no significant difference between the two countries, with a large number of patients indicating they had no close friends in both countries (34.9% - 97/278 - in Portugal and 24.9% - 65/261 - in England). However, the results between countries were significantly different when it came to the number of close friends PFF patients saw or heard from at least once a month. In Portugal, 36.7% (102/278) of the patients did not see or talk to their close friends at least once a month but 34.5% (96/278) saw nine or more, which was not consistent with the number of close friends they reported. On the other hand, in England, 23.0% (60/261) of the patients did not see or talk to their close friends at least once a month and 10.3% (27/261) saw or talked to nine or more close friends once a month, but the number of patients reporting seeing three to eight close friends was also not consistent with the number of three to eight close friends they reported.

Table 34: Results of the LSNS questions on family and friends

	Portugal	England	<i>p</i> -value
How many relatives do you see or hear from at least once a month?			<i>p</i> =0.08
0	13 (4.7%)	16 (6.1%)	
1	12 (4.3%)	22 (8.4%)	
2	38 (13.7%)	41 (15.7%)	
3-4	69 (24.8%)	76 (29.1%)	
5-8	92 (33.1%)	64 (24.5%)	
9 or more	54 (19.4%)	42 (16.1%)	
How often do you see or hear from the relative with whom you have the most contact?			<i>p</i> <0.01
Less than monthly	13 (4.7%)	17 (6.5%)	
Monthly	3 (1.1%)	6 (2.3%)	
A few times a month	2 (0.7%)	6 (2.3%)	
Weekly	21 (7.6%)	41 (15.7%)	
A few times a week	28 (10.1%)	61 (23.4%)	
Daily	211 (75.9%)	130 (49.8%)	
How many relatives do you feel close to?			<i>p</i> <0.01
0	17 (6.1%)	16 (6.1%)	
1	76 (27.3%)	52 (19.9%)	
2	97 (34.9%)	59 (22.6%)	
3-4	60 (21.6%)	82 (31.4%)	
5-8	24 (8.6%)	33 (12.6%)	
9 or more	4 (1.4%)	19 (7.3%)	
How many close friends do you have?			<i>p</i> =0.07
0	97 (34.9%)	65 (24.9%)	
1	34 (12.2%)	36 (13.8%)	
2	35 (12.6%)	42 (16.1%)	
3-4	57 (20.5%)	48 (18.4%)	
5-8	37 (13.3%)	41 (15.7%)	
9 or more	18 (6.5%)	29 (11.1%)	
How many of these friends do you see or hear from at least once a month?			<i>p</i> =0.02
0	102 (36.7%)	60 (23.0%)	
1	11 (4.0%)	37 (14.2%)	
2	20 (7.2%)	36 (13.8%)	
3-4	17 (6.1%)	56 (21.5%)	
5-8	32 (11.5%)	45 (17.2%)	
9 or more	96 (34.5%)	27 (10.3%)	

Table 35 presents the clinical characteristics of the PFF patients recruited at the HSM and the JRH as well as information about the discharge destination of these patients.

Table 35: Clinical characteristics and discharge destination of sample patients recruited from HSM and JRH

Variables	Number of patients (%)		<i>p-value</i>
	HSM	JRH	
Charlson Comorbidity Index	1.2 (1.5)	1.7 (1.7)	<i>p</i> < 0.01
Dementia			<i>p</i> = 0.67
Has no diagnosis of dementia	225 (80.9%)	203 (77.8%)	
Has a diagnosis of dementia	53 (19.1%)	58 (22.2%)	
Discharge destination			<i>p</i> < 0.01
Own home	154 (55.4%)	68 (26.1%)	
Mean LOS (SD)	11.7 (6.4)	17.5 (11.5)	
Care home / warden controlled flat	105 (37.8%)	28 (10.7%)	
Mean LOS (SD)	13.3 (10.3)	15.2 (12.5)	
Rehabilitation unit/community hospital	19 (6.8%)	165 (63.2%)	
Mean LOS (SD)	24.0 (26.2)	16.3 (11.4)	

According to the Charlson Comorbidity index (CCI), the sample patients at the HSM had 1.2 comorbidities which was significantly different from the 1.7 comorbidities observed in the sample at the JRH. There was no statistically significant difference in the proportions of patients with a recorded diagnosis of dementia: 19.1% in the HSM and 22.2% in the JRH ($p=0.67$).

The main discharge destination for PFF patients discharged from HSM was home (55.4%; 154/278) with family support or the support of a caregiver. All patients admitted from a care home returned to the same institution (22.3%; 62/278) and an additional 15.5% (43/278) of the patients who lived at home prior to hospital admission were also discharged to a care home. A total of 37.8% (105/278) of the patients were discharged to care homes. Nineteen out of 278 patients (6.8%) were discharged to rehabilitation units, 16/278 (5.8%) to private units and three out of 278 (1.1%) to publicly-funded rehabilitation units. Patients discharged home had the shortest mean LOS (11.7 days).

Patients discharged to a care home and patients discharged to a rehabilitation unit (whether publicly-funded or private) spent on average approximately 1.5 extra days and 10.7 extra days in hospital, respectively, than patients discharged home. This was significantly different from what was observed at the JRH, where 26.1% (68/261) of the PFF patients were discharged home with family support or the support of a caregiver/domiciliary services. Twenty-eight out of 261 patients (10.7%) were discharged to a care home/warden controlled flat and 165/261 (62.3%) were discharged to rehabilitation units (164/261 patients were discharged to community hospitals and one patient was discharged to a private rehabilitation unit). Unlike what was observed in the HSM, there was not a significant variation in terms of the mean LOS by discharge destination, although patients discharged to care homes/warden controlled flats had the shortest mean LOS (15.2 days) followed by patients discharged to community hospitals (16.3 days) and patients discharged home (17.5 days).

6.3.2 Days of delayed discharge in proximal femoral fracture patients

The 278 PFF patients at the HSM stayed for a total of 3,647 days in hospital with a mean LOS of 13.1 (SD 10.8) days (**Table 36**). This mean LOS was significantly different from the 16.5 (SD 11.5) days observed in the JRH sample of 261 patients staying a total of 4,306 days in hospital ($p<0.01$).

At the HSM, 22% of the patients (62/278) experienced delays in their discharge corresponding to 419 excess bed days in hospital (12% of their total LOS). The mean days of delayed discharge for the PFF patients with a delay at the HSM was 6.8 (SD 11.2) which was significantly different from the 8.4 (SD 9.2) days observed in the JRH sample ($p<0.01$),

where 87% of the patients (227/261) had a delay in their discharge corresponding to 1,897 unnecessary days in hospital (44% of the total LOS). In terms of mean length of medically-necessary stay, PFF patients at the HSM spent, on average, 11.6 medically-necessary days in hospital whereas patients at the JRH had a mean medically-necessary stay of 9.2 days. These two values are significantly different from each other ($p<0.01$).

The mean age of patients with delayed discharges was not significantly different in both countries (85.7 years in Portugal and 86.5 years in England) as was not the percentage of females in the sample (77.4% - 48/62 - in Portugal and 72.7% - 165/227 - in England). In both samples, the majority of the patients did not have a partner (71.0% - 44/62 in Portugal and 66.5% - 151/227 – in England) but they differed significantly in terms of source of admission with 93.6% (58/62) coming from home (either own or family home) in Portugal and 83.3% (189/227) in England. The samples also differed significantly in terms of the level of social isolation of patients with delayed discharges with a greater percentage of patients reporting a lower level of social isolation in Portugal (46.8% - 29/62) whereas in England the majority was socially isolated (55.1% - 125/227) prior to hospital admission. Patients with delayed discharges had a significantly higher CCI in the English sample than in the Portuguese sample (1.7 versus 1.0) but they did not differ significantly in terms of not having a diagnosis of dementia (82.8% - 188/227 - in England versus 90.3% (56/62) in Portugal). Discharge destination in patients with a delayed discharged differed significantly between countries. Most of the patients with a delay in discharge in England were discharged to a rehabilitation unit (61.2% - 139/227) whereas in Portugal discharges to a rehabilitation unit/community accounted for 16.1% (10/62) of the patients with delay. In this country, the greater percentage of patients with delayed

discharges were discharged home (46.8% - 29/62) whereas in England this represented 28.2% (64/227). The percentage of patients with a delayed discharge discharged to a care home in Portugal and England were 37.1% (23/62) and 10.6% (24/227), respectively.

Table 36: LOS and delayed discharges for PFF patients at the HSM and the JRH

Length of stay	HSM	JRH	p-value
Total number of patients	278	261	
Mean LOS (SD)	13.1 (10.8)	16.5 (11.5)	<i>p</i> < 0.01
Median LOS	10.0	14.0	
Total LOS	3,647	4,306	
Mean length of adequate stay (SD)	11.6 (7.8)	9.2 (7.2)	<i>p</i> < 0.01
Delayed discharges	HSM	JRH	p-value
Number of patients with delayed discharge	62	227	
% of patients with delayed discharge	22.3% (62/278)	87.0% (227/261)	<i>p</i> < 0.01
Delayed discharge as % of total LOS	11.5% (419/3,647)	44.1% (1,897/4,306)	<i>p</i> < 0.01
Number of days of delayed discharge	419	1,897	
Mean days of delayed discharge for patients with delay (SD)	6.8 (11.2)	8.4 (9.2)	<i>p</i> < 0.01

Characteristics of patients with delayed discharges	HSM	JRH	p-value
Age (SD)	85.7 (6.1)	86.5 (5.7)	<i>P=0.34</i>
Gender			
Male	22.6% (14/62)	27.3% (62/227)	<i>p=0.45</i>
Female	77.4% (48/62)	72.7% (165/227)	
Marital status			
Single / widowed / separated / divorced	71.0% (44/62)	66.5% (151/227)	<i>p=0.44</i>
Married / living together	29.0% (18/62)	33.5% (76/227)	
Source of admission			
Own home	93.6% (58/62)	83.3% (189/227)	<i>P=0.04</i>
Care home / warden controlled flat	6.4% (4/62)	16.7% (38/227)	
Social isolation			
Low risk	46.8% (29/62)	10.1% (23/227)	<i>p<0.01</i>
Moderate risk	16.3% (10/62)	15.0% (34/227)	
High risk	22.5% (14/62)	19.8% (45/227)	
Socially isolated	14.5% (9/62)	55.1% (125/227)	
Charlson Comorbidity Index (SD)	1.0 (1.5)	1.7 (1.6)	<i>P<0.01</i>
Dementia			
Has no diagnosis of dementia	90.3% (56/62)	82.8% (188/227)	<i>P=0.15</i>
Has a diagnosis of dementia	9.7% (6/62)	17.2% (39/227)	
Discharge destination			
Own home	46.8% (29/62)	28.2% (64/227)	<i>P<0.01</i>
Care home / warden controlled flat	37.1% (23/62)	10.6% (24/227)	
Rehabilitation unit/community hospital	16.1% (10/62)	61.2% (139/227)	

Table 37 and Appendix 21 present the results of the negative binomial regression models on additional days of delayed discharge for PFF patients at the HSM and the JRH. At the HSM, compared to patients with low risk of social isolation, patients with a high risk spent an additional 2.6 unnecessary days in hospital (IRR: 4.15; 95% CI: 1.50 to 11.43) and

socially isolated patients had 8.0 additional days of delayed discharge (IRR: 10.73; 95% CI: 3.32 to 34.62). Patients with a moderate risk spend an additional 0.8 days of delayed discharge in hospital (IRR: 2.00; 95% CI: 0.69 to 5.84) compared to low risk patients but this was not statistically significant. Patients admitted from a care home spend 7.2 fewer unnecessary days in hospital (IRR: 0.15; 95% CI: 0.004 to 0.05) than patients who are admitted from home (either own home or family home) and patients with dementia spend 3.1 fewer unnecessary days in hospital (IRR: 0.16; 95% CI: 0.06 to 0.43) than patients without a record of dementia. At the JRH, compared to patients with low risk for social isolation, patients with moderate risk, high risk and socially isolated had, on average, 3.8 (IRR: 1.96; 95% CI: 1.15 to 3.34), 3.1 (IRR: 1.79; 95% CI: 1.03 to 3.13), 4.0 (IRR: 2.01; 95% CI: 1.18 to 3.44) additional days of delayed discharge, respectively. All other variables did not significantly influence additional days of delayed discharge.

As the results clearly differ between the two models, it was not considered appropriate to incorporate both hospitals in the same model.

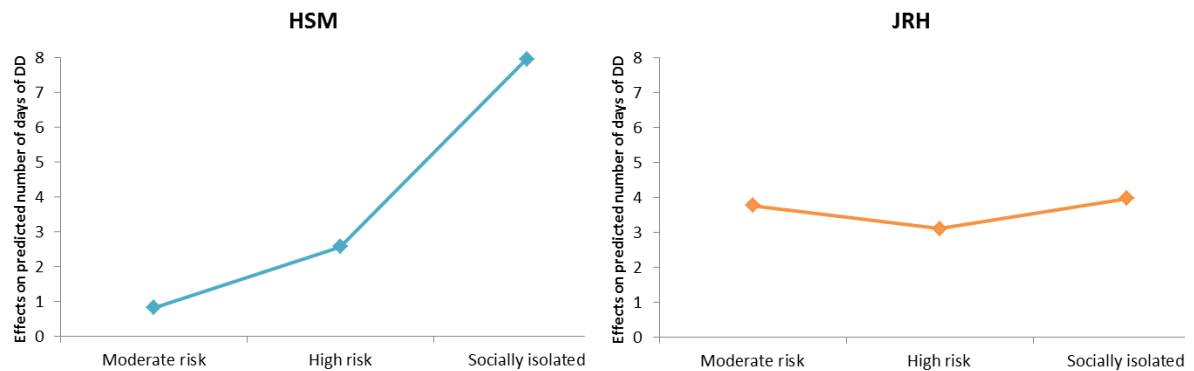
Table 37: Negative binomial regression models on additional days of delayed discharge for PFF patients at the HSM and the JRH

	HSM		JRH	
	IRR* 95% CI	Additional days of delay	IRR* 95% CI	Additional days of delay
Level of social isolation				
Low risk	Reference	Reference	Reference	Reference
Moderate risk	2.00 (0.69 – 5.84)	0.82	1.96 (1.15 – 3.34)	3.77
High risk	4.15 (1.50 – 11.43)	2.57	1.79 (1.03 – 3.13)	3.11
Socially isolated	10.73 (3.32 – 34.62)	7.95	2.01 (1.18 – 3.44)	3.97
Source of admission				
Own home	Reference	Reference	Reference	Reference
Care home/warden controlled flat	0.15 (0.004 – 0.05)	-7.17	1.01 (0.61 – 1.68)	0.10
Age	1.02 (0.95 – 1.10)	0.03	1.02 (1.00 – 1.04)	0.14
Gender				
Female	Reference	Reference	Reference	Reference
Male	0.86 (0.35 – 2.10)	-0.25	1.03 (0.74 – 1.44)	0.21
Dementia				
No record of dementia	Reference	Reference	Reference	Reference
Having dementia	0.16 (0.06 – 0.43)	-3.08	0.79 (0.50 – 1.24)	-1.72
Number of observations	278		261	
Akaike Information Criterion	601		1,596	
Bayesian Information Criterion	634		1,628	

*IRR – Incidence rate ratio

In terms of the impact of social isolation on the predicted days of delayed hospital discharges, it can be observed that at the HSM, as the level of social isolation of PFF patients increases, so do the predicted days of delayed discharge (**Figure 24**). However, at the JRH, PFF patients with a moderate risk, high risk or socially isolated all are expected to have on average approximately four extra days of delayed discharge than patients with a low risk, with no increase in the number of days of delayed discharge as the risk of social isolation increases.

Figure 24: Average marginal effects of social isolation on predicted days of delayed discharge



6.3.3 Costs of proximal femoral fractures and delayed discharges in Portugal and England

Costs of proximal femoral fractures in Portugal

In 2013 an estimated total of 118,424 of public hospital beds days were consumed by PFF patients aged 75 and above (9,040 patients x LOS of 13.1 days). The estimated cost of acute inpatient admissions in public hospitals for PFFs for patients aged 75 and above in that year was €42,287,312 (SD €33,975,936; €41,211,552 for inpatient admission to an orthopaedic ward and €1,075,760 for the corresponding A&E episode) or €67,133,586 PPP adjusted.

Cost of proximal femoral fractures in England

In 2014, PFF patients aged 70 and above in 2014 are estimated to have spent 827,530 days in acute hospitals (53,389 patients x LOS of 15.5 days). The estimated acute inpatient cost of PFF patients aged 70 and above in England in 2013 was €536,025,560 (SD €128,219,022; €522,998,644 for the inpatient admission and €13,026,916 for the corresponding A&E episode) or €544,457,527 PPP adjusted.

6.3.4 Costs of delayed discharges in proximal femoral fracture patients in Portugal and England

Costs of delayed discharges in proximal femoral fracture patients in Portugal

Base case

Delayed discharges represented 11.5% of the total LOS for PFF patients aged 75 and above at the HSM. In 2013, an estimated total of 118,424 public hospital beds days were consumed by PFF patients aged 75 and above. Applying the proportion of delayed discharges at the HSM, 13,619 bed days were lost to delayed discharges. Using the excess bed day cost of €167, delayed discharges represented a cost of €2,274,373 (€3,610,700 PPP adjusted) to the Portuguese National Health Service (NHS), with each patient costing €252 (€399 PPP adjusted).

Scenario Sensitivity analysis

Using the mean cost of a PFF bed day (€348), the cost of delayed hospital discharges to the Portuguese NHS was €4,739,412 (€7,524,094 PPP adjusted), corresponding to a cost per patient of €524 (€832 PPP adjusted).

Costs of delayed discharges of proximal femoral fracture patients in England

Base case

The total number of days of delayed discharges in PFF patients aged 70 and above in England was estimated to be 46,609 in the financial year 2014/15 (1,897 bed days lost to delayed discharges at the JRH x 4.1% / 87.0%). Using the excess bed day cost of €327,

these delayed discharges represented a cost of €15,241,143 (€15,518,229 PPP adjusted) to the English NHS, with a cost per patient of €285 (€290 PPP adjusted).

Sensitivity analysis

Using the mean daily cost for a PFF of €632, the cost of delayed discharges in patients aged 70 and above was €29,456,888 (€29,920,038 PPP adjusted), or €552 per patient (€632 PPP adjusted).

6.4 Considerations on the comparison of the results of the two studies and extrapolation of costs to a national level

6.4.1 On the number of days and costs of delayed discharges

The mean number of days of delayed discharges for PFF patients with a delay varied significantly between the two samples (6.8 days at the HSM and 8.4 days at the JRH), as did the percentage of patients with a delay (22.3% at the HSM and 87.0% at the JRH). This contributed to a significant difference in mean LOS between both hospitals (13.1 days at the HSM and 16.5 days at the JRH). Another factor contributing to this difference was the difference in mean length of medically-necessary stay between the two studies (11.6 days at the HSM versus 9.2 days at the JRH) arising mainly from the difference in the mean waiting time for surgery (4 days in Portugal versus a maximum of 2 days in England following the National Institute for Health and Care Excellence (NICE) guidelines⁴³).

Despite these differences, PFFs and associated delayed discharges represent a significant cost to both Portuguese and English NHSs with a mean hospitalisation cost of €4,684

(€7,436 PPP adjusted) per patient in Portugal and €9,793 (€9,957 PPP adjusted) in England. These costs are similar to estimates from other studies^{221,226}, and the discrepancy in costs between countries had already been previously recognised by Branco et al.²²⁷.

Delayed discharges also represent a significant cost within this specific patient group: in Portugal, they are estimated to comprise between 5.4% and 11.2% of the total annual inpatient costs for patients aged 75 and above who were treated for PFF (depending on whether the cost of an excess bed day or the usual cost of a bed day was considered), and between 2.8% and 5.5% of the total inpatient costs in England for those aged 70 and above. The costs of delayed discharges per patient were similar in both countries but, when adjusted for differences in cost of living, delayed discharges represented a greater cost per patient to the Portuguese NHS than to the English NHS.

Social support networks and, consequently, the way in which health and social care are organised in both countries, help explain the differences in the number of days of delayed discharge. In Portugal, the provision of post-acute care relies mainly on social support networks, especially given the lack of appropriate long-term care (LTC) resources available to patients at discharge (see Chapters 3 and 4). The greater onus of care on the family in Portugal arises, therefore, not only from cultural reasons but also from the way post-acute care is organised. The lack of places in publicly-funded rehabilitation units in Portugal originates the significant difference in terms of the number of patients being discharged to publicly-funded rehabilitation units/community hospitals in these two countries (1.1% at the HSM versus 62.8% at the JRH). It is important to note that there

were significant differences between countries in terms of referring patients to publicly-funded rehabilitation units or community hospitals after a PFF. At the HSM, there were no clearly defined clinical criteria for referring patients to a publicly-funded rehabilitation unit and, given the reduced number of places available in such units in the Lisbon area (see Chapter 3), patients were only referred to such units if there was no other discharge destination option (i.e. patients had no one to look after them or if the family requested that the patient was discharged to such a unit. Consequently, most patients were discharged home with family support.

In England, on the other hand, social support networks are less prevalent in older people's lives, with 31.0% of people aged 65 and above living alone in England in 2011 versus 19.8% in Portugal (see Chapter 3). At the JRH, 53.3% of the patients were socially isolated at admission and 21.8% had a high risk of social isolation. Given this lack of informal care, more health and LTC services post-discharge are offered to address the needs of these patients at discharge. As described in Chapter 3, in 2014, per capita government expenditure on LTC was significantly higher in the United Kingdom (UK) than in Portugal (USD 478.1 and USD 48.9 PPP adjusted, respectively). In contrast to Portugal, discharge guidelines for hip fractures⁴³ (detailed in Chapter 3) have been defined in England and, therefore, most of the patients were referred to a community hospital following a PFF for rehabilitation. However, supply still falls short of demand, with 37.9% of delayed discharges in the last month of the study at the JRH being attributed to awaiting further non-acute NHS care, including intermediate care, rehabilitation, etc⁶⁸.

The differences in social support networks observed in these two countries, and consequently the health and LTC care services available, had an impact in terms of the number of days of delayed discharges: in Portugal, the number of days increases as social isolation increases, whereas in England, patients with some level of isolation have more days of delayed discharges than patients with low level but the number of days is not dependent upon the relative level, as a consequence of a standardised referral process for LTC. In summary, as social support networks decline, more health and LTC services are necessary in order to avoid delayed discharges from hospitals. Standardisation of referral is advisable so as to guarantee equality in treatment.

Rehabilitation in publicly-funded rehabilitation units or community hospitals can reduce the level of dependency of PFF patients and allow them to return home²²⁸ preventing further social isolation²²⁹. Increasing the number of available beds in publicly-funded rehabilitation units could reduce the number of days of delayed discharges at the JRH since most of the PFF patients who experienced delayed discharges were referred to a community hospital for rehabilitation and the unnecessary time these patients spent in hospital indicates that community hospitals represent a bottleneck in the system. It would have been informative to understand the impact of intended discharge destination on delayed discharge at the JRH. However, given the way it was determined, discharge destination could be not only a function of the need of care but also of the delay in discharge itself. As such, this multi-faceted dependence meant that it was not possible to incorporate discharge destination into the model. Nevertheless, the results from HSM presented in Chapter 4, where intended discharge destination was included in the model, clearly demonstrate that social isolation is still a strong predictor of the days of delayed

discharge even after accounting for discharge destination in the model. A study by Dahl et al.²³⁰ in Norway indicates that the introduction of intermediate care hospitals can lead to a decrease in total LOS in local general hospitals without exposing the patients to increased health risks. By improving the level of dependency of the patients, these rehabilitation units can simultaneously promote better social integration of a patient.

Furthermore, having been admitted from a care home or warden controlled flat and having a diagnosis of dementia were found to be protective factors for the number of days of delayed discharges but only at the HSM. A study conducted by Mayo et al.³⁸ in stroke patients in Canada also found, as in the HSM, that being admitted from an institution had a protective effect in terms of having a delayed discharge (OR: 0.39; 95% CI: 0.23 - 0.66). In Portugal, patients who were admitted from care homes spent, on average, 7.2 fewer unnecessary days in hospital than patients admitted from home since they have a secured place in the care home to which to return, with all patients admitted from care homes returning to those facilities. Moreover, care homes were also used as a temporary discharge location for patients awaiting placement in a publicly-funded rehabilitation unit. And, in some cases, the PFF episode acted as a trigger for the institutionalisation of patients after discharge (22.3% of the patients were admitted from a care home vs 37.8% of the patients discharged to a care home). On the other hand, in England, only 10.0% of patients returned to care homes or warden controlled flats directly following acute hospital discharge. Patients were discharged to care homes that had rehabilitation facilities in place and were able to accept the patients back with a lower level of mobility than before the PFF. The remaining 7.2% were discharged to community hospitals for rehabilitation because care homes would not accept them back

until they had regained a certain level of mobility, as described on Chapter 3. It is therefore not surprising to observe that being admitted from a care home/warden controlled flat was not a statistically significant predictor of delayed discharges at the JRH. Care homes have, however, been used in some cases in England to alleviate the pressure caused by delayed discharges on acute hospitals during the “winter bed crisis” with NHS funding some beds^{231,232}. An alternative approach to reducing delayed discharges in PFF patients could be the commissioning of rehabilitation in care homes to alleviate the waiting times for community hospital beds.

Another difference between the two samples was in the protective role of having dementia in determination of the number of days of delayed discharge. This was due to the fact that, in Portugal, all patients with a record of dementia had care arrangements in place prior to hospital admission (25/53 lived at home or with family, and 28/53 were admitted from care homes) and they mostly returned to these arrangements after discharge although, in some cases, the PFF triggered the institutionalisation of these patients (7/53). In the English sample, on the other hand, not all PFF patients with dementia had care arrangements in place prior to hospital admission and having a diagnosis of dementia was not a significant predictor of the number of days of delayed discharge.

Returning home with continuous care or domiciliary care could also help prevent delayed discharges and further social isolation of the patients, but it is important to guarantee that these services exist and are able to meet demand. It is also important that rehabilitation is immediately provided for this patient group, which is not necessarily the

case in Portugal given the long waiting times for rehabilitation²³³. A mixed model of tele-rehabilitation and standard rehabilitation might be a viable option for these patients, in order to maximise access to physiotherapy post-discharge. This model has been shown to be cost-saving for total knee replacements²³⁴ when compared to standard rehabilitation, although this was investigated in a younger population (mean age of 60 years) without any complications after the surgery and no cognitive impairment. In Portugal, where no standard rehabilitation is a more appropriate comparator, this model could be more costly but also more effective.

6.4.2 On strengths and limitations of these results

As reported in Chapters 4 and 5, this is the first study to estimate the impact of social isolation, measured with a validated tool (LSNS), on delayed discharges. The use of LSNS gives a better representation of the complex social isolation construct and therefore provides more reliable results.

Also, to the best of my knowledge, no previous study has examined delayed discharges of PFF patients. As stated in Chapter 2, looking at delayed discharges by disease may be more informative because patients being discharged with a disabling condition like PFFs or stroke will have different requirements at discharge than patients admitted with pneumonia or chronic obstructive pulmonary disease (COPD). Mayo et al.³⁸, Van Straten et al.²³⁵ and Vuadens et al.²³⁶ examined delayed discharges in patients with stroke and in these studies the proportions of delayed discharges varied less than in studies which did not look at specific conditions (42.6%, 36.0% and 25.1%, respectively), possibly due to increased heterogeneity in scope of need. Furthermore, in these three studies, a

significant number of days spent on delayed discharges were spent waiting for a bed to be available in either a care home or in a rehabilitation unit. At the JRH 63.2% of the patients were discharged to a community hospital for rehabilitation and the wait for a bed in these units was the main reason for delayed discharges in this study. In the HSM, even though only 6.8% of the patients were discharged to a rehabilitation unit, the wait for a bed in a publicly-funded rehabilitation unit accounted for a significant number of days of delay in discharge. However, the driver of the need for discharge to such units was social isolation and even after adjusting for discharge destination, having a high risk for social isolation or being socially isolated remained significant predictors of delayed discharges with odds ratios of 3.24 and 3.55, respectively (Chapter 4).

There are, however, some limitations to these findings. The definition of delayed discharges used in both countries differs slightly but it is sufficiently similar to allow for comparisons to be made between these two hospitals. The decline rate to take part in the both studies is different (0.7% at the HSM versus 32.3%% at the JRH). Although it would be desirable to establish comparisons of patients' characteristics between those that accepted and those that did not accept the request to take part in the studies, this was not possible due to the lack of consent from patients who did not agree to take part in the study. However, in the JRH sample, patients referred to the longevity of the Fracture Free study (5 years follow up) as a deterrent for participation. The results of the LSNS are self-reported by patients/next of kin and, therefore, there is always the risk of misinterpretation of the questions. For example, in the question on how many close friends do patients see or talk to at least once a month (see **Table 34**), it is possible that patients have reported the number of friends/acquaintances they see or talk to instead

of the close friends identified in the previous question. However, such misinterpretations are likely to occur in both countries but not with the same intensity. This may be due to the differences in level of formal education in the two countries.

Additionally, it would have been interesting to investigate whether the ability to live alone differs between older people living in Portugal and in England, and how this impacts on the discharge process, but the data available did not allow such an analysis to be conducted. However, it is important to note that living alone is a complex construct which encompasses more than the ability to live alone. It also includes: expectations of the older people in having their family looking after them, the way children were educated in terms of being responsible to look after their parents in old age, the societal pressure to look after older parents, the availability of services, disposable income, and other factors playing an important role as in the decision making process. Further research is needed in this field.

In order to estimate the number of PFFs for patients aged 75 and above in Portugal in 2013, the age-specific incidence rates of hip fractures reported for 2008 by Alves et al.²²⁴ were used. The estimate of 9,040 PFFs for the Portuguese population aged 75 and above is also in line with the 9,416 fractures reported by Santos et al.²³⁷ for this same population in 2009.

Also, in order to estimate the number of days of delayed discharge for PFF patients aged 75 and above in Portugal, it was assumed that the proportion of delayed discharges would be the same as that observed at the HSM since there were no data available. But,

in fact, the Lisbon area had a shortage of beds in publicly-funded rehabilitation units and this may have an impact on the number of days of delayed discharges. If the situation in the rest of the country is better, the estimates presented for Portugal are likely to be an overestimate.

For the purpose of this analysis, and in order to make both models as similar as possible, only pre-admission determined variables were included. Even though the intended discharge destination is known immediately after admission at the HSM, this is not the case in the JRH where the discharge destination of a patient could be influenced by a delay in discharge. Therefore, discharge destination was not included in the models.

As discussed in Chapters 4 and 5, micro-costing was also not available at a country level in Portugal and England and, therefore, mean daily cost of an orthopaedics bed and HRGs were used, respectively as the best option available to calculate inpatient and delayed discharges costs.

Additionally, it is noteworthy to mention that even though costs of delayed discharges are estimated, these do not include the opportunity costs of delayed discharge beds.

6.4.3 Additional considerations

As described above delayed discharges consume a significant amount of scarce healthcare resources without benefiting the patients as they could be better cared for at lower level of care. Patients' and carer's views on the discharge process and preferences for discharge destination should be heard in order to facilitate the discharge process and

to determine which services would be most desirable. This could better inform health and social care services allowing them to define a better cooperation strategy providing patients with more adequate services designed based on a whole system approach. Very few studies^{238,239} have considered the patient's and carer's perspective on delayed discharges despite them being the most affected by this situation.

Also, health and social care systems should be preparing for an increase in the number of socially isolated patients and working on interventions to reduce delayed discharges based on an integrated, personalised and multi-disciplinary approach. On the one hand, these could mean preventing avoidable admissions by using established resources and teams such as medical assessment units, intermediate care assessment teams in A&E departments²⁴⁰ and hospital at home services²⁴¹. In this category "hospital at home", where older adults receive high-quality and safe specialist hospital level care in their own homes is a good example. A systematic review by Shepperd²⁴¹ found no evidence to suggest that "hospital at home" leads to outcomes (mortality and readmission) that differ from usual inpatient hospital care. These services are provided at a similar or lower cost than inpatient hospital care. Another example is "Coordinated Care Management" where risk stratification tools and professional judgements are used to identify individuals who are vulnerable and at risk of future emergency admissions. Used to coordinate the care for people with chronic complex and/or frequently changing needs, these services are provided by primary care and community care teams which coordinate the care of these older adults in an anticipatory and holistic manner in order to keep them well and at home. These services have demonstrated positive outcomes²⁴² such as fewer emergency admissions and less bed days in hospital. In South Lanarkshire, the "Integrated

Community Support Team” has managed to keep 89.7% of the older adults referred to the team at home at 30 days²⁴³ in the first year of operations. This team, composed of nurses, allied healthcare professionals, social workers and homecare workers, provides support to older adults with complex healthcare needs in order to prevent emergency hospital admission but also supporting timely discharges from hospital to home. However, interventions aimed at avoiding hospital admission are not applicable to PFF patients because they need a surgical intervention which can only be provided in an acute care hospital. But, for this specific patient group, prevention services such as fracture liaison services can improve patient outcomes and have proved to be cost-effective²⁴⁴⁻²⁴⁶.

On the other hand, when patients are admitted to acute hospitals it is necessary to guarantee that the adequate services are available at discharge and these should be tailored to a growing isolated older population. In terms of post-discharges interventions, a systematic review by Coffey²⁴⁷ indicates that there is evidence on the effect of transitional care interventions speeding up discharges and reducing hospital readmissions. These interventions may include in-hospital activities, such as additional assessments before and/or after discharge, or may involve co-ordination between in-hospital and post-discharge services through liaison nursing or other care co-ordination specialists. A systematic review on discharge planning from hospital to home²⁴⁸ indicates that a structured discharge plan tailored to the individual patient can result in small reductions in hospital LOS and readmission rates for older inpatients. Alternatively, intermediate care in a community hospital setting may be provided as an alternative to prolonged hospitalisation. Studies have shown that co-ordination of services across the

interface of hospital and post-discharge community providers (for example via electronic health records²⁴⁹) results in positive outcomes, including lower readmission rates²⁴⁹⁻²⁵⁶. There is also evidence to suggest that benefits from transitional care are greater when longer follow-up periods are used²⁵⁰, and that the effectiveness of these interventions varies according to the chronic health conditions/comorbidities. For example, in one study hospital-initiated support for stroke patients resulted in a reduced length of stay but no reduction in readmission rates²⁵⁷, and in another study transitional care was associated with a fewer chronic obstructive pulmonary disease-related hospitalisations but in intervention groups mortality increased²⁵⁸.

6.5 Conclusions

This chapter has conducted an objective and thorough comparison of the studies conducted at the HSM and the JRH.

Delayed discharges represent a significant cost to both healthcare systems, especially taking into account that while on delayed discharge patients are not receiving the most adequate care.

Social isolation was found to be associated with delayed discharges in both hospitals but in different ways, due to the existing cultural and social differences in the expected role of social support networks in both countries and also to the differences in care organisations (e.g. publicly-funded rehabilitation units/community hospitals).

The overall changes in social interactions of older people, as well as the services available at discharge from hospitals, particularly in the absence of carers, need to be reconsidered in order to reduce delayed discharges. Social interventions aiming at alleviating isolation in older people together with post-discharge care re-design based on integrated, personalised and multidisciplinary approaches could help reduce unnecessary days in hospital.

Chapter 7 : Alleviating social isolation in older people – a systematic review on effectiveness of interventions

7.1 Introduction

Chapter 6 evaluated the impact of social isolation on the duration of delayed discharges of proximal femoral fracture (PFF) patients in both a Portuguese and English settings. The results show that social isolation is an important determinant of the number of days of delayed discharges in PFF patients, though for different reasons in England and Portugal. Hence, interventions aimed at alleviating social isolation could potentially reduce the number of days of delayed hospital discharges.

In this chapter, I report a systematic review and meta-analysis of interventions aimed at reducing social isolation. The effectiveness of different interventions is presented alongside comparisons between group, one-to-one and mixed group and one-to-one interventions. Differences between technological and non-technological interventions are also analysed.

The chapter concludes by discussing which type of intervention is more effective in alleviating social isolation. Limitations of the review are discussed and areas for future research are presented.

7.2 Systematic review of interventions aimed at alleviating social isolation

7.2.1 The concept of social isolation

The systematic review presented in this chapter focuses solely on social isolation. However, social isolation and related concepts have been defined in different ways in the literature. Some definitions have encompassed both quantitative measures of contact and relationships, as well as subjective feelings about contacts²⁵⁹. However, many have called for objective and subjective assessments to be recognised as separate concepts, with social isolation referring to the objective state of having minimal social interaction, and loneliness corresponding to the subjective state of negative feelings associated with perceived social isolation^{260,261}. This distinction can be illustrated by the idea that while social isolation may be voluntary, loneliness is always involuntary²⁶². Theories of social isolation and loneliness reinforce the idea that these are distinct, but related, concepts, in which loneliness may have psychological and social components²⁶³. In turn, models of loneliness may include measures of social isolation as possible contributing factors^{264,265}.

7.2.2 Risk factors for social isolation

Many of the identified risk factors for social isolation are particularly relevant when considering the older population²⁵⁹. The increased risk of social isolation in older age groups²⁶⁶ may be associated with specific physical conditions such as sensory loss²⁶⁷ or urinary incontinence²⁶⁸, and more generally it has been found that increased disability and reduced mobility in older people is associated with reduced social contacts^{264,269}. Significant psychosocial risk factors for social isolation have also been found. For example, living alone and loss/bereavement are risk factors for social isolation, whether it

be the loss of a relative, friend, close neighbour, or spouse^{259,270}. Social isolation is also more common in people who report a depressed mood²⁶⁶.

The diversity of these various risk factors for social isolation and the multiple associated adverse effects on health has led to the description that it is part of a cascade of complex psychosocial factors that interact to cause negative health outcomes in older adults²⁵⁹. With the unprecedented ageing of the population²⁷¹, and a high vulnerability of older people to social isolation (measures of prevalence range up to 28%^{6,272-274}), addressing social isolation is an increasingly pressing issue.

7.2.3 Interventions to alleviate social isolation

A range of interventions have been employed to tackle social isolation, from computer training²⁷⁵ to reminiscence group therapy²⁷⁶, with varying degrees of success. However, relatively few systematic reviews have focused on the effectiveness of interventions in the specific context of social isolation, and these have generally only included studies published in English²⁷⁷⁻²⁸², and have considered loneliness and social isolation together^{262,277,280-283}. Consequently the degree to which any findings can be attributed to social isolation alone is limited. Of reviews that report outcomes specifically related to social isolation, group based interventions appear to have some effect in reducing social isolation^{262,280,282,283}. The evidence for one-to-one interventions reducing social isolation and those utilising technology is equivocal^{262,277-280,282,283}. However, it has been noted that poor study quality (including small sample sizes), the heterogeneity of interventions studied, and the outcome measures used are limitations of these analyses^{278,279,282,283}. Furthermore, not all reviews have used a validated quality assessment of the included

studies^{277,282,283}. Although two meta-analyses have investigated the effectiveness of interventions tackling loneliness^{261,284}, no such analyses have been performed to assess social isolation. This analysis seeks to address these deficiencies.

7.2.4 Objectives of the meta-analysis

The main objective of this meta-analysis is to assess the effects of interventions to reduce social isolation in older people and in order to identify interventions that are effective at alleviating social isolation. Additional objectives include assessing the effects of group interventions compared to one-to-one interventions, and comparing technological based interventions with those that are not.

7.2.5 Methodology

Protocol and registration

The protocol for this meta-analysis was registered with the PROSPERO international prospective register of systematic reviews (registration number CRD42016039650) and subsequently published²⁸⁵. Amendments to this protocol are reported below. The final analysis has been reported following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) statement²⁸⁶⁻²⁸⁸.

Criteria for considering studies for this meta-analysis

Types of studies

This meta-analysis includes studies published in peer-reviewed journals or doctoral theses using randomised control trials (RCT), non-randomised controlled trials (NRCT),

and controlled before-and-after (CBA) or uncontrolled before-and-after (BA) study designs.

Types of participants

Studies were included if the mean age of the study population was 60 years or over, consistent with the United Nations definition of older people²⁸⁹.

Types of interventions

Studies were only included if the intervention under analysis was designed to alleviate or prevent social isolation. All interventions were considered.

Types of outcome measures

The outcome of interest is social isolation measured using appropriate instruments. Both validated (e.g. Lubben Social Network Scale (LSNS)²⁹⁰ and Duke Social Support Index²⁹¹) and non-validated outcome instruments of social isolation were considered. To be included, studies must have reported a quantitative measure of the effect of the intervention on social isolation.

Search methods for identification of studies

Electronic searches

The selection of electronic databases and the search strategy were developed in conjunction with an information specialist and were based on search strategies reported in previous literature reviews^{261,262,292}. The following electronic databases were searched from 1 January 1995 until the 31 December 2015: Medline, Embase, PsycINFO, Cinahl,

ASSIA, LILACS, OpenGrey and The Cochrane Library. No language or geography restrictions were applied to the search. The exact search terms used in all databases are described in Appendix 22.

Manual searches

The reference lists of the studies included in this meta-analysis, as well as those of previous literature reviews on health promotion interventions to reduce social isolation or loneliness, were searched in order to identify additional potentially relevant studies.

Data collection and analysis

Selection of studies

ENDNOTE X7 was used to manage the references. After the removal of duplicates, each abstract was independently reviewed to determine whether full text review was needed. Full texts of potentially eligible studies were retrieved, reviewed and assessed for final inclusion.

Social isolation and loneliness are distinct but closely related concepts (as noted above) and these two terms have been used interchangeably and inconsistently in the literature. Therefore, they were considered collectively for search purposes up to and including full text review of eligible studies.

Data extraction and management

Data extraction was conducted independently by two native or fluent speakers of the relevant language for both English (Filipa Landeiro, Ellen Nuttall-Musson and Paige

Barrows) and Non-English references (Filipa Landeiro, Alejandro Salgado Montejo, Moses Song and Heuishil Chang)^{vi}. The following information was extracted using a data extraction form based on “The Cochrane Group Data collection form for intervention reviews”²⁹³. Data extracted covered the following points (see Appendix 23):

- Study details: title, author, publication details, location, language (if not English);
- Study design: type of study, duration, outcomes measured;
- Participant demographics: setting, inclusion and exclusion criteria, population size and demographics;
- Intervention Characteristics: duration, type and mode of intervention;
- Outcomes: Measure of outcome used, any other outcomes analysed;
- Results: Raw data and effect size for social isolation as main outcome as well as secondary outcomes;
- Ethical considerations;
- Conclusions: Author and reviewer conclusions.

If a study was considered to have a quasi-RCT design, it was classed as a NRCT. The patient demographics extracted were values that were representative of the sample as a whole. If these data were not provided in the reports, they were calculated from the means and samples sizes of the experimental and control groups.

^{vi} Translation of non-English references was done by Dr Wei Han, Dr Apostolos Tsiachristas, Jilles Fermont, Moses Song, Alejandro Salgado Montejo, Heuishil Chang, Michal Barabas, Thomas Rouyard and Jingyi Luo.

For RCTs, where available, adjusted values and standard deviations (SD) were extracted. For other study designs, unadjusted values were used as the focus was on the population average effects rather than on condition effects²⁹⁴.

Risk of bias (quality) assessment

A quality appraisal of each study was independently performed by Filipa Landeiro and Ellen Nuttall-Musson using the Effective Public Health Practice Project “Quality assessment tool for quantitative studies”²⁹⁵ recommended by the Cochrane Public Health Group, as it is applicable to both experimental and quasi-experimental study designs²⁹⁶. In line with this quality assessment tool and its accompanying dictionary²⁹⁷, each paper was rated as “strong”, “moderate” or “weak” in the domains of selection bias, study design, confounders, blinding, data collection methods, and withdrawals/drop outs. Each paper was then given a global rating as advised by the quality assessment tool: a study was designated “weak” overall if two or more of the domains listed were classed as “weak”.

If the responses to the tool for a particular domain gave an outcome that was not specified in the accompanying dictionary, that domain was designated as “not applicable”.

Measures of treatment effect

The studies were divided by type of study design (i.e. RCT, NRCT, CBA and BA) and by type of intervention (i.e. group, one-to-one and other designs). A summary of all relevant

studies was prepared, divided by study design and sub-divided by type of intervention, describing study and participants' characteristics, interventions, outcomes and results.

The effectiveness of the interventions on alleviation or prevention of social isolation was reported in terms of mean effect size (i.e. standardised mean difference - SMD) and respective confidence interval. The rationale for the use of standardised mean differences was the expected variation in the instruments used to assess social isolation. Effect sizes were calculated using Hedges' (adjusted) *g*, as recommended for studies with small samples²⁹⁸.

If studies measured social isolation specifically (such that higher scores indicated more isolation), the sign of the effect size was inversed so that a positive effect size indicated more social support. If various measures of social activity were provided but no specific measure of social isolation (e.g. social contact, social network) was available, the social activity category most closely corresponding to social isolation was used to calculate effect size.

Each step of the selection of studies for inclusion^{vii}, data extraction^{viii}, risk of bias assessment^{ix} and selection of measure of social activity when various measures were provided^x was conducted by two of the three reviewers and the third reviewer (Filipa Landeiro, Ellen Nuttall-Musson and Paige Barrows) was consulted in case of disagreement.

^{vii} Main reviewers were Filipa Landeiro and Paige Barrows.

^{viii} Main reviewers were Filipa Landeiro and Ellen Nuttall-Musson.

^{ix} Main reviewers were Filipa Landeiro and Ellen Nuttall-Musson.

^x Main reviewers were Filipa Landeiro and Ellen Nuttall-Musson.

Unit of analysis issues

The primary effect size for each study was calculated from the first available post-intervention measurement time point. A single study could contribute to more than one analysis. If a study had more than one control group, the primary effect size was calculated using the group which theoretically was expected to generate the greatest difference from the intervention group²⁶¹.

Dealing with missing data

The authors of the studies included in this analysis were contacted with the aim of retrieving any missing data required for this analysis. When necessary, attempts were made to calculate variables required for the SMD calculation for continuous measures from the reported statistics (e.g. standard error (SE)). If it was not possible to contact the authors, or authors no longer possessed the required data, such that it was not possible to calculate the effect size, those studies were excluded from the analysis.

Data synthesis

The effectiveness of the interventions was combined using a random-effects meta-analysis by type of study design and intervention using the “metan” command²⁹⁹ in Stata 12³⁰⁰. The meta-analysis was performed by comparing the SMD in social isolation post intervention in the experimental and control groups where possible (i.e. in studies that employed an RCT or NRCT design). Where this was not possible due to a single group before-and-after study design, the SMD in social isolation within the treatment group was used. This method has previously been used in a meta-analysis investigating related

loneliness interventions²⁶¹. Forest and funnel plots using the output of the meta-analysis in Stata were produced in R³⁰¹, using the metafor package³⁰².

Subgroup analysis and investigation of heterogeneity

Heterogeneity, in terms of study design, interventions and outcome measures, has been observed in previous literature evaluating interventions for social isolation. Hence, the following steps were adopted in this analysis: standardised mean differences were used to calculate effect sizes, random-effects meta-analyses were performed, and subgroup analyses by study design and subsequently by type of intervention (group, one-to-one or mixed, and technological versus non-technological interventions) were conducted. The between-study heterogeneity was evaluated using the χ^2 test for heterogeneity (significance level $p < 0.1$) and the I^2 statistic.

Assessment of reporting biases

Funnel plots were produced to investigate the presence of publication bias, and Egger's test was applied, as advised by Cochrane²⁹⁴.

Sensitivity analysis

If any effect sizes calculated were clear outliers then sensitivity analyses were performed by excluding these studies to examine their effect on the meta-analysis. Details of these sensitivity analyses are presented in the results section of the relevant sections.

Cost analysis

When studies provided monetary values in terms of the intervention costs, these costs were inflated to 2015 prices where required, using the World Bank Gross Domestic Product (GDP) deflator for each country⁷² and then adjusted to a common currency (United States Dollars (USD)) using the Purchasing Power Parity (PPP) method³⁰³.

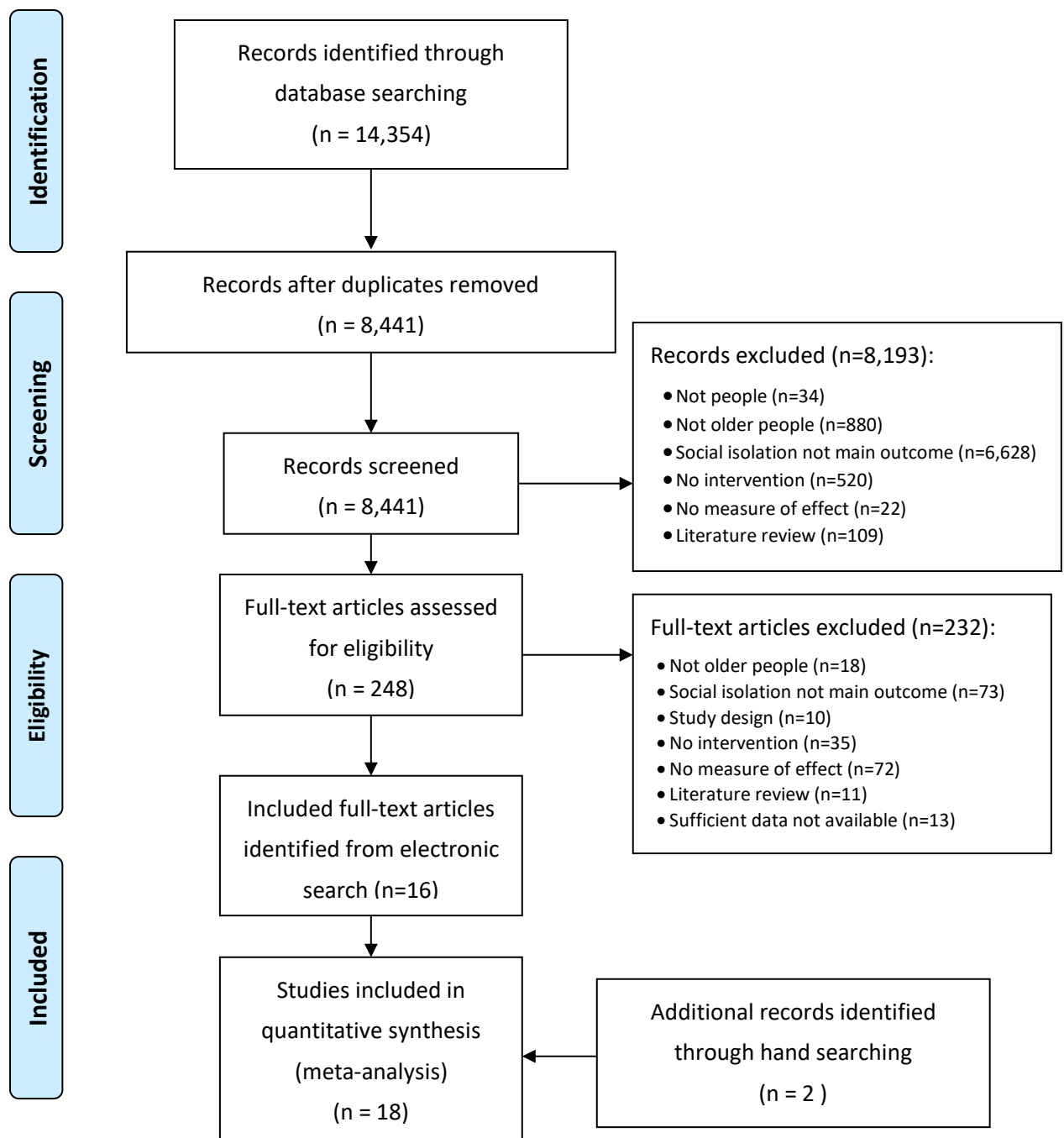
7.2.6 Results

Description of studies

Results of the search

The results of the search are summarised in the PRISMA flow diagram shown in **Figure 25**. The search produced 14,354 results in total. After reviewing these references as described, 16 papers were eligible for inclusion with two additional references being found by citation searching.

Figure 25: PRISMA flow diagram



Included studies

Comprehensive summaries of the characteristics of the 18 included studies are provided in Appendix 24. **Table 38** provides a description of the interventions used in the studies.

Table 38: Description of the interventions used in the studies

First author (publication year)	Intervention		Control condition	Intervention duration (weeks)	Frequency of intervention	Timing of first post intervention outcome measure (weeks after start of intervention)	Social isolation measurement tool			Group or one-to-one	Tech or non-tech
							Name	Validated?			
Bartsch (2009)	Senior Gatekeeper Programme	Reach	NA	52	Variable	52	Care Manager Survey (social isolation component)	No		One-to-one	Non-tech
Brennan (1995)	ComputerLink; computer program providing information, decision support and communication		Placebo training experience identifying local services and resources	52	Constant	52	Instrumental and Expressive Social Support Scale	No		One-to-one	Tech
Dammeyer (2004)	Reminiscence group therapy		Waiting list control	4	2 times per week	4	LSNS	Yes		Group	Non-tech
Drentea (2006)	Individual and family counselling, support group		Resource information and referrals on request	17	Variable	17	Measures taken from Stokes Social Network list	No		Mixed	Non-tech
Greaves (2006)	The Health Centre	Upstream Living	NA	26	Weekly	26	MOS Social Support Survey (shortened to only 3 “positive interaction” items)	No		Mixed	Non-tech
Hombrados Menieta (2003)	Social support/discussion groups		NA	17	Fortnightly	17	Frequency of social contact	Yes		Group	Non-tech
Jones (2015)	Computer training (Plymouth SeniorNet)		NA	18.5**	Variable	Variable***	LSNS	Yes		One-to-one	Tech
Jones (2015b)	Computer training (Plymouth SeniorNet)		NA	10.7**	Variable	Variable***	LSNS	Yes		Group	Tech

First author (publication year)	Intervention	Control condition	Intervention duration (weeks)	Frequency of intervention	Timing of first post intervention outcome measure (weeks after start of intervention)	Social isolation measurement tool		Group or one-to-one	Tech or non-tech
						Name	Validated?		
Kim (2012)	Visits from programme volunteers	Baseline services	52	Weekly	26	SSQ6 (familial)	Yes	One-to-one	Non-tech
Routasalo (2009)	Goal orientated group meetings	Not described	13	Weekly	13	LSNS	Yes	Group	Non-tech
Saito (2012)	Group sessions: focus group discussion, sharing experiences raising awareness of local activities	Waiting list, provided with information about other local group activities	6	Fortnightly	10	Not specified	No	Group	Non-tech
Stewart (2001)	Bereavement support groups	NA	20	Weekly	20	The Emotional/Social Loneliness Inventory (social isolation)	Yes	Group	Non-tech
Torp (2008)	Computer training and use	NA	78	Constant	52	Family and Friendship Contacts Scale	No	Mixed	Tech
Tsai (2010)	Videoconference programme	Regular care	13	Weekly	1	Not specified*	Unclear	One-to-one	Tech
Tsai (2011)	Videoconference programme	Regular care	52	Weekly for 3 months, then at their leisure	13	Social Support Behaviours Scale*	Unclear	One-to-one	Tech
Tse (2010)	Indoor gardening programme	Regular care	8	Weekly	8	LSNS	Yes	Group	Non-tech
White (1999)	Computer training and use	No computer use during study	22	Constant	22	Duke Social Support Scale	Yes	Group	Tech

First author (publication year)	Intervention	Control condition	Intervention duration (weeks)	Frequency of intervention	Timing of first post intervention outcome measure (weeks after start of intervention)	Social isolation measurement tool			Group or one-to-one	Tech or non-tech
						Name	Validated?			
Winningham (2007)	Cognitive enhancement programme	Regular care	13	3 times per week	13	Social Support Appraisals (SS-A)	Unclear		Group	Non-tech
Woodward (2011)	Computer training and use	Not described	26	Fortnightly	13	Frequency of contact with social network	No		Group	Tech

Of the 18 studies, 6 were RCTs, 6 were NRCTs, and 6 were BA studies. Sample sizes varied from 17 to 235 with the majority of participants being female. The setting of the interventions varied from the community³⁰⁴⁻³¹⁵ to supported living facilities^{275,276,316-319}. In terms of outcomes, both social isolation and proxies of social isolation were considered and the latter included social contact, social network and social support (specific measurement tools given in **Table 38**).

The interventions varied in terms of their duration (range from 4 to 78 weeks) and frequency. Furthermore, a wide variety of interventions were employed and were broadly categorised into group (n=10), one-to-one (n=6) and a mixture of group and one-to-one (n=3) interventions. Group interventions included reminiscence¹¹ group therapy²⁷⁶, social support groups^{310,315}, a bereavement support group³⁰⁹, local orientation meetings³⁰⁷, a cognitive enhancement programme³¹⁹ and an indoor gardening programme³¹⁸. One-to-one interventions included active community based referral to services like community based mental health care, care management, information, community based interventions³⁰⁵, volunteer visits³⁰⁶ and videoconferencing with family members^{316,317}. The studies investigating mixed group and one-to-one interventions focused on individual and family counselling³¹⁴ and a community based individualised programme to increase social interaction³⁰⁴. Interventions were also classed as being technology based (n=7) or not (n=11). Technology based interventions included computer training^{275,308,311,312}, computer programme providing information, decision support and communication³¹³, and videoconference programme^{316,317}. Computer training initiatives were investigated in group, one-to-one and mixed settings^{275,308,311-313}. The results of one

¹¹ the use of life histories (written, oral, or both) to improve psychological well-being.

study are presented as two records as this study presented data on subgroups receiving one-to-one and group based interventions³⁰⁸.

The effectiveness of the interventions in most studies was measured at the end, or shortly after the end, of the intervention period. However, two studies measured the effectiveness very shortly after the introduction of the intervention^{316,317}. Half of the studies reported ethical approval and only eight (44%) of the 18 studies used a validated tool to measure social isolation (i.e. LSNS, Duke Social Support Scale, SSQ6 and the Emotional/Social Loneliness inventory).

The resources required to provide the interventions were reported in eight studies^{275,308,311-313,316-318} e.g. each participant received a computer. However, only two studies reported the costs of providing the intervention³⁰⁸ (see **Table 39**).

Table 39: Costs of interventions

First author (year)	Intervention resources	Cost of intervention per person (2015 PPP)
Brennan (1995)	Computer	USD 538
Jones (2015)	Computer training (some participants provided with computers and broadband).	USD 1,022

Risk of bias in included studies

The quality assessment for each of the included studies is provided in Appendix 25. Most studies (n=12) were considered “weak” with regard to selection bias. This occurred at both the population and the individual level. At a population level, several studies^{310,312,314,316,318,319} defined study populations from which samples were taken but the extent to which the original population is representative of the wider target

population was not addressed and is unclear. At an individual level, some studies relied on volunteers^{275,304,308,315} and in one study staff in the nursing home where the intervention took place advised the research team on which residents could be included in the trial³¹⁸. No information about recruitment was provided in two studies^{309,319}.

Because of the nature of the interventions, blinding of participants with respect to their allocation is difficult. That said, blinding was poorly described: none of the included studies specified that the assessors were blind to the allocation of the participants and none specified blinding the participants to the research question. Due to the lack of information, the majority of studies (n=14) were therefore not rated.

Six studies were RCTs but only two described the method of randomisation^{307,315}. Amongst the NRCTs, allocation was performed using a range of different methods: Winningham et al³¹⁹ allocated at an institutional level depending on location and facilities; in White et al²⁷⁵ participants were allocated depending on their personal availability to take part in the intervention; Kim et al³⁰⁶ state that participants were allocated in an arbitrary manner but no further detail is given; Tsai et al³¹⁶ did not recruit sufficient study participants using the initial allocation method and it is not clear from the authors' description whether they subsequently maintained a consistent allocation method or not; and, in Jones et al³⁰⁸, participants were allocated to a particular intervention based on their mobility, although this is a risk factor for social isolation in itself.

Seven studies were designated as “weak” with regard to confounding factors, either because there were reported baseline differences between the intervention and control groups (or within the intervention group for before-and-after studies) that were not controlled for, or it was not possible to tell from the data presented^{304,305,308-311}.

Validated instruments were used to quantify social isolation in eight studies. These included the LSNS, the Duke Social Support Scale, the Emotional/Social Loneliness Inventory, and the Social Support Questionnaire 6 (SSQ6).

In some cases, there is more than one component to the intervention making it difficult to understand which component contributes most to the global effect. For example, in Torp et al³¹¹ the primary intervention was computer training and computer access to carer specific information and forums, but participants also had monthly group meetings to discuss the service. Some also chose to install email and this enabled social interaction beyond the primary intervention. It is therefore unclear in this study whether the global effect is a result of the computer intervention, regular group meetings, or both.

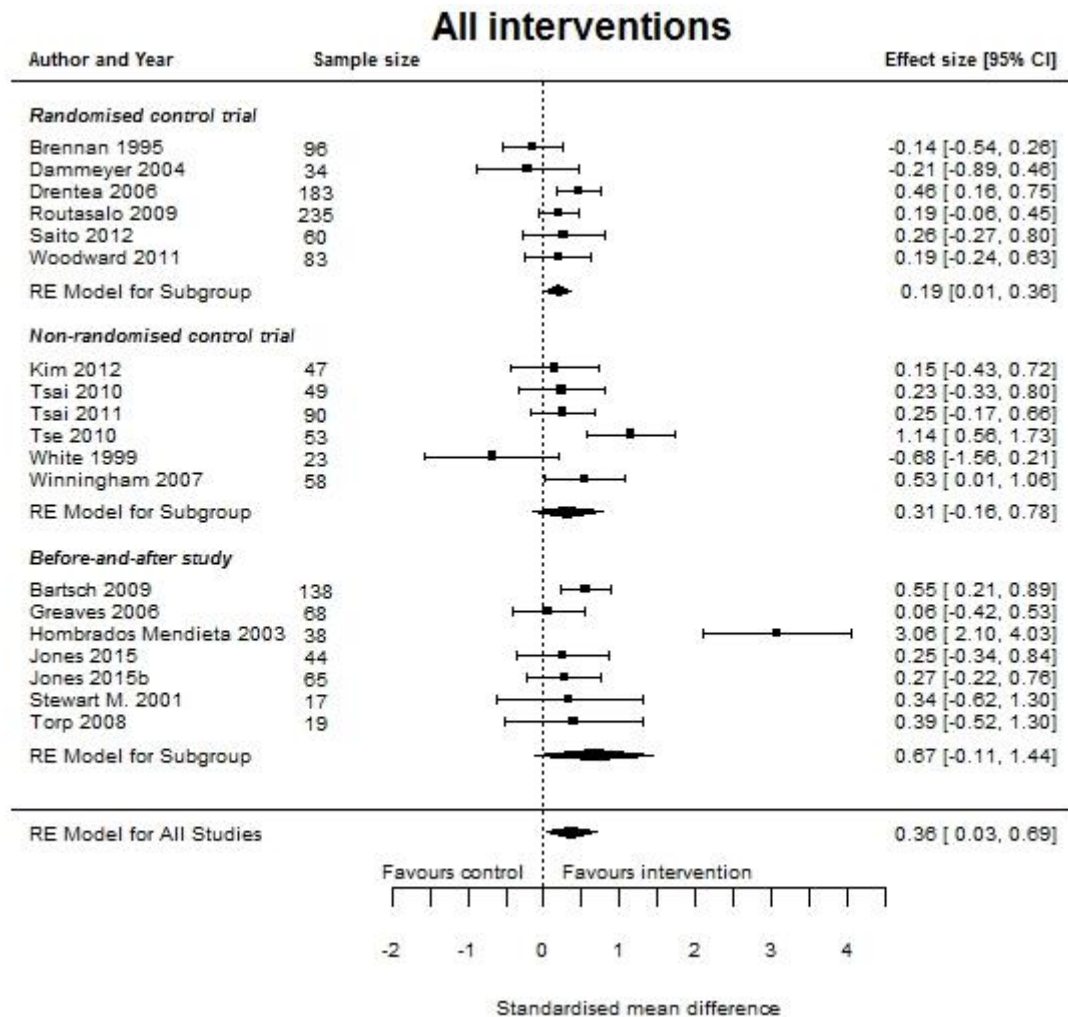
Effects of interventions

Overall

The RCTs showed a modest but significant positive effect size at the first outcome measurement post intervention, representing a reduction in social isolation. The NRCTs and BA studies showed non-significant positive effect sizes, as shown by the summary estimates for the different study designs in **Figure 26**. Considering all study types

combined, the analysis shows a small but significant positive effect size post intervention (SMD: 0.36; 95% CI: 0.03 - 0.69), favouring the intervention.

Figure 26: Forest plot for all studies



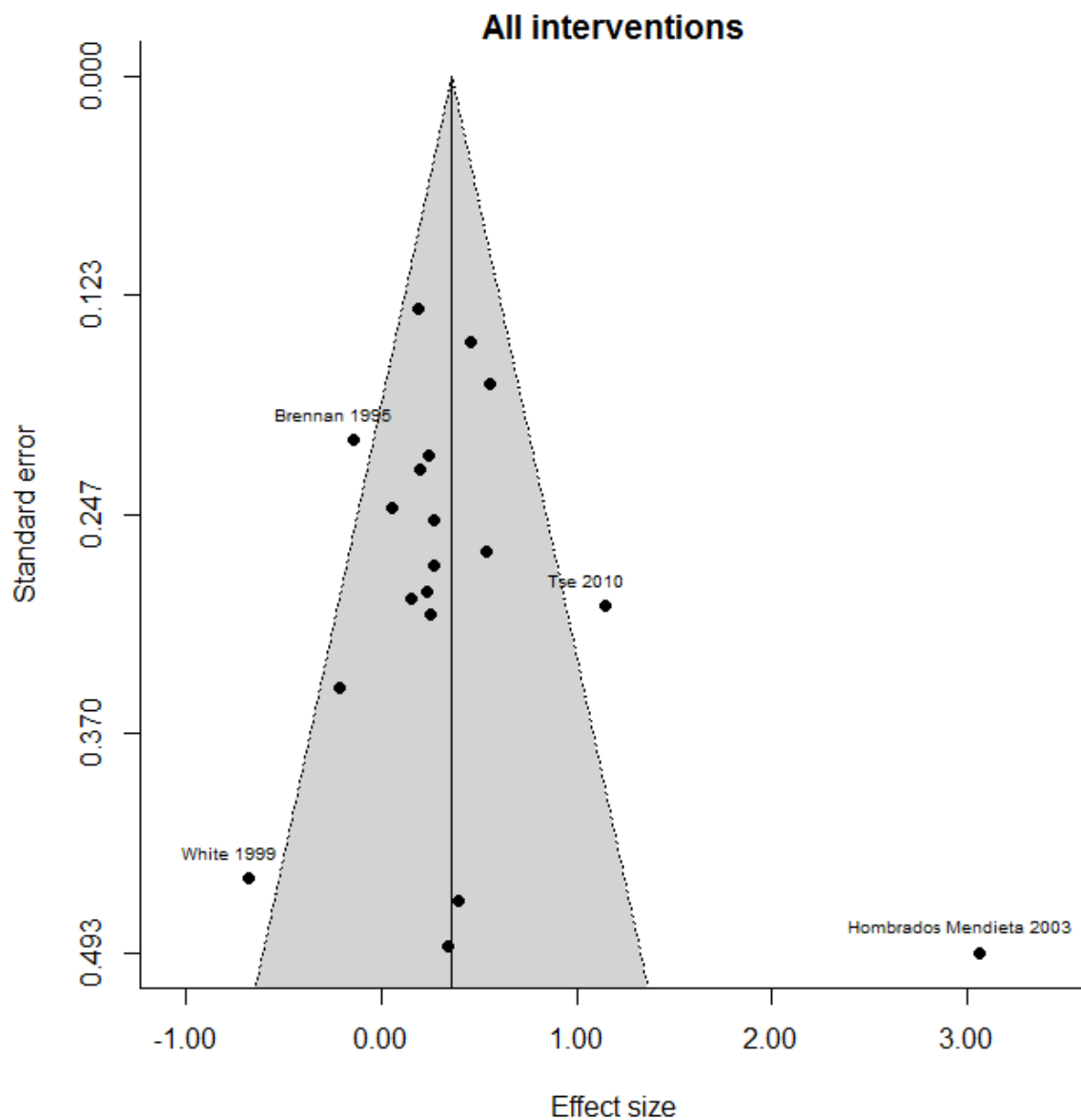
The χ^2 statistic for heterogeneity was 57.4 ($p < 0.001$) and the I^2 statistic was 88.5%, indicating considerable heterogeneity. Considering each study design separately, the RCTs had a χ^2 statistic of 7.2 ($p = 0.205$) with an I^2 statistic of 21.7%, suggesting that these data are non-heterogeneous. The NRCTs had a χ^2 statistic of 13.6 ($p = 0.018$) and an I^2 of 75.6%, and the BA studies had a χ^2 statistic of 32.1 ($p < 0.001$) and an I^2 of 91.9%.

Therefore, there is less heterogeneity between the RCTs than between the other study designs.

Five studies had statistically significant positive effect sizes. An RCT by Drentea³¹⁴ et al comparing individual and family counselling support group for spouse caregivers of people with Alzheimer's disease to regular care reported a significantly positive effect size. Additionally, among the NRCTs, the study by Tse et al³¹⁸ comparing an indoor gardening programme to regular care in a nursing home reports a large positive effect size and the study by Winningham et al³¹⁹ on a cognitive enhancement programme also reports a statistically significant effect size. Finally, amongst the BA studies, Hombrados Mendieta et al³¹⁰ reports a significant large effect in reducing social isolation compared to the other studies. This study investigated the effect of social support/discussion groups for older people and the main outcome measure consisted of a proxy for social isolation, namely the frequency of social contacts. Bartsch et al³⁰⁵, analysing the impact of a senior reach gatekeeper programme, also reported a significant positive effect. On the other hand, the study by White et al²⁷⁵, comparing computer training and use to no computer use in a retirement community, appears to have a larger negative effect size than other studies in the group.

Figure 27 is a funnel plot of the effect sizes of all included studies. It shows a clear outlier with a large effect (Hombrados Mendieta et al³¹⁰), although there does not appear to be significant asymmetry to suggest small study effects. Egger's test suggested no significant funnel plot asymmetry ($p=0.299$).

Figure 27: Funnel plot for all studies



Sensitivity analysis

As Hombrados Mendieta et al³¹⁰ represented a clear outlier in **Figure 26** and **Figure 27**, a sensitivity analysis was performed excluding this study. The forest and funnel plots produced by this analysis are shown in Appendix 26. The summary statistic for the BA studies showed a similar effect (SMD: 0.35; 95% CI: 0.13 - 0.56). Overall, excluding this study resulted in an effect size that was smaller than the original analysis but still significant (SMD: 0.26; 95% CI: 0.11 - 0.42).

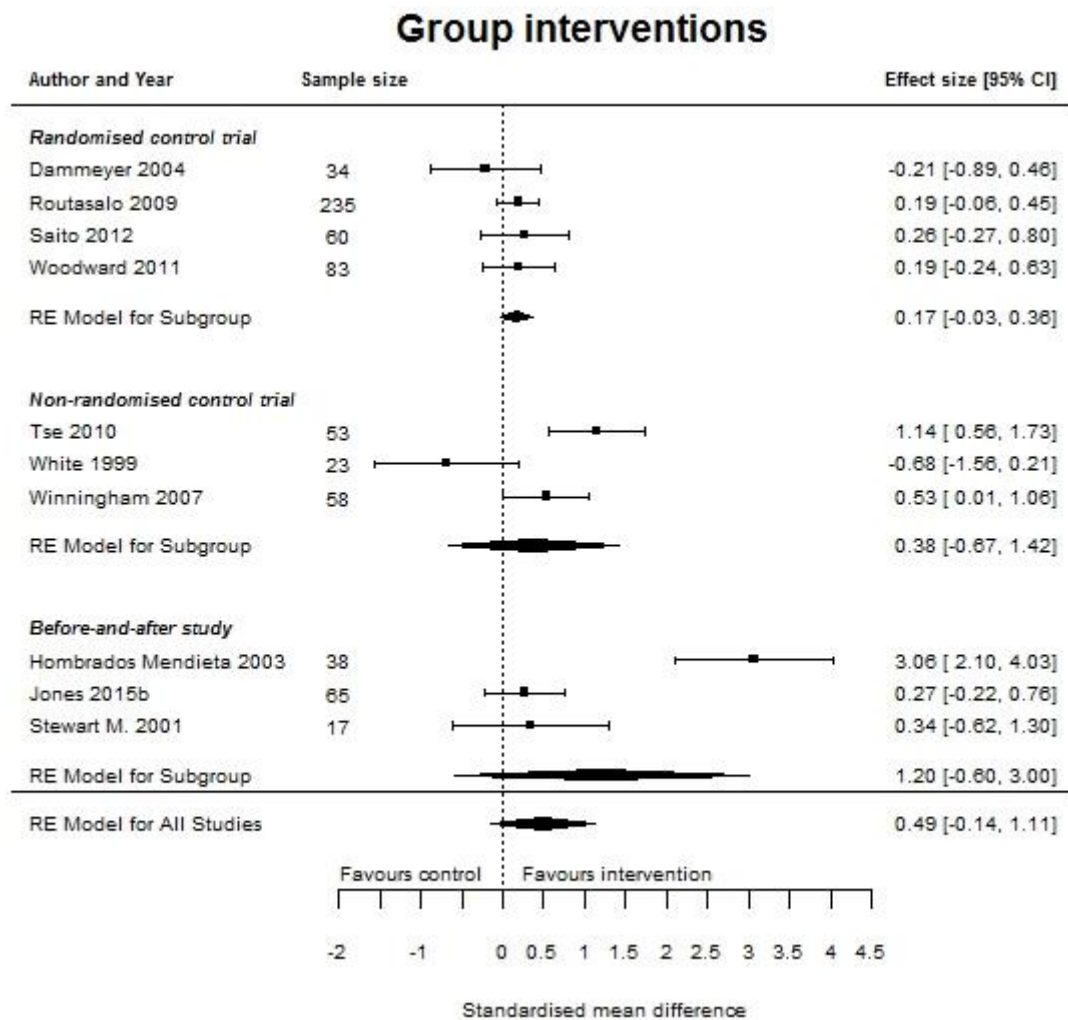
Subgroup analysis

Group interventions

Ten studies evaluated the effectiveness of group based interventions – four RCTs, three NRCTs and three BA studies. All study types showed non-significant positive effect sizes (suggesting less social isolation) at the first outcome measurement after commencing the intervention, as shown in **Figure 28**. Overall, the estimate of effect size for all study types looking at group interventions combined did not show a significant reduction in social isolation (SMD: 0.49; 95% CI: -0.14 to 1.11).

There was much more variability in the effect sizes reported amongst the NRCTs and BA studies when compared to RCTs. Overall, the χ^2 statistic for heterogeneity is 47.8 ($p < 0.001$) and the I^2 statistic is 92.6% for group interventions, indicating considerable heterogeneity.

Figure 28: Forest plot for studies looking at group interventions only



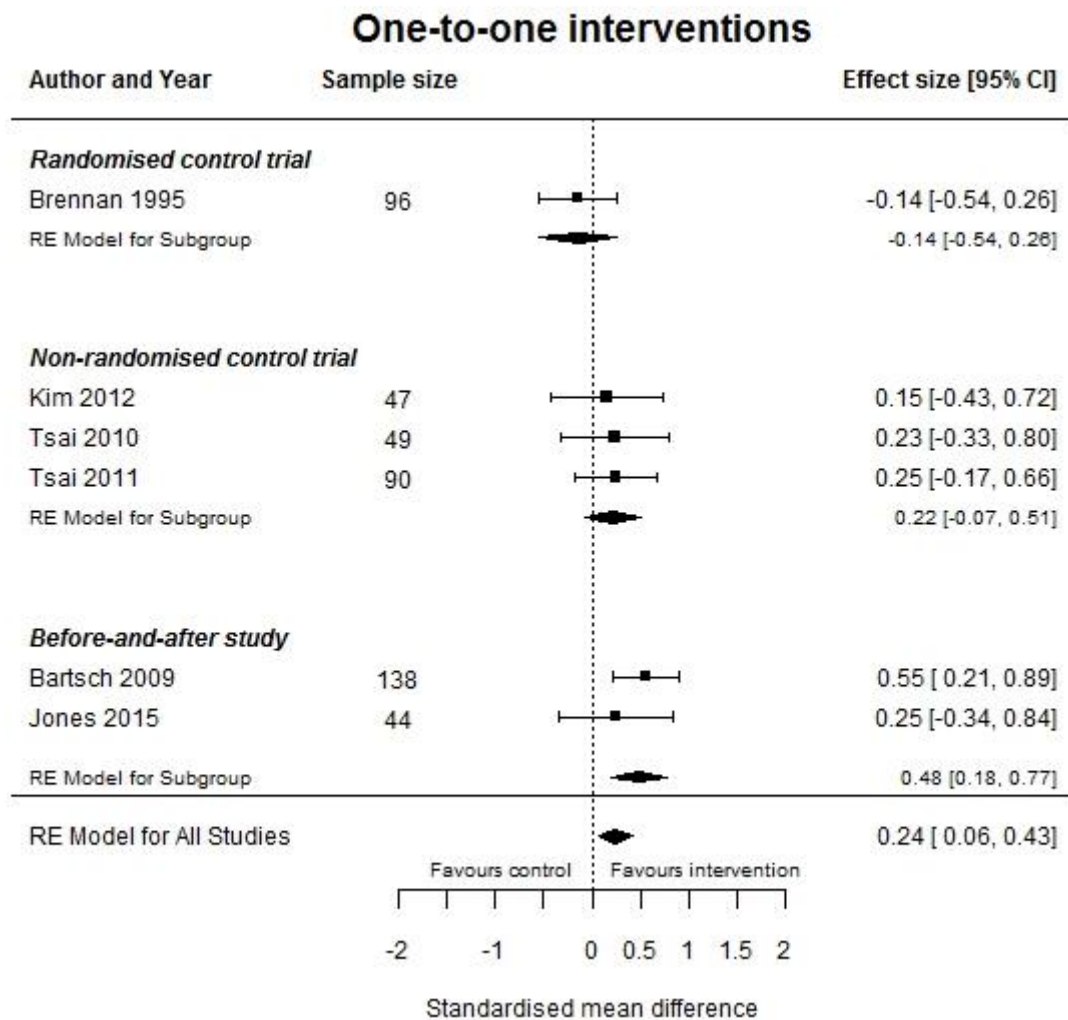
Sensitivity analysis

A sensitivity analysis was performed by excluding Hombrados Mendieta et al³¹⁰ (as described in the previous section). The plot relating to this analysis is shown in Appendix 27. The summary statistic for the BA studies showed a more modest effect size, but remained non-significant. This was also seen in the estimate across all study types with group interventions, with a SMD of 0.26 (95% CI: -0.05 to 0.58). The sensitivity analysis for group interventions also showed less heterogeneity ($\chi^2=68.2$ ($p=0.037$), $I^2=68.2\%$).

One-to-one interventions

The results of studies evaluating one-to-one interventions are shown in **Figure 29**. These studies include one RCT, three NRCTs and two BA studies. The only RCT³¹³, investigating the effects of a computer network to provide assistance to caregivers of persons with Alzheimer's disease on their social isolation, reported a small non-significant negative effect size, i.e. a non-significant increase in social isolation. The effect sizes amongst the three NRCTs were similar, and overall suggested a non-significant positive effect (reduction in social isolation) post intervention. The two BA studies suggested a significant positive effect post intervention. Overall, one-to-one interventions produced a small but significant positive effect size (indicating more social support in the treatment groups compared to controls) (SMD: 0.24; 95% CI: 0.06 to 0.43). The χ^2 statistic for heterogeneity is 6.88 ($p=0.230$) and the I^2 statistic is 0%, suggesting that the data are non-heterogeneous.

Figure 29: Forest plot for studies looking at one-to-one interventions only

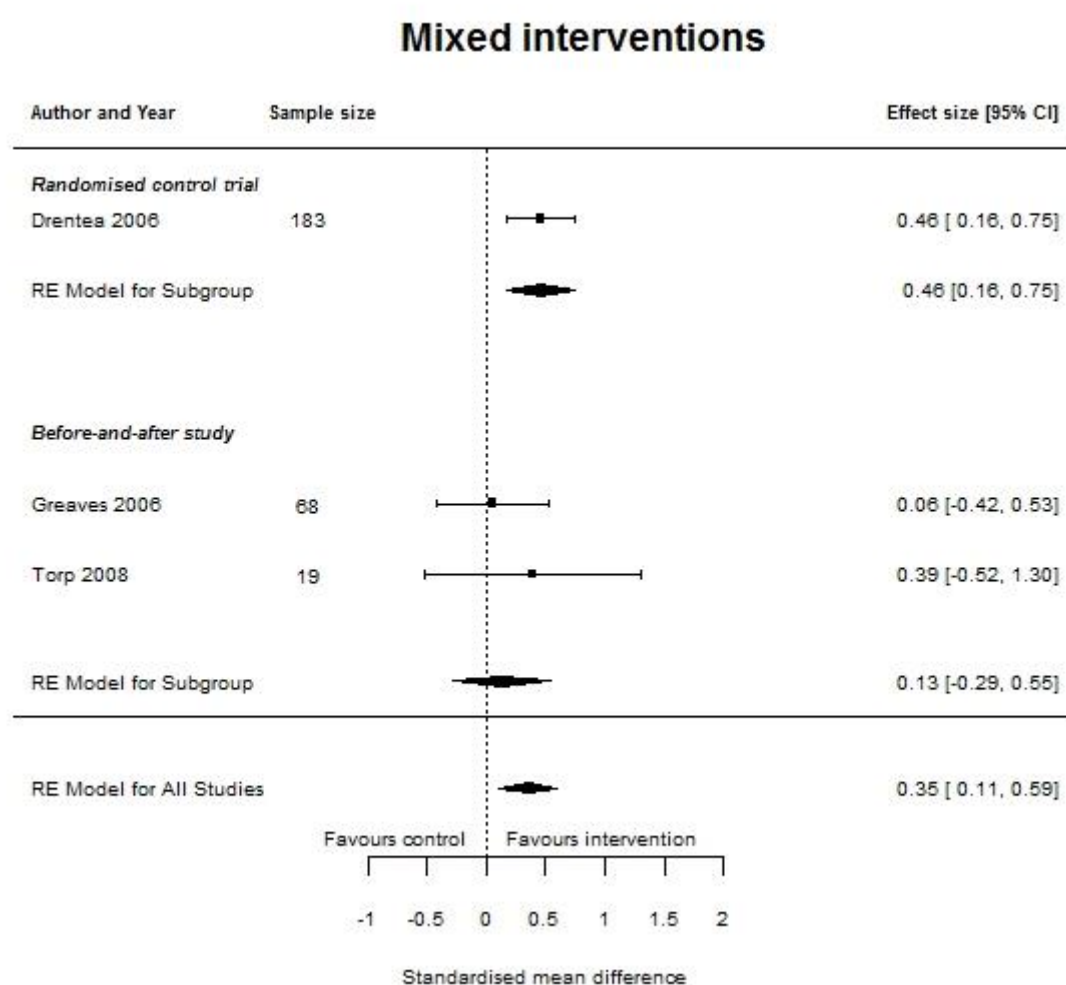


Mixed interventions

Three studies (one RCT and two BA studies) investigated interventions that featured both one-to-one and group based elements. In one study participants either received a one-to-one or a group based intervention, but the results as reported combined both interventions³⁰⁴. In the remaining two studies participants received a combination of one-to-one and group based interventions^{311,314}. The results of this subgroup analysis are shown in **Figure 30**. The summary statistic for this subgroup suggests that mixed interventions have a significant positive effect (SMD: 0.35; 95% CI: 0.11 - 0.59). The χ^2

statistic for heterogeneity is 1.98 ($p=0.371$) and the I^2 statistic is 0%, suggesting that the data are non-heterogeneous.

Figure 30: Forest plot for studies looking at a mix of one-to-one and group interventions



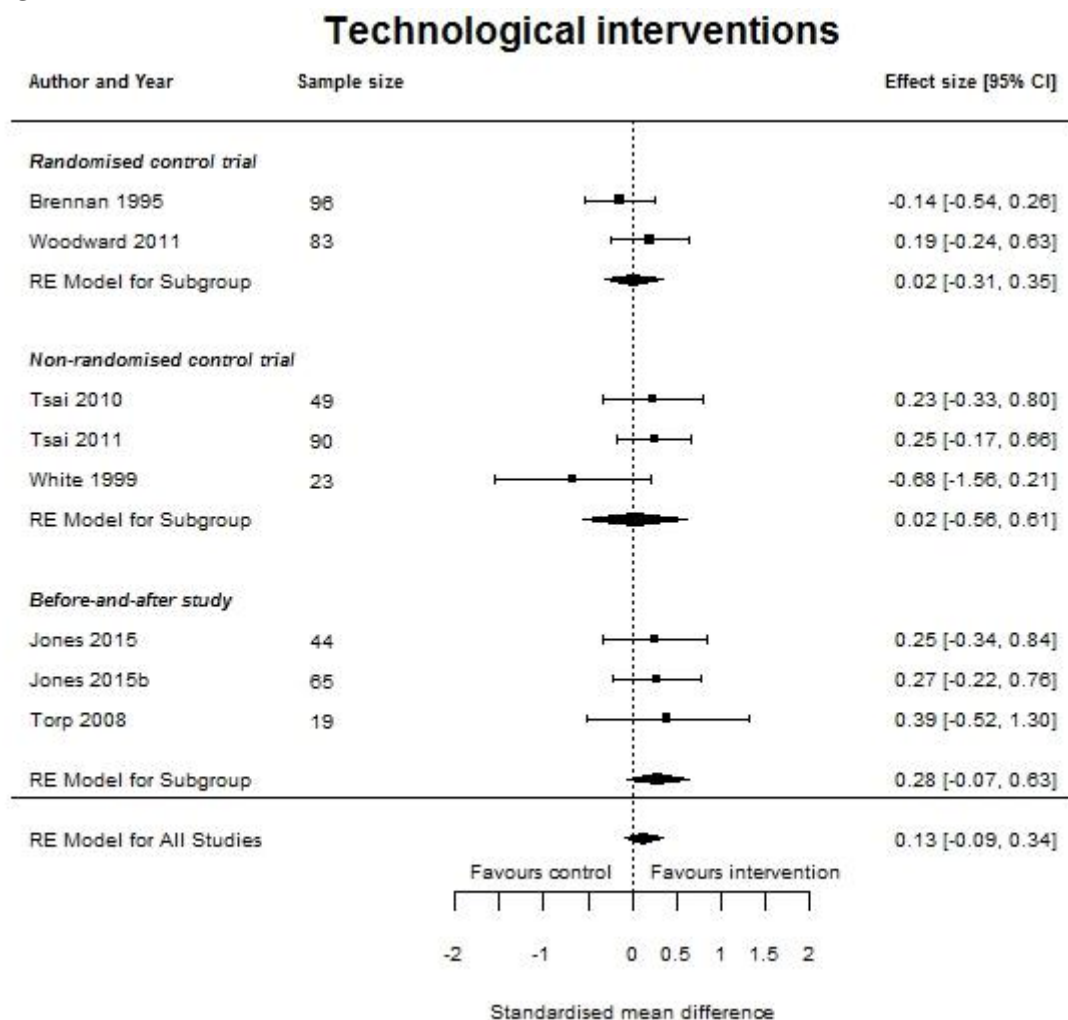
Technological interventions

The results of the subgroup analysis focusing on studies using technological interventions are shown in **Figure 31**. Seven studies employed a technological intervention, of which two were RCTs, three NRCTs and two BA studies. Where applicable, the technological interventions were compared against standard care. The interventions were broadly split

into computer training^{275,308,311-313} and videoconferencing^{316,317}. The RCTs and NRCTs both showed a non-significant SMD close to zero. The BA studies showed a non-significant reduction in social isolation. Overall (all study designs combined), technological interventions showed a non-significant positive effect size (SMD: 0.13; 95% CI: -0.09 to 0.34).

The χ^2 statistic for heterogeneity is 6.3 ($p=0.51$) and the I^2 statistic is 23.8%, suggesting that the data are non-heterogeneous.

Figure 31: Forest plot for studies looking at technological interventions versus standard care

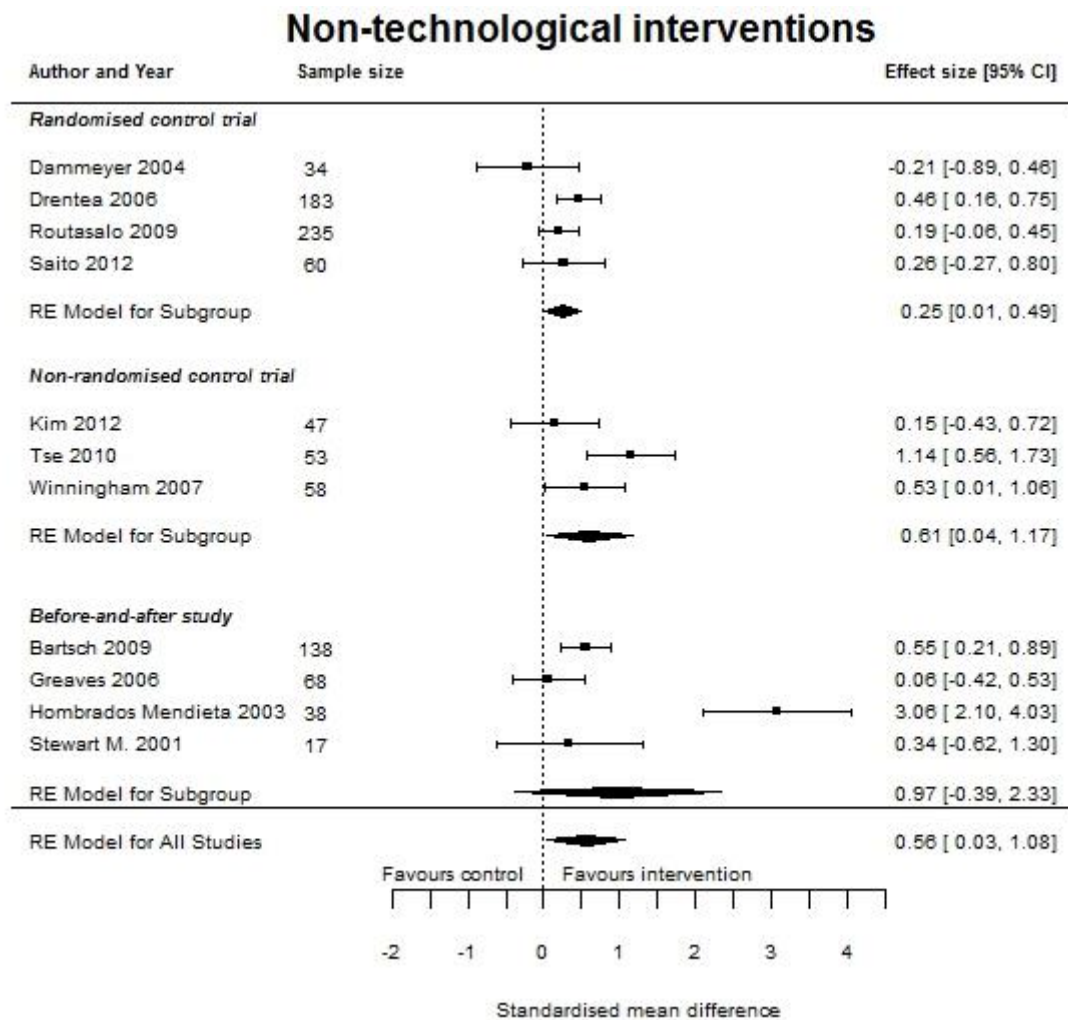


Non-technological interventions

The results of the studies using non-technological interventions subgroup analysis are shown in **Figure 32**. The subgroup consisted of four RCTs, three NRCTs and four BA studies. Where applicable, the non-technological interventions were compared against standard care. All study types suggested a positive effect size post intervention, which was significant in the RCTs and NRCTs. Overall, the studies employing non-technological interventions showed a significant positive effect, suggesting less social isolation post intervention (SMD 0.56; 95% CI 0.03 - 1.08). The χ^2 statistic for heterogeneity is 45.3 ($p < 0.01$) and the I^2 statistic is 92.8%, indicating considerable heterogeneity.

Five of these studies used a validated tool to assess social isolation and six used different non-validated measures. Even the studies using validated tools did not use the same one (three different tools were used). Therefore, there was not enough power to assess the impact of the different tools used on the effect size given the high degree of variation in the use of tool to assess social isolation. But, it is of note that three^{305,310,320} out of the four^{305,310,318,320} studies reporting a statistically significant effect size used a non-validated tool to assess social isolation.

Figure 32: Forest plot for studies looking at non-technological interventions versus standard care



Sensitivity analysis

The plot relating to the non-technological sensitivity analysis with Hombrados Mendieta et al³¹⁰ excluded from the sample is shown in Appendix 28. The summary statistic for the BA studies showed a smaller effect but reached significance (SMD: 0.38; 95% CI: 0.12 - 0.65). Overall, the effect size of this sensitivity analysis was smaller but remained significant (SMD: 0.36; 95% CI: 0.15 - 0.56). Further, there was less heterogeneity ($\chi^2=15.6$ ($p=0.075$), $I^2=50.9\%$)

7.2.7 Discussion of the results of the meta-analysis

Summary of main results

Overall, the current body of evidence shows that interventions attempting to tackle social isolation produce a small but significant positive effect size (SMD: 0.36; 95% CI: 0.03 – 0.69), implying a reduction in social isolation post intervention. When analysed by study design, a significant effect size of the interventions is observed among the RCTs alone (SMD: 0.19; 95% CI: 0.01 – 0.36). In terms of subgroup analysis, a significant effect size is observed in one-to-one (SMD: 0.24; 95% CI: 0.06 – 0.43) and mixed interventions (SMD: 0.35; 95% CI: 0.11 – 0.59) only indicating that one-to-one interventions and mixed interventions have better results in alleviating social isolation than group interventions alone.

Additionally, it appears that the evidence supports non-technological interventions to reduce social isolation (SMD: 0.56; 95% CI: 0.03 – 1.08) rather than those based on technology. Technology-based interventions involved computer training and video-conferencing whereas non-technological interventions focused on people in the community identifying socially isolated people and referring them to services, reminiscence group therapy, individual and family counselling, support groups, visits from programme volunteers, goal oriented group meetings, gardening programme and cognitive enhancement programme. Hence, face-to-face relationships seem to be more effective at reducing social isolation than via a computer. This may reflect quality of the social contacts rather than quantity – computer use may have the capacity to facilitate more contacts and a wider network in someone who is socially isolated, but this may not translate into a decrease in social isolation in real terms. Also, it may be due to the nature

of the social contact or reflect limitations of the participants in the use of the new technologies such as computers. For example, the study participants were likely to come from a generation who are not very familiar with computers and, despite training provided as part of the studies, the extent to which they would have been able to utilise technology to alleviate social isolation in a meaningful way may have been a limiting factor.

There was a considerable amount of heterogeneity between the studies included in this review which was expected given the broad inclusion criteria. However, there was less heterogeneity in some subgroups, particularly RCTs (compared to other study designs), one-to-one and mixed interventions, and technology-based interventions. Hence, the results of these subgroup analyses may therefore be more reliable. Additionally, one study was identified as a clear outlier during sensitivity analysis and its exclusion resulted in a more modest overall SMD across all study types but it remained significant and decreased the heterogeneity between the studies.

Overall completeness and applicability of evidence

The search strategy was extensive and comprehensive. This meta-analysis is the first of its kind to focus on social isolation as a distinct entity from loneliness. The inclusion criteria were therefore relatively broad to allow a thorough assessment of the current evidence surrounding interventions tackling social isolation in older people, a field that has not been extensively researched. As a result there was significant heterogeneity between the included studies. However, their inclusion gives a relevant and thorough preliminary

synthesis of the existing data on health promotion interventions aimed at tackling this important issue.

Despite the differences between interventions, there were some broad methodological features that could be reliably categorised, such as focusing on a group or one-to-one based intervention, and those utilising technology or not, as per the objectives of this meta-analysis. Any more specific subgroup analysis beyond these general themes would be difficult due to small study numbers.

Only three studies employed mixed interventions, that is, interventions that had one-to-one and group-based elements. Aside from the small sample sizes, interpretation of the results for this subgroup is difficult due to the inability to ascertain the partial effectiveness of its different elements. Furthermore, the effect size calculated for one of the studies³¹⁴, the study with the significantly positive effect, is questionable due to baseline heterogeneity, as there was a significant difference in social network size between the control and the intervention groups at baseline. This difference is a confounding factor in this analysis, which uses the mean scores.

Regarding the applicability of the evidence, several features of the included studies should be noted. Firstly, the majority of the studies focus on older women in developed countries and the extent to which these conclusions can be applied to older men and across different social structures is limited. Secondly, almost all the “technological” interventions are rather outdated in terms of hardware, software, and technology accessibility/flexibility. For example, none of the included studies investigated

technological approaches that used smartphones. Thus, although the results of the meta-analysis suggest that the use of technology is not helpful in reducing social isolation, one cannot conclude that this is true for newer technologies not investigated by the included studies.

A comment on the applicability of the body of evidence in general, independent of this analysis, is important. Given the numerous factors contributing to social isolation, it is noteworthy that the literature seems to lack explicit analysis of causes of social isolation at an individual level. Some papers identify specific target groups (e.g. widows³⁰⁹ or carers^{311,313,314}) but one could argue that this makes assumptions about the cause of an individual's social isolation. As such, it is quite possible that study participants may differ in terms of drivers of their social isolation. If this is the case, merely exposing someone to a nonspecific intervention may have little impact. Previous reviews have found that studies which focus on specific groups tend to be more effective²⁸³ and research is ongoing to investigate more personalised approaches to the related concept of loneliness³²¹. The same approach may be appropriate when considering social isolation. This was consistent with the approach taken by three studies in this analysis^{304,305,314}. Bartsch et al³⁰⁵ found a significant increase in social support, while Greaves et al³⁰⁴ found no effect. Both were BA studies. Drentea et al³¹⁴ (an RCT) found a significant positive effect size, although this should be interpreted with caution as the control and experimental groups had significantly different network sizes at baseline. Further high quality research into this concept would be interesting.

Limitations of the work

Sources of bias introduced as part of this meta-analysis include factors related to the inclusion criteria. Only studies from which the effect size of the intervention could be calculated were included. This led to the exclusion of studies that were more qualitative in nature or ones where the authors could not be contacted/no longer had access to their data. Additionally, conference abstracts were not included in the search strategy. There are advantages and disadvantages to this approach. Some classes of intervention which try to improve social wellbeing do not feature very much if at all in this analysis, e.g. animal therapies and socially assistive robots³²².

A further source of bias is introduced by the fact that the first available post intervention measurement of social isolation was taken. Although, given the heterogeneity of the intervention lengths and frequencies and numbers of serial assessments of social isolation, selection of a specific measurement time-point with which to quantify effect size will always be fraught with difficulty, the method chosen in this meta-analysis is likely to focus on short term effects of interventions, rather than longer term effects (which could arguably be more important from a policy making perspective).

Due to the variety of outcome measurement tools used, comparing effect sizes is difficult. The use of a SMD, as in this analysis, is an appropriate method with which to try and draw comparisons. However, it is not perfect, as illustrated in some of the included studies. Firstly, one cannot assume direction of effect size and standardising the scale prohibits analysis of ceiling/floor effects²⁷⁵. Secondly, misleading effect sizes may be

calculated if there are significant differences between treatment and control groups at baseline³¹⁴.

A range of study designs were included in this analysis (RCTs, NRCTs and before-and-after studies). Subgroup analysis by study design showed considerable heterogeneity within NRCT and BA studies (which both report larger, albeit non-significant, effect sizes than the stronger RCTs). Although it is encouraging that the RCTs report a significant positive effect size in favour of intervention, the results of this analysis across all studies is likely to have been influenced by the weaker studies.

Implications for practice and for research

Overall, this analysis suggests that interventions aimed at tackling social isolation in older people can reduce it. Based on the results of the subgroup analysis, the current evidence base supports the use of one-to-one interventions, non-technological interventions, and possibly mixed interventions. The included studies did not show evidence of significant effects in group-based and technologically assisted interventions. However, the quality of the evidence is weak and there was a considerable degree of heterogeneity between the included studies. The results of this analysis should therefore be interpreted with caution.

More high-quality research into this area is required and, as the gold standard, it would be helpful to undertake more RCTs. In terms of study participants, it is important to recognise that social isolation has many possible contributing factors and the success of different interventions is likely to vary depending on whether or not they target the

cause(s) of someone's social isolation. Therefore, interventions targeted at specific populations are more likely to produce useful conclusions with which to inform practice.

Similarly, the type of intervention should be chosen based on the needs of the population. The interventions with significant positive effect sizes in this analysis varied. Two used an individualised approach^{305,314}, two used a group intervention that created a goal orientated shared purpose amongst the participants^{318,319} and one was a support group specifically targeted at alleviating social isolation³¹⁰. Several of these had methodological limitations, as discussed, but these may be interesting themes to consider in further research. Although there is more robust evidence to support one-to-one and non-technological interventions, one cannot conclude from the evidence base that group based and technology assisted interventions do not work, especially as the results of this analysis differ from the findings of previous systematic reviews. More research into all of these areas would be useful. It would also be interesting to study interventions using newer/different technology assisted interventions as the majority included in this analysis were personal computer based. There are many other variables in terms of the intervention that were not included in this analysis (notably the intervention intensity and duration) which might also be interesting to consider.

Measurement is another key area to mention with regards to future research. It is important that the tools for measuring social isolation are validated and are sensitive to changes that may be brought about by a given intervention. Furthermore, the timing of measurements is important to understand the time course of any effect size observed.

With increasing pressures on health and social care budgets, accurate reporting of intervention costs to facilitate cost-effectiveness analyses would also be valuable.

7.3 Conclusion

In this chapter I presented a comprehensive systematic review and meta-analysis examining the effects of interventions aiming at alleviating social isolation.

Overall, these interventions were found to have a significantly positive effect at tackling social isolation, with one-to-one and mixed interventions having a significantly positive effect at alleviating social isolation but no evidence of a significant effect for group based interventions. However, the number of studies is small, the quality of the evidence base is poor and there was considerable heterogeneity between studies.

However, the main aim of this review was to identify interventions that are effective at alleviating social isolation. The interventions identified in this chapter will therefore be used in Chapter 8 to inform how these can impact on delayed discharges through alleviation of social isolation.

Chapter 8 : Can delayed discharges be reduced by alleviating social isolation?

8.1 Introduction

In Chapter 6 I presented a comparison of the impact of social isolation on the number of days of delayed discharges of proximal femoral fracture (PFF) patients in a Portuguese and English context. The results showed that social isolation is an important determinant of the number of days of delayed discharges in PFF patients, though for different reasons in England and Portugal. Hence, interventions aimed at alleviating social isolation could potentially reduce the number of days of delayed hospital discharges.

In Chapter 7, a systematic review identified interventions aimed at reducing social isolation. Two interventions identified in the review were chosen as case studies because they used the 10-item LSNS to assess the impact of the interventions on social isolation. Using the Portuguese and English cohorts of PFF patients as case studies, this chapter considers these two interventions, and simulates their potential impact on the number of days of delayed discharges and healthcare costs were they to be generally implemented. The chapter concludes by discussing how interventions aimed at alleviating social isolation could help achieve a more efficient use of healthcare resources.

8.2 Can interventions to alleviate social isolation reduce delayed discharges?

Chapter 2 explored the many factors that may be associated with delayed discharges, including discharge destination and social factors such as living alone and the absence of a family carer⁶. The case studies presented in Chapters 4 and 5 then showed that social isolation (incorporating both the size of the social network and the strength of the relationships within it) has a significant effect on the number of days of delayed discharge in older people with proximal femoral fractures (PFFs), resulting in significant costs, and is also associated with increased emergency hospital attendances^{23,323} and an increased rate of rehospitalisation after discharge in older people³²⁴. Associations with a range of harmful health behaviours^{121 127} and negative physical and mental health outcomes have also been documented^{19,325-328}.

Chapter 7 described a range of interventions in different settings aimed at alleviating social isolation in older people. This systematic search and meta-analysis suggests that interventions can reduce social isolation, particularly one-to-one, mixed (one-to-one and group based) and non-technological interventions. I now explore the potential impact of these interventions on delayed discharges and respective costs using the Portuguese and English cohorts, described in Chapters 4 and 5, as case studies.

8.2.1 Methods

Case studies

In order to model the impact of social isolation on delayed discharges, data from the two prospective cohort studies conducted at the *Hospital de Santa Maria* (HSM) (Chapter 4) and at the John Radcliffe Hospital (JRH) (Chapter 5) were used. Social isolation was measured in these studies using the 10-item LSNS. Details of these studies and the statistical and modelling methods applied were described fully in Chapters 4, 5 and 6.

Identification of interventions aimed at reducing social isolation

Two of the studies identified in the systematic review used the 10-item LSNS to measure social isolation and reported a positive effect (i.e. a larger reduction in social isolation in the treatment group than the control group post intervention)^{315,318}, although this was only significant in Tse et al³¹⁸. The interventions reported in these two studies were chosen to illustrate the potential impact of alleviating social isolation in a “real-world” setting.

Routasalo et al³¹⁵ report the results of a randomised controlled trial (RCT) investigating the impact of a psychosocial peer-support group based intervention in older community dwelling adults in Finland. This intervention consisted of a psychosocial group nursing intervention with three types of activities, namely, arts and inspiring activities, group exercise and discussions, and therapeutic writing and group therapy. The groups met weekly for three months. There was no significant difference between the LSNS scores in the control and experimental groups pre-intervention. Both groups had a small reduction in LSNS scores after three months. The resulting mean difference was calculated as 1.60

(SE 1.08; 95% CI: -0.52 to 3.72) in favour of the intervention group. Tse et al³¹⁸ report the results of a non-randomised controlled trial (NRCT) investigating the impact of a group based indoor gardening programme for older adults who were nursing home residents. The intervention was delivered weekly for 8 weeks. There was no significant difference between the LSNS scores in the control and experimental groups pre-intervention. The LSNS score increased in the experimental group during the intervention and remained static in the control group. The calculated mean difference in scores post-intervention was 6.44 (SE 1.54; 95% CI: 3.42 to 9.46). Both studies were classed as at a “moderate” risk for bias using the EPHPP quality assessment tool.

The demographics and social isolation scores of the participants in the two studies described above are provided in **Table 40**.

Table 40: Characteristics of participants in social isolation intervention studies and the cohort studies at the HSM and the JRH

Variable	Routasalo et al		Tse et al		HSM	JRH
	Experimental (n=117)	Control (n=118)	Experimental (n=26)	Control (n=27)		
% Females	74.4	72.9	96.2	74.1	79.5	70.5
Mean age (range)	80 (75-92)	80 (75-90)	85.23 (73-95)	83 (65-95)	85.5 (75-102)	86.2 (75-102)
% Widowed	68.1	68.8	76.9	70.4	71.9*	64.8*
% Living alone	80.2	78.8	n.a.	n.a.	20.5	n.a.
LSNS pre intervention, mean (SD)	26.1 (8.6)	24.6 (8.2)	19.3 (8.0)	18.3 (4.2)	30.1 (9.0)	20.6 (70.6)
LSNS post intervention, mean (SD)	25.8 (8.3)	24.2 (8.3)	24.8 (6.7)	18.3 (4.2)	n.a.	n.a.

* The data presented refer to single / widowed / separated / divorced

The subjects of these two social isolation intervention studies were therefore comparable to the two cohort studies on delayed discharges in terms of their age and gender

composition as described in **Table 40**. No significant difference was observed in terms of age across the studies and the percentage of females in the samples was also similar across studies (although slightly higher in the experimental group in Tse et al). The percentage of participants who were widowed in these two social isolation intervention studies was also similar to the percentage of participants who were categorised as single/widowed/separated/divorced in the HSM (71.9%) and the JRH (64.8%) cohorts. The mean LSNS in the cohort at the HSM is higher (30.1) than in the two social isolation intervention studies and in the cohort at the JRH the LSNS is in line with the two intervention studies (20.6).

Statistical analysis

The effect of the interventions in reducing social isolation was compared to no intervention in terms of the number of days of delayed discharges and costs using the HSM and the JRH cohorts.

A decision analysis framework was used where the relative treatment effect of the intervention was applied to the absolute risk of the event of interest (social isolation) to obtain the absolute risk difference between the intervention and no intervention groups. This was subsequently translated into the outcomes of interest (days of delayed discharge) to estimate the cost difference between intervention and no intervention.

$$\begin{array}{ccccc}
 \text{Absolute risk} & & \text{Treatment effect} & & \text{Absolute risk} \\
 \text{(no intervention} & \times & \text{(from comparative} & = & \text{difference} \\
 \text{/control group)} & & \text{studies)} & & \downarrow \\
 & & & & \text{Difference in size of} \\
 & & & & \text{outcomes}
 \end{array}$$

Hence, I assumed that patients, as observed in the HSM and in the JRH, had not received the intervention and represented the no intervention group (absolute risk of social isolation). The intervention effect obtained from the comparative studies (RCT and NRCT) was then applied to the no intervention group to estimate the absolute risk difference in social isolation. This risk difference was subsequently translated into days of delayed discharge using the country-specific negative binomial models reported in Chapter 6. The expected number of days of delayed discharge in the absence of intervention was estimated by applying the country-specific negative binomial models to the baseline characteristics and social isolation as observed in the Portuguese and English cohorts. The expected number of days of delayed discharge with the intervention was estimated by applying the country-specific negative binomial models to the baseline characteristics and changed social isolation in the Portuguese and English cohorts.

Following decision analysis framework, the uncertainty in the treatment effect was propagated into the final outcomes (days of delayed discharge and costs). For simplicity purposes, I did not propagate the uncertainty in the country-specific negative binomial models as its impact was likely to be small in relative terms when comparing the two groups.

For simplicity purposes, I assumed that the effect of the intervention would remain throughout the lifetime of the participant. I also assumed the effect of the intervention would not differ between people with and people without dementia.

Hence, the effectiveness of the two interventions to alleviate social isolation was estimated using the mean difference in the LSNS, calculated as the difference between the mean LSNS in the treatment and control groups at the first post-intervention measurement reported for each comparative study. The SE of the mean difference in LSNS score for study i , $SE_{d,i}$, was calculated using the following formula,

$$SE_{d,i} = \sqrt{\frac{\sigma_{1,i}^2}{n_{1,i}} + \frac{\sigma_{2,i}^2}{n_{2,i}}}$$

where $\sigma_{1,i}$ and $\sigma_{2,i}$ represent the SD in the intervention and in the control groups, respectively, and $n_{1,i}$ and $n_{2,i}$ represent the respective sample size for study i ³²⁹.

The uncertainty around the mean difference was assumed to be represented by a normal distribution characterised by the mean and the SE described above. To propagate the uncertainty in the effectiveness of the interventions to the outputs of interest, 1,000 random draws from the normal distribution of the mean difference were obtained and applied to the baseline LSNS score at individual level in the two cohorts. This resulted in a set of 1,000 datasets for each cohort representing the uncertainty in the LSNS score at individual level following the intervention. The expected number of days of delayed discharge following the intervention was then estimated, at individual level, for each of the 1,000 uncertainty datasets using the country-specific negative binomial models. The difference in days of delayed discharge resulting from the intervention was estimated by

subtracting, at individual level, the number of days of delayed discharge in the absence of intervention from the number of days of delayed discharge following the intervention (as in the 1,000 uncertainty datasets). The difference in days of delayed discharge was then averaged across all patients for each of the 1,000 datasets and the percentile method was used to estimate the confidence interval around this mean difference³³⁰.

Estimating the impact of social isolation interventions on cost

Costs were converted to Euros and adjusted for differences in costs of living in the two countries using the purchasing power parity (PPP) method (described in Chapter 6). The cost of an excess bed day in each cohort, described in Chapter 6 (€167 for the Portuguese cohort - €265 PPP adjusted - and €327 for the English cohort – €325 PPP adjusted), was applied to the mean difference in days of delayed discharge across each cohort, had the social isolation interventions been implemented, to estimate the mean acute hospital cost savings that could be produced by interventions to reduce social isolation per patient.

The authors of the two studies evaluating the interventions used as case studies were contacted for information regarding the cost of the intervention per person. The cost of the psychosocial group intervention studied in Routasalo et al³¹⁵ was €773 per person in 2003, which corresponds to €939 at 2013 prices (€1,158 PPP adjusted³³¹). The intervention costs were then compared to the potential cost savings in days of delayed discharge derived from them. No data regarding the cost of gardening programme intervention described in Tse et al³¹⁸ were available. Hence, for this intervention, the

point at which the cost of the intervention would equal the potential cost savings in delayed discharges (the breakeven point) was estimated.

8.2.2 Results

Effect of social isolation interventions on delayed discharge

Portuguese cohort

In the absence of any intervention, the mean LSNS score for the cohort at the HSM was 30.15 and the mean number of days of delayed discharge was estimated to be 1.70 (95% CI: 1.41 to 1.98) (**Table 41**). By implementing the psychosocial peer-support group intervention, the mean LSNS score was expected to increase to 31.75 and the number of days of delayed discharged was reduced by 0.16 days (95% CI: -0.44 to 0.13) per patient. Implementing the indoor gardening intervention, the mean LSNS score at baseline was expected to increase to 36.59 and the days of delayed discharge were estimated to be reduced by 0.62 (95% CI: -0.78 to -0.46) per patient.

Table 41: Mean LSNS and mean number of days of delayed discharge pre- and post-interventions for the cohorts at the HSM and the JRH

	HSM	JRH
Mean LSNS pre-intervention (SD)	30.15 (8.99)	20.57 (7.63)
Mean LSNS post-intervention: psychosocial peer-support group intervention (SD)	31.75 (8.99)	22.17 (7.63)
Mean LSNS post-intervention: indoor gardening intervention (SD)	36.59 (8.99)	27.01 (7.63)
Mean number of days of delayed discharge pre-intervention (SD)	1.70 (2.44)	7.27 (1.62)
Mean number of days of delayed discharge post-intervention: psychosocial peer-support group intervention (SD)	1.55 (2.21)	7.02 (1.71)
Mean number of days of delayed discharge post-intervention: indoor gardening intervention (SD)	1.08 (1.24)	6.46 (1.96)

English cohort

In the absence of any intervention, the mean LSNS score for the cohort at the JRH was 20.57 and the mean number of days of delayed discharge was estimated to be 7.27 (95% CI: 7.08 to 7.47) (**Table 41**). By implementing the psychosocial peer-support group intervention, the mean LSNS score was expected to increase to 22.17 and the number of days of delayed discharged was reduced by 0.25 days (95% CI: -0.57 to 0.06) per patient. Implementing the indoor gardening intervention, the mean LSNS score at baseline was expected to increase to 27.01 and the days of delayed discharge were estimated to be reduced by 0.82 (95% CI: -1.27 to -0.37) per patient.

Estimated cost impact of social isolation interventions

Portuguese cohort

In the Portuguese cohort, there were 419 days of delayed discharge during the study period. The cost of an excess bed day was estimated to be €167 and, therefore, the cost of delayed discharges in this cohort was €69,973.

Had the psychosocial peer-support group intervention been applied, this would result in an estimated mean reduction in days of delayed discharge of 0.16 days per patient, corresponding to 44.48 fewer days of delayed discharge (95% CI: -122.32 to 36.14) across the cohort and a cost saving of €27 (95% CI: -€73 to €22) per patient or €7,428 (95% CI: -€20,427 to €6,035) for the whole cohort. The intervention to alleviate social isolation had a cost of €939 per patient or €261,042 for the whole cohort. Taking into account the cost of the intervention, the net cost would be €912 per patient or €253,614 (95% CI:

€240,615 to €267,077) (€402,627 PPP adjusted for differences in cost of living) for the whole cohort.

Had the indoor gardening intervention been applied, this would result in an estimated mean reduction in days of delayed discharge of 0.62 days per patient, corresponding to 172.36 fewer days of delayed discharge (95% CI: -216.84 to -127.88) across the cohort and a cost saving of €104 (95% CI: -€130 to -€77) per patient or €28,784 (95% CI: -€36,212 to -€21,356) (€45,696 PPP adjusted for differences in cost of living) for the whole cohort. It was not possible to estimate the net gain of this intervention because data on costs of the intervention is not available but the breakeven point would be reached if the intervention cost was €104 per patient.

English cohort

In the English cohort, 1,897 days of delayed discharge occurred during the study period. The cost of an excess bed day was estimated to be €327 and, therefore, the cost of delayed discharges in this cohort was €620,319.

Had the psychosocial peer-support group intervention been applied, this would result in an estimated mean reduction in days of delayed discharge of 0.25 days per patient, corresponding to 65 fewer days of delayed discharge (95% CI: -149 to 16) across the cohort and a cost saving of €82 (95% CI: -€186 to 20) per patient or €21,337 (95% CI: -€48,723 to €5,232) for the whole cohort. The intervention to alleviate social isolation had a cost of €939 per patient or €261,042 for the whole cohort. Taking into account the cost of the intervention, the net cost would be €918 per patient or €239,705 (95% CI:

€190,982 to €244,937) (€235,745 PPP adjusted for differences in cost of living) for the whole cohort.

Had the indoor gardening intervention been applied, this would result in an estimated mean reduction in days of delayed discharge of 0.82 days per patient, corresponding to 213 fewer days of delayed discharge (95% CI: -331 to -97) across the cohort and a cost saving of €268 per patient (95% CI: -€415 to -€121) or €69,985 (95% CI: -€108,237 to -€31,719) (€68,828 PPP adjusted for differences in cost of living) for the whole cohort. It was not possible to estimate the net gain of this intervention because data on costs of the intervention is not available but the breakeven point would be reached if the intervention cost was €268 per patient.

8.2.3 Discussion

The results from both the HSM and the JRH models on the number of days of delayed discharge described in chapters 4 and 5 indicate that social isolation is associated with a higher number of days of delayed discharges in PFF patients. Therefore, it is theoretically expected that effective interventions aimed at tackling social isolation could reduce days of delayed discharge. In this chapter, the potential impact of two interventions were evaluated in a 'real world' setting using the Portuguese and English cohorts. The two case studies showed that such interventions could lead to reductions in the number of days of delayed discharges. The psychosocial peer-support group intervention, as described by Routasalo et al.³¹⁵, resulted in a non-significant reduction in social isolation measured with the LSNS and, consequently, in a non-significant simulated reduction in the number of days of delayed discharge in both the Portuguese (-0.16 days of delayed discharge;

95% CI: -0.44 to 0.13) and the English (-0.25 days of delayed discharge; 95% CI: -0.57 to 0.06) cohorts. However, a significant reduction in social isolation was observed in the gardening intervention, as described in the study conducted by Tse et al.³¹⁸, corresponding to a significant but modest reduction in the number of days of delayed discharge in both the Portuguese (-0.62 days of delayed discharge; 95% CI: -0.78 to -0.46) and English (-0.82 days of delayed discharge; 95% CI: -1.27 to -0.37) cohorts.

The reduction in the number of days of delayed discharge associated with both interventions is smaller in the Portuguese case study than in the English one. It is important to note though that the social isolation profiles of the two cohorts differed significantly with the majority of the PFF patients in Portugal having a low risk for social isolation (52% of the sample), and the majority of the English patients being socially isolated at admission (53% of the sample). Hence, the estimated mean number of days of delayed discharge across the Portuguese cohort in the absence of intervention was 1.70 (95% CI: 1.41 to 1.98), which was lower than the 7.27 days (95% CI: 7.08 to 7.47) reported in the English cohort. As patients with a low risk for social isolation cannot improve their level of social isolation (i.e. the scale goes from low risk of social isolation to socially isolated), the English sample, where patients with a low risk for social isolation represented only 11% of the sample, has more scope for improvement in the level of social isolation than the Portuguese sample.

By reducing the number of days of delayed discharge in both hospitals, the two interventions were estimated to reduce the acute hospital costs. The psychosocial peer support group intervention applied to the Portuguese cohort could have resulted in cost

savings of €7,428 (95% CI: -€20,427 to €6,035) arising from the potential reduction in the number of days of delayed discharge and €21,337 (95% CI: -€48,723 to €5,232) in the English cohort. On the other hand, the gardening intervention could have resulted in cost savings of €28,784 (95% CI: -€36,212 to -€21,356) in the Portuguese cohort and €69,985 (95% CI: -€108,237 to -€31,719) in the English cohort, as a result in the potential reduction in the number of days of delayed discharges. However, the costs of any intervention also need to be taken into account. If the psychosocial peer support group intervention is taken as an example, its costs outweigh the cost savings associated with the reduction in acute hospital costs (net cost of €253,614 (95% CI: €240,615 to €267,077) in the Portuguese cohort and of €239,705 (95% CI: €190,982 to €244,937) in the English cohort). The cost of this intervention would have been €261,042 for the Portuguese cohort and €245,079 for the English cohort, and the estimated reduction in days of delayed discharge would have offset about 2.8% and 8.7% of the intervention cost in each cohort, respectively. An intervention with these characteristics would have been cost saving, in terms of its impact on the number of days of delayed discharges, if its cost per person was below €27 in the Portuguese case and €82 in the English case. The difference in costs between the two cases arises from the difference in levels of social isolation in both cohorts, as discussed above, and also from the difference in the number of days of delayed discharges. On the other hand, a gardening intervention was also considered as a case study. Even though in this particular case the intervention was conducted in a care home, its characteristics allow it to also be conducted in a community setting. Unfortunately, there were no data on costs available for this intervention but in terms of its impact in the number of days of delayed discharges, this intervention would

have been cost saving if its cost per person was below €104 in the Portuguese case and €268 per patient in the English case.

The interventions were applied to all patients as a preventative measure. Had the interventions been applied only to patients at some risk of social isolation (i.e. moderate risk, high risk or socially isolated), the costs associated with the intervention would have been lower but the cost of having to previously screen the population for social isolation would have had to be added to the cost of the intervention.

Nevertheless, one important aspect of social isolation is that it is very hard to change through interventions and therefore the effect sizes of the interventions are small, as described in Chapter 7. Consequently, the impact of these interventions on the number of days of delayed discharges will also be modest, given the nature of the problem. However, social isolation has many far-reaching consequences (i.e. biological, psychological and social) and it should be noted that this analysis does not factor in any spillover effects of the interventions to alleviate social isolation such as the impact on depression, on emergency hospital admissions, on the risk of stroke, on cognitive decline, to name a few. A cost-effectiveness analysis in which the net costs are set against the net health outcomes would be more informative in this case.

Limitations

This is an exploratory study to assess how interventions aiming alleviating social isolation reduce delayed discharges. Two interventions identified in the systematic literature review described in Chapter 7 were chosen as case studies because they used the 10-item

LSNS to assess the impact of the interventions on social isolation. There may be more effective interventions to reduce social isolation but none used the 10-item LSNS. Given that this scale was the measurement used in the case studies described in Chapters 4 and 5, the psychosocial peer support group intervention and the gardening intervention were chosen to illustrate the how a reduction in social isolation could impact on the number of days of delayed discharges.

In terms of the interventions, the psychosocial peer support group intervention was conducted in the community whereas the gardening intervention was conducted in a care home setting. Given the nature of the interventions, both were able to be used in either a community or a nursing home setting but the effects of the interventions would probably vary in both settings. This exploratory analysis did not take into account this potential difference in effects in terms of social isolation. Moreover, when including the interventions in the models, no differentiation was made in terms of whether the patients were coming from the community or from a care home setting.

Furthermore, the fact that in the HSM and the JRH models social isolation is split into categories (i.e. low risk for social isolation, moderate risk, high risk or socially isolated) meant that fewer people moved categories as a result of the interventions to alleviate social isolation and this will consequently have an impact on the reduction on the number of days of delayed discharge.

The information incorporated into the models was only done in terms of the whole cohort and therefore another limitation was the assumption that the interventions had the same impact across all PFF patients.

Additionally, the effect of the intervention was assumed to remain throughout the lifetime of the participant, which may not happen since the number and frequency of social contacts changes throughout the life of a person especially in older age with the loss of spouse and friends in the same age group.

Implications for practice and for research

From this exploratory analysis it is possible to understand how interventions aiming at alleviating social isolation could reduce the number of days of delayed discharges in PFF patients. The impact of these interventions in terms of health and healthcare are far reaching and further research is needed to quantify all relevant downstream costs and benefits accruing from them.

The current body of literature on interventions to alleviate social isolation is reduced and of poor quality. Analysis of more interventions are needed, including detailed costing, in order to better model the impact of these interventions on the health and healthcare services consumption of older people.

8.3 Conclusion

In this chapter two interventions from the systematic review described in Chapter 7 were used as case studies to inform how interventions to reduce social isolation could impact on delayed hospital discharges.

The results indicate that these interventions can potentially reduce the number of days of delayed discharges in 'real-world' PFF patients and consequently the costs associated with these delays. As published information on intervention costs is limited, as is the information on the downstream impact of these interventions on the health of older people and on their consumption of healthcare resources, it was not possible to assess the potential cost-effectiveness of these interventions.

Chapter 9 : Conclusion

9.1 Introduction

In this chapter I present an overview of the findings in this thesis and address the primary research question: what is the impact of social isolation on delayed hospital discharges and what are the costs associated with these delays? I discuss the challenges that arose while conducting this research as well as the practical implications, generalisability and policy implications of my findings. I then conclude by highlighting the areas for future research.

9.2 Overview of the thesis findings

In this thesis I explore the impact of social isolation in older people on the inappropriate use of acute hospital beds due to delays in discharge and the costs associated with these delays. The main focus of this research was on how social isolation (measured with a validated instrument) influences the number of clinically unnecessary days that proximal femoral fracture (PFF) patients spend in acute hospitals in two countries with different social support network structures for older people, namely, Portugal and England and on the costs these delays represent to both National Health Services (NHSs). These findings are particularly relevant in a context of constant pressure upon funding of healthcare systems and increasing demand for, and diminishing supply of, acute hospital beds.

A literature review describing the background to this thesis was conducted which generated three key findings. Firstly, there is limited knowledge about the impact of pre-admission patient characteristics, including social isolation, on delayed hospital

discharges. Secondly, the significant variability in prevalence of delayed discharges would be better understood if the proportions of delayed discharges were estimated by disease area, since certain patient groups (e.g. hip fractures or stroke patients) may have specific post-discharge needs, like rehabilitation, which could be impacting on unnecessary acute care stays due to lack of places available in rehabilitation units. Thirdly, very few studies have analysed the costs of these delays limiting the current knowledge of the full economic impact of delayed discharges.

Based on these findings, I assessed the impact of social isolation, measured with a validated tool, on delayed hospital discharges in older patients using two case studies: PFF patients admitted to the *Hospital de Santa Maria* (HSM) in Portugal and to the John Radcliffe Hospital (JRH) in England. These patients were followed from hospital admission to discharge to determine how much of their length of hospital stay was deemed clinically unnecessary and whether social isolation played a role in delaying discharge from hospital. Additionally, costs were estimated for the days of delayed discharge spent in hospital.

The research conducted showed that social isolation is a predictor of the number of days of delayed hospital discharges. However, whereas in Portugal the number of days of delayed discharges increased progressively with the level of social isolation, in England no dose-response relationship was observed between increasing levels of social isolation and delayed discharge, indicating that any social isolation leads to delayed discharge but the level of social isolation has little effect.

The costs of delayed discharges were found to be significant in both countries. Preventing delayed discharges could have led to a €2,352 saving in hotel costs per PFF patient with a delay in discharge in Portugal and £2,328 in England.

When extrapolated to a national level, the costs of delayed discharges were estimated to vary between 5.4% and 11.2% of the total acute inpatient costs for PFF patients aged 75 and above per year in Portugal and between 2.8% and 5.5% of the total acute inpatient costs for PFF patients aged 70 and above per year in England, depending on the cost used to value a day of delayed discharge (excess bed day cost or average daily cost of an orthopaedics bed).

Given that social isolation was identified as a predictor of the number of days of delayed discharges in both Portugal and England, the research proceeded with a systematic review that found interventions that alleviated social isolation in older people. Two of these interventions were selected to incorporate in the delayed discharge models at the HSM and the JRH. The case studies show potential for these interventions to reduce the number of days of delayed discharge.

9.3 Challenges of this research

This thesis provided some interesting challenges to address. First, in the two case studies described in the thesis, it was necessary to determine the criteria used to declare a patient was medically fit for discharge. In both cases, a clinical judgement was made based on very similar clinical indicators, all explicit and objective but not recognised as an evaluation tool. Other tools exist, such as the Appropriateness Evaluation Protocol⁸⁰, but

it is unlikely that the relationship between social isolation and delayed discharges would have changed based on the findings of the systematic review described in Chapter 2.

Secondly, intended discharge destination was used as an explanatory variable in the predictive models for delayed discharges and number of days of delayed discharge of PFF patients at the HSM, even though the intended discharge destination was not pre-determined at admission. However, in this hospital, the intended discharge destination is determined immediately after surgery and always before the patients is deemed medically fit for discharge and, therefore, it was considered that its omission could have introduced bias and its inclusion did improve the fit of the model. Nevertheless, the same variable was not included in the predictive models for PFF patients in the JRH because intended discharge destination was not determined immediately after admission. In fact, it could be determined after the patient had been declared medically fit for discharge. As such, it was considered that its inclusion would have biased the results and consequently the interpretation of the coefficients arising from such models would be difficult to interpret.

Thirdly, it is clear that micro-costing would have provided a more accurate measurement of the cost of delayed discharges in PFF patients. However, micro-costing is not available at the HSM or at a national level in Portugal. Given the lack of data, the mean national daily cost of an orthopaedics bed was used as the best option available which may overestimate the cost of delayed discharges. Although the average daily cost of an orthopaedics bed accounts for more than just hotel costs, it still captures the use of an acute bed when no longer necessary. Furthermore, in Portugal, PFF patients remaining in

a trauma ward after being deemed medically fit for discharge consume more resources than just hotel costs. These patients are very dependent and therefore require nursing care and rehabilitation (although these services would be better provided in another setting, such as a rehabilitation unit). Therefore, the use of the cost of an orthopaedics bed day is appropriate for this specific patient group.

Finally, as in Portugal, micro-costing was also not available at a national level in England and therefore healthcare resource groups (HRGs) were used as the best option available to calculate inpatient and delayed discharges costs because they are estimated based on micro-costing information provided by hospitals.

9.4 Limitations of this research

The analyses presented in this thesis have a number of limitations which should be noted. In terms of the systematic review on the prevalence and costs of delayed discharges, the significant variation in methodologies used in the included studies in terms of definition of delayed discharges, information available on the outcomes of interest, sample sizes and cost estimates, made comparisons across studies very challenging. Additionally, the number of studies available for the meta-regression was small which resulted in reduced sample power to investigate the association between the proportion of delayed discharges and possible explanatory factors. Furthermore, these explanatory factors were not consistently reported across studies which further limited the analysis conducted.

The results of the Lubben Social Network Scale (LSNS), used to assess the level of social isolation, were self-reported by patients/next of kin and, therefore, there was always the

risk of misinterpretation of the questions. However, such misinterpretations were likely to occur in both countries.

The generalisability of the findings from the JRH study in terms of proportions of delayed discharges may be limited by the fact that the Oxford University Hospital NHS Foundation Trust (OUH Trust) has been identified as having high numbers of days of delayed transfers of care⁶⁸ in England. However, the focus of this case study was on the role of social isolation as a contributory factor in delayed hospital discharges, rather than the proportion of delayed discharges per se.

The opportunity cost of occupying a bed when not clinically necessary was not incorporated in the cost estimates for delayed hospital discharges in the two case studies presented. However, the foregone opportunities this represents are expected to be high, as both Orthopaedic Departments at the HSM in Portugal and the JRH in England were operating above the recommended occupancy rate (80% in Portugal and 85% in England) above which the pressure the hospital is under may affect the quality of care and cause disruption in patients' admissions.

Unlike in England, there is no publicly available information on the annual number of PFFs in Portugal in 2013. As such, this number was estimated based on a study reporting age-specific incidence rates of hip fractures from 2000 – 2008. As no significant fluctuations were observed over this period, and adjustments were made for the population aged 75 and above living in Portugal in 2013, it is expected that the estimated value is a reliable proxy for the actual number of PFFs for this age group. Similarly, there is no publicly-

available information on the number of days of delayed discharge for PFF patients and, therefore, it was assumed that the national proportion of delayed discharges would be the same as that observed at the HSM. If the situation in the rest of the country in terms of delayed discharges was better than the observed in Lisbon, the estimates presented for Portugal are likely to be an overestimate.

In terms of the systematic review and meta-analysis on interventions to reduce social isolation in older people, significant heterogeneity was found between the included studies limiting the generalisability of the findings and the results should therefore be interpreted with caution. However, the main purpose of this systematic review was to identify interventions that alleviated social isolation which could be used to inform the model on how social isolation interventions could influence the number of days of delayed discharges. Two important limitations that impacted on the modelling were that many identified studies did not use a validated measure of social isolation, particularly the 10-item LSNS, and very few reported costs, restricting the number of interventions incorporated in the model. Furthermore, in both hospital models, social isolation was split into broad categories. As the interventions to alleviate social isolation had small effect sizes, this meant that few people moved categories as a result of the interventions. This consequently had an impact on the reduction on the number of days of delayed discharge. Finally, the information incorporated into the models was only done in terms of the whole cohort given that the information available does not permit any subgroup analysis.

9.5 Implications of this research

The implications of the research findings reported in this thesis are described below.

9.5.1 Contribution to health economics and other fields

This thesis has made a number of contributions to the literature. Firstly, the systematic review presented in Chapter 2 identified a gap in research in terms of how individual patient characteristics, such as social isolation, impact on delayed hospital discharges and how these delays vary according to the clinical condition which led to hospital admission of the patients. This thesis consequently made a contribution to the literature by implementing two one-year cohort studies in Portugal and England, examining the impact of social isolation, measured with a validated instrument, on delayed discharges of older PFF patients. These are the first studies to the best of my knowledge to examine the impact of social isolation as a complex construct, on delayed discharges and also to estimate these delays in PFF patients. Furthermore, this research has provided information on all PFF patients, including those with cognitive impairment, in order to assess the full range of their needs.

An additional contribution was made through a meta-analysis on interventions to reduce social isolation indicating that one-to-one and mixed one-to-one and group interventions seem to be more effective than group interventions alone. Finally, the effect of interventions designed to reduce social isolation was modelled in terms of their impact on the number of days of delayed discharges for PFF patients.

9.5.2 Generalisability of the findings

PFFs are a common condition in old age, requiring hospital admission for diagnosis and treatment. The findings from this research can be generalised to PFF patients being treated in NHS acute hospitals in Portugal and England and extended to other clinical conditions such as stroke and dementia where patients have increased health and long-term care (LTC) needs. Even though the fact that OUH Trust has been identified as having high numbers of days of delayed transfers of care⁶⁸, it is not expected that this will limit the generalisability of the findings from this study because the focus is on the role of social isolation as a contributory factor in delayed hospital discharges. Therefore, the two predictive models on number of days of delayed discharge can be used in both countries by clinicians and social workers to predict the number of unnecessary days a PFF patient will spend in acute hospital based on their pre-admission characteristics.

The changes in family structures, especially in developed countries, due to fewer children and children being born at a much later maternal age, the increasing presence of women in the work market, later retirement ages, migration and immigration are leading to a reduction in the level of support for older people that will consequently impact on delayed discharges^{6,332,333}. Moreover, disabling conditions associated with later life such as PFFs³³⁴, dementia³³⁵, and stroke³³⁶ are becoming more prevalent. Alternatives need to be found for the provision of post-acute care services for these patients, especially when there is no social network support to provide care^{38,337}. The findings of this thesis can therefore be generalizable to countries with similar social support structures.

Additionally, the mean cost of a bed day for PFF patients used to estimate the daily cost of a delayed discharge can be applicable to hospitals across both countries, respectively, since they are estimated at a national level.

Finally, interventions which were found to be effective at reducing social isolation in the meta-analysis can be applied to older populations in many other contexts.

9.5.3 Policy and practical implications

This thesis provides an understanding of how social isolation drives delayed hospital discharges. The findings of this research contribute to a better understanding of how, in countries where the level of social isolation of the older population is increasing, acute hospital beds are being unnecessarily used. Additionally, these findings may also inform countries which retain a strong social network structure at discharge from hospital on what to expect in the future as family structures changes, so that they can prepare adequately in terms of service provision. These findings can therefore inform the devising of policies that would result in a more efficient allocation of scarce healthcare resources. It is clear, from the Portuguese data that there is a significant shortage in the number of publicly-funded rehabilitation units with patients being discharged to an alternative setting while waiting for a bed to become available in such units. Also, the English data reveals a bottleneck in the system with most of the patients being discharged to community hospitals and having delays. This thesis provides policy makers with an important tool to understand the needs of this particular patient group which, in general, has had a sudden and significant increase in their level of dependency.

The second main objective of this thesis is to estimate the costs of delayed discharges for PFF patients. The information provided in this thesis on the daily cost of a delayed discharge as well as mean cost of a patient with a delayed discharge is of value to policy makers. It allows comparison of the costs per patient of the unnecessary use of an acute hospital bed with the costs of alternative/lower levels of care for this specific patient group in order to understand where savings can be achieved.

Finally, the exploratory analysis presented on how interventions aiming at alleviating social isolation could reduce the number of days of delayed discharges in PFF patients allows policy makers to understand which further areas should be tackled (i.e. social isolation) to achieve a more efficient use of healthcare resources. The impact of such interventions in terms of health benefits for the patient and use of healthcare resources are far reaching and this work is just a small example of the benefits of reducing social isolation.

9.6 Future research

A final consideration is the scope for future research which builds on the findings of this thesis. I have identified three areas in which further research would greatest impact: 1) clearer interpretation of the prevalence of delayed discharges and associated reasons; 2) improving the understanding of the economic impact of delayed discharges, and; 3) expanding the knowledge on how social isolation can be alleviated.

First, discrepancies have been found in parameters used to determine when a patient's discharge is delayed at a global level and this will inevitably impact upon the estimated

proportions of delayed discharge. Therefore, it is necessary to emphasise the need for agreement on a set of internationally recognised parameters to determine when a patient is medically ready for discharge alongside their formal validation. Furthermore, given that level of health and LTC support needed at discharge varies depending on the clinical condition the patient was admitted to hospitals for, it would be relevant to analyse delayed discharges by major conditions affecting older people to better understand their care needs and where the bottlenecks exist in the system. Additionally, larger studies are needed, with a period of analysis of at least one year to account for seasonal fluctuations (e.g. winter bed crisis). Little is known about the patient and family's experience throughout the discharge process. Qualitative studies of the views of patients, families and hospital staff on delayed discharges are needed to better assess these patients' needs, and further investigation is also necessary into the reasons for delay in accessing community services. Early supported discharge is described in the National Institute for Health and Care Excellence (NICE) hip fracture pathway as an option for PFF patients. Further research is needed into the applicability and efficacy of this discharge option. Furthermore, when determining the impact of delayed discharges, looking at specific diseases and taking into account the pre-admission patient characteristics are key to identify the services likely to be most useful for these patients at discharge, such as rehabilitation or early supported discharge for PFF and stroke patients.

In Portugal, little is known about the prevalence of delayed discharges. In England, NHS England has developed a database reporting the monthly numbers of delayed transfers of care as well as the reasons for these delays. However, given that patients length of stay

varies, it would be more informative to report the proportion of delayed discharge days out of the total length of stay in order to better understand the progression of the unnecessary consumption of hospital beds. I am currently developing work in the field estimating the historical proportion of delayed discharges. Furthermore, it would be useful to have a similar database in Portugal in order to determine the amount of acute resources that are being unnecessarily consumed as well as the reasons behind these delays in order to devise better policies and align the provision of LTC services with current patient needs.

Secondly, more accurate information is needed in terms of costs. In Portugal, the main problem regarding costs is the lack of publicly available and detailed data. Some hospitals are already estimating costs at a micro level. Efforts should be made to have this initiative extended to a national level and to make data easily available for future research. In the UK, where micro-costing is available in hospitals, it would be useful to estimate the exact costs for the delayed discharges for PFF patients in order to determine, for this specific patient group, how these would compare with the mean daily cost or the excess bed day cost for the corresponding HRG.

Thirdly, there is only a small body of literature assessing the impact of interventions aimed at alleviating social isolation and most of this work is of poor quality. Effectiveness analysis of more interventions to reduce social isolation are needed, including detailed costing, in order to better model the impact of these interventions on the health and healthcare services consumption of older people. There are several projects in place in European countries aiming at alleviating social isolation, such as home shares for older

and young people, which have not yet been evaluated in terms of their effectiveness/cost-effectiveness. This is an area I intended to further investigate in the future.

But, in order to fully understand social isolation, it would also be relevant to gain a better understanding of its components, such as living alone. Living alone is a complex construct which encompasses more than the ability to live alone. It also includes: expectations of older people in having their family looking after them, the way children were educated in terms of being responsible to look after their parents in old age, the societal pressure to look after older parents, the availability of services, disposable income, and other factors playing an important role as in the decision making process. Future research is needed to assess how living alone differs across countries and what is driving these differences.

9.7 Concluding remarks

Delayed hospital discharges represent an inadequate use of scarce acute hospital beds. They impact on health and social care systems in terms of provision of services and associated costs, and of patient outcomes. Through detailed empirical research, this thesis provides stakeholders with two models predicting the number of days of delayed discharges for PFF patients based on individual patient characteristics and with estimates of the costs of delayed discharges for these patients at a national level in Portugal and England. Additionally, this work informs relevant key players on interventions available to reduce social isolation as well as on how such interventions can help reduce the number of days of delayed discharges. The findings of this thesis will be disseminated amongst health economists, policy makers, clinicians, social workers, gerontologists, patients and

other relevant stakeholders with the aim of informing future practice ultimately leading to a more efficient use of acute hospital beds.

List of references

1. World Health Organization. Total number of hospital beds. https://gateway.euro.who.int/en/indicators/hfa-indicators/hfa_477-5051-total-number-of-hospital-beds/.
2. Barisonzo R, Wiedermann W, Unterhuber M, Wiedermann CJ. Length of stay as risk factor for inappropriate hospital days: interaction with patient age and co-morbidity. *Journal of Evaluation in Clinical Practice* 2013; **19**(1): 80-5.
3. Caminiti C, Meschi T, Braglia L, et al. Reducing unnecessary hospital days to improve quality of care through physician accountability: a cluster randomised trial. *BMC Health Services Research* 2013; **13**: 14.
4. Edirimanne S, Roake JA, Lewis DR. Delays in discharge of vascular surgical patients: a prospective audit. *ANZ Journal of Surgery* 2010; **80**(6): 443-6.
5. Coid J, Crome P. Bed blocking in Bromley. *British Medical Journal* 1986; **292**(6530): 1253.
6. Victor C, Healy J, Thomas A, Seargeant J. Older patients and delayed discharges. *Health and Social Care in the Community* 2000; **8**(6): 443-52.
7. Styrborn K. Early discharge planning for elderly patients in acute hospitals--an intervention study. *Scandinavian Journal of Social Medicine* 1995; **23**(4): 273-85.
8. United Nations. World population prospects: the 2012 revision. New York, 2013.
9. Casey B, Oxley H, Whitehouse E, Antolin P, Duval R, Leibfritz W. Policies for an ageing society: recent measures and areas for future reform. Paris: Organisation for Economic Co-operation and Development, 2003.
10. Spillman BC, Lubitz J. The effect of longevity on spending for acute and long-term care. *The New England Journal of Medicine* 2000; **342**(19): 1409-15.
11. Suarez Garcia F, Oterino de la Fuente D, Peiro S, et al. Factors associated with hospitalization use and appropriateness for patients over 64 years of age. [Spanish]. *Revista Espanola de Salud Publica* 2001; **75** (3): 237-48.
12. Glover JD, Hetzel DM, Tennant SK. The socioeconomic gradient and chronic illness and associated risk factors in Australia. *Australia and New Zealand Health Policy* 2004; **1**(1): 8.
13. Department of Health. National service framework for older people. London, 2001.
14. Gray LC, Yeo MA, Duckett SJ. Trends in the use of hospital beds by older people in Australia: 1993-2002. *Medical Journal of Australia* 2004; **181**(9): 478-81.
15. Irish Medical Organisation. IMO position paper on Acute Hospital Bed Capacity: Irish Medical Organisation, 2005.
16. Glasby J, Littlechild R, Pryce K. Show me the way to go home: A narrative review of the literature on delayed hospital discharges and older people. *British Journal of Social Work* 2004; **34**(8): 1189-97.
17. British Columbia Ministry of Health. Social isolation among seniors: an emerging issue. March 2004.
18. Nicholson NR. A review of social isolation: an important but underassessed condition in older adults. *The Journal of Primary Prevention* 2012; **33**(2-3): 137-52.

19. Tomaka J, Thompson S, Palacios R. The relation of social isolation, loneliness, and social support to disease outcomes among the elderly. *Journal of Aging and Health* 2006; **18**(3): 359-84.
20. Cacioppo JT, Hawkley LC, Norman GJ, Berntson GG. Social isolation. *Ann N Y Acad Sci* 2011; **1231**: 17-22.
21. Cohen S, Doyle WJ, Skoner DP, Rabin BS, Gwaltney JM, Jr. Social ties and susceptibility to the common cold. *The Journal of the American Medical Society* 1997; **277**(24): 1940-4.
22. Cornwell EY, Waite LJ. Social disconnectedness, perceived isolation, and health among older adults. *Journal of Health and Social Behavior* 2009; **50**(1): 31-48.
23. Hastings SN, George LK, Fillenbaum GG, Park RS, Burchett BM, Schmader KE. Does lack of social support lead to more ED visits for older adults? *The American Journal of Emergency Medicine* 2008; **26**(4): 454-61.
24. Lim SC, Doshi V, Castasus B, Lim JKH, Mamun K. Factors causing delay in discharge of elderly patients in an acute care hospital. *Annals of the Academy of Medicine Singapore* 2006; **35**: 27-32.
25. Mohammed A. Audit of orthopaedic bed utilisation. *Health Bulletin* 2001; **59**(6): 353-5.
26. Falcone D. Waiting for placement : an exploratory analysis of determinants of delayed discharges of elderly hospital patients. *Health Services Research* 1991; **26**(3): 339-74.
27. Hinchliffe D. Delayed discharges. London: House of Commons Health Committee, 2002.
28. Lefevre F, Feinglass J, Potts S, et al. Iatrogenic complications in high-risk, elderly patients. *Archives of internal medicine* 1992; **152**(10): 2074-80.
29. Giraud T, Dhainaut JF, Vaxelaire JF, et al. Iatrogenic complications in adult intensive care units: a prospective two-center study. *Critical Care Medicine* 1993; **21**(1): 40-51.
30. Kohli HS, Bhaskaran MC, Muthukumar T, et al. Treatment-related acute renal failure in the elderly: a hospital-based prospective study. *Nephrology, Dialysis, Transplantation* 2000; **15**(2): 212-7.
31. McFarland LV. Epidemiology of infectious and iatrogenic nosocomial diarrhea in a cohort of general medicine patients. *American journal of infection control* 1995; **23**(5): 295-305.
32. Tepp J, Voitek A. Hip fracture as a complication of hospitalization. *International Journal of Health Care Quality Assurance* 1999; **12**(6-7): x-xiii.
33. Creditor MC. Hazards of Hospitalization of the Elderly. *Annals of Internal Medicine* 1993; **118**(3): 219-23.
34. Hirsch CH, Sommers L, Olsen A, Mullen L, Winograd CH. The natural history of functional morbidity in hospitalized older patients. *Journal of the American Geriatrics Society* 1990; **38**(12): 1296-303.
35. Sager MA, Franke T, Inouye SK, et al. Functional outcomes of acute medical illness and hospitalization in older persons. *Archives of Internal Medicine* 1996; **156**(6): 645-52.
36. Sager MA, Rudberg MA, Jalaluddin M, et al. Hospital admission risk profile (HARP): identifying older patients at risk for functional decline following acute medical illness and hospitalization. *Journal of the American Geriatrics Society* 1996; **44**(3): 251-7.

37. Kozyrskyj AL, Black C, Chateau D, Steinbach C. Discharge outcomes in seniors hospitalized for more than 30 days. *Canadian Journal on Aging* 2005; **24**: 107-19.
38. Mayo NE, Wood-Dauphinee S, Gayton D, Scott SC. Nonmedical bed-days for stroke patients admitted to acute-care hospitals in Montreal, Canada. *Stroke* 1997; **28 (3)**: 543-9.
39. Barrette PA. 1,005 Delayed Days: A Study of Adult Psychiatric Discharge. *Psychiatric Services* 1981; **32(4)**: 266-8.
40. Halliday HL, Grant AP. Social Factors associated with Delay in Discharge from an Acute Medical Ward. *The Ulster Medical Journal* 1975; **44(2)**: 139-44.
41. Becchi MA, Pescetelli M, Caiti O, Carulli N. Characteristics of patients in a ward of Academic Internal Medicine: implications for medical care, training programmes and research. *Internal and Emergency Medicine* 2010; **5(3)**: 205-13.
42. Foer D, Ornstein K, Soriano TA, Kathuria N, Dunn A. Nonmedical factors associated with prolonged hospital length of stay in an urban homebound population. *Journal of Hospital Medicine* 2012; **7 (2)**: 73-8.
43. National Institute for Health and Care Excellence. Hip fracture: management. Clinical guidance [CG 124]. London, 2011.
44. Royal College of Physicians. National Hip Fracture Database: annual report 2015. 2015.
45. Landeiro F, Leal J, Gray AM. The impact of social isolation on delayed hospital discharges of older hip fracture patients and associated costs. *Osteoporosis International* 2016; **27(2)**: 737-45.
46. Kröger T. Families, Work and Social Care in Europe. A Qualitative Study of Care Arrangements in Finland, France, Italy, Portugal and the UK, Workpackage 6, Final Report, Contract HPSE-CT-1999-00010: New Kinds of Families, New Kinds of Social Care, European Commission, 5th Framework Programme Key Action for Socio-Economic Research, Brussels. . 2003.
47. Centro Hospitalar Lisboa Norte. Relatorio e Contas 2014. Lisbon, 2015.
48. Oxford University Hospitals NHS Trust. Annual review 2014-2015. Oxford, 2015.
49. Bianco A, Pileggi C, Rizza P, Greco MA, Angelillo IF. An assessment of inappropriate hospital bed utilization by elderly patients in southern Italy. *Aging Clinical and Experimental Research* 2006; **18(3)**: 249-56.
50. Epstein J, Kaplan G, Lavi B, et al. A description of inappropriate hospital stays in selected in-patient services: A study of cases receiving social work services. *Social Work in Health Care* 2001; **32 (4)**: 43-65.
51. Lenzi J, Mongardi M, Rucci P, et al. Sociodemographic, clinical and organisational factors associated with delayed hospital discharges: a cross-sectional study. *BMC Health Services Research* 2014; **14**: 128.
52. Monteis Catot J, Martin-Baranera M, Soler N, et al. Impact of a clinical self-evaluation intervention on the appropriateness of hospital stays. *Gaceta Sanitaria* 2007; **21(4)**: 290-7.
53. Namdaran F, Burnet C, Monroe S. Bed blocking in Edinburgh hospitals. *Health Bulletin* 1992; **50(3)**: 223-7.
54. Costa AP, Poss JW, Peirce T, Hirdes JP. Acute care inpatients with long-term delayed-discharge: evidence from a Canadian health region. *BMC Health Services Research* 2012; **12**: 172.

55. Hanif I, Rathod B. Delays in discharging elderly psychiatric in-patients. *Psychiatric Bulletin* 2008; **32 (6)**: 211-3.
56. Styrborn K, Thorslund M. 'Bed-blockers': Delayed discharge of hospital patients in a nationwide perspective in Sweden. *Health Policy* 1993; **26 (2)**: 155-70.
57. Bryan K. Policies for reducing delayed discharge from hospital. *British Medical Bulletin* 2010; **95**: 33-46.
58. Norman V. Inappropriately delayed discharge from hospital: What do we know? *British Medical Journal* 2003; **326**: 927-8.
59. Lewis R, Glasby J. Delayed discharge from mental health hospitals: results of an English postal survey. *Health & Social Care in the Community* 2006; **14(3)**: 225-30.
60. Majeed MU, Williams DT, Pollock R, et al. Delay in discharge and its impact on unnecessary hospital bed occupancy. *BMC Health Services Research* 2012; **12**: 410.
61. Vieira NB, Rodriguez-Vera FJ, Ferrao E, et al. Adequacao do internamento num servico de medicina interna utilizando o Appropriateness Evaluation Protocol. *Acta Medica Portuguesa* 2006; (19): 67-70.
62. Carey MR, Sheth H, Braithwaite RS. A prospective study of reasons for prolonged hospitalizations on a general medicine teaching service. *Journal of General Internal Medicine* 2005; **20(2)**: 108-15.
63. McCoy D, Godden S, Pollock AM, Bianchessi C. Carrot and sticks? The Community Care Act (2003) and the effect of financial incentives on delays in discharge from hospitals in England. *Journal of Public Health* 2007; **29(3)**: 281-7.
64. Bryan K, Gage H, Gilbert K. Delayed transfers of older people from hospital : causes and policy implications. *Health Policy* 2006; **76(2)**: 194-201.
65. Unni Alice Dahl AS, Svanhild Jenssen, Roar Johnsen. Hospital discharge of elderly patients to primary health care, with and without an intermediate care hospital – a qualitative study of health professionals' experiences. *International Journal of Integrated Care* 2014.
66. Department of Health. The Community Care (Delayed Discharges) Act. London: Department of Health, 2003.
67. Godden S, McCoy D, Pollock A. Policy on the rebound: trends and causes of delayed discharges in the NHS. *Journal of the Royal Society of Medicine* 2009; **102(1)**: 22-8.
68. NHS England. Delayed transfers of care. <https://www.england.nhs.uk/statistics/statistical-work-areas/delayed-transfers-of-care/>.
69. Godfrey M, Townsend J. Delayed Hospital Discharge in England and Scotland: A Comparative Study of Policy and Implementation. *Journal of Integrated Care* 2009; **17(1)**.
70. Shepperd S LN, Clemson LM, McCluskey A, Cameron ID, Barras SL. Discharge planning from hospital to home (Review). *The Cochrane Database of Systematic Reviews* 2013; (1).
71. Ingold BB, Yersin B, Wietlisbach V, Burckhardt P, Burnand B, Bula CJ. Characteristics associated with inappropriate hospital use in elderly patients admitted to a general internal medicine service. *Aging-Clinical and Experimental Research* 2000; **12(6)**: 430-8.
72. The World Bank. Gross Domestic Product deflators. <http://data.worldbank.org/indicator/NY.GDP.DEFL.ZS>.
73. The World Bank. Official exchange rate (local currency unit per USD, period average). <http://data.worldbank.org/indicator/PA.NUS.FCRF>.

74. OANDA. Historical exchange rates. <http://www.oanda.com/currency/historical-rates>.
75. The World Bank. Purchasing power parity conversion factor (local currency unit per international USD). <http://data.worldbank.org/indicator/PA.NUS.PPP>.
76. Jadad AR, Moore RA, Carroll D, et al. Assessing the quality of reports of randomized clinical trials: is blinding necessary? *Control Clin Trials* 1996; **17**(1): 1-12.
77. Wells GA, Shea B, O'Connell D, et al. The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses.
78. Abdul Pari AA, Simon J, Wolstenholme J, Geddes JR, Goodwin GM. Economic evaluations in bipolar disorder: a systematic review and critical appraisal. *Bipolar Disorders* 2014; **16**(6): 557-82.
79. Kirkwood BR, Sterne JAC. Medical statistics: Essential; 2003.
80. Gertman PM, Restuccia JD. The appropriateness evaluation protocol: a technique for assessing unnecessary days of hospital care. *Medical Care* 1981; **19**(8): 855-71.
81. Hayee BH, Miell J. Delayed hospital discharge. *Clinical Medicine* 2001; **1** (6): 518-9.
82. Chin JJ, Sahadevan S, Tan CY, Ho SC, Choo PW. Critical role of functional decline in delayed discharge from an acute geriatric unit. *Annals of the Academy of Medicine, Singapore* 2001; **30** (6): 593-9.
83. Anderson P, Meara J, Brodhurst S, Attwood S, Timbrell M, Gatherer A. Use of Hospital Beds - a Cohort Study of Admissions to a Provincial Teaching Hospital. *British Medical Journal* 1988; **297**(6653): 910-2.
84. McClaran J, Tover-Berglas R, Glass KC. Chronic status patients in a university hospital: bed-day utilization and length of stay. *Canadian Medical Association Journal* 1991; **145**(10): 1259-65.
85. Tadros G, Kelson E, Balloo S, Tejani A, Al-Taei I. Discharge delays in the elderly from Birmingham City Hospital. *International Psychogeriatrics* 2011; **23**: S246-S7.
86. Meschi T, Fiaccadori E, Cocconi S, et al. Analisi del problema "dimissioni difficili" nell'Azienda Ospedaliera-Universitaria di Parma [Italian]. *Annali Italiani di Medicina Interna* 2004; (19): 109-17.
87. Gallagher P, Henry C, O'Callaghan N. Do relatives of elderly patients block the discharge process? *Irish Medical Journal* 2008; **101**(3): 70-2.
88. Koffman J, Hudson M. Assessing the impact of delayed discharge on acute care. *Nursing Standard* 1996; **10**(20): 41-3.
89. Moya-Ruiz C, Peiro S, Meneu R. Effectiveness of feedback to physicians in reducing inappropriate use of hospitalization: A study in a Spanish hospital. *International Journal for Quality in Health Care* 2002; **14** (4): 305-12.
90. Paldi Y, Porath A, Friedman L, Mozes B. Factors associated with inappropriate hospitalization in medical wards: a cross-sectional study in two university hospitals. *International Journal for Quality in Health Care* 1995; **7** (3): 261-5.
91. Rockwood K. Delays in the discharge of elderly patients. *Journal of Clinical Epidemiology* 1990; **43**(9): 971-5.
92. Vallalta J, Sisó A, Cereijo A-C, Sequeira E, de la Sierra A. Adecuación de la hospitalización en una unidad de estancia corta de un hospital universitario. Un estudio controlado [Spanish]. *Medicina Clínica* 2004; **122**(12): 454-6.
93. Luis Zambrana Garcia J, Delgado Fernandez M, Cruz Caparros G, Dolores Martin Escalante M, Diez Garcia F, Ruiz Bailen M. Predictive factors for inappropriate hospital stays in an internal medicine department. [Spanish]. *Medicina Clínica* 2001; **117** (3): 90-2.

94. Fenn A. Inappropriate bed usage in a district general hospital. *Journal of Clinical Excellence* 2000; **1**(4): 2221-227.
95. Mendoza Giraldo D, Navarro A, Sanchez-Quijano A, Villegas A, Asencio R, Lissen E. Impact of delayed discharge for nonmedical reasons in a tertiary hospital internal medicine department. [Spanish]. *Revista Clinica Espanola* 2012; **212**(5): 229-34.
96. De Bey JS, Huijsman R, Van Der Cammen TJM. Delayed discharge of older patients from the Department of Geriatric Medicine of the Erasmus Medical Centre and factors affecting the length of stay; July 2001-June 2002. [Dutch]. *Nederlands Tijdschrift voor Geneeskunde* 2004; **148** (49): 2438-42.
97. Panero F, Gruden G, Zucco C, et al. Delayed discharge: a rising cause of concern in general internal medicine wards. *Minerva Medica* 2013; **104**(1): 113-5.
98. Benson RT, Drew JC, Galland RB. A waiting list to go home: An analysis of delayed discharges from surgical beds. *Annals of the Royal College of Surgeons of England* 2006; **88** (7): 650-2.
99. McCulloch P, Bowyer, J., Fitzsimmons, T., Johnson, M., Lowe, D. and Ward, R. . Emergency admission of patients to general surgical beds: attitudes of general practitioners, surgical trainees, and consultants in Liverpool, UK. *Journal of Epidemiology and Community Health* 1997; **51**(3): 315-9.
100. McDonagh MS, Smith, D.H. and Goddard, M. . Measuring appropriate use of acute beds: a systematic review of methods and results. *Health Policy* 2000; **53**(3): 157-84.
101. Hendy P, Patel JH, Kordbacheh T, Laskar N, Harbord M. In-depth analysis of delays to patient discharge: a metropolitan teaching hospital experience. *Clinical Medicine* 2012; **12**(4): 320-3.
102. Lubben N. Assessing social network among elderly population. *Family Community Health* 1988; **11**: 42-52.
103. United Nations. World Population Ageing: the 2015 revision: United Nations, Department of Economic and Social Affairs, Population Division, 2015.
104. United Nations. World Population Prospects: the 2015 revision. 2015. <https://esa.un.org/unpd/wpp/>.
105. United Nations. World Economic and Social Survey 2007: development in an ageing world New York: United Nations Department of Social and Economic Affairs, 2007.
106. World Health Organization. World report on ageing and health. Luxembourg: World Health Organization, 2015.
107. Hung WW, Ross JS, Boockvar KS, Siu AL. Recent trends in chronic disease, impairment and disability among older adults in the United States. *BMC Geriatrics* 2011; **11**: 47.
108. Liao Y, McGee DL, Cao G, Cooper RS. Recent changes in the health status of the older U.S. population: findings from the 1984 and 1994 supplement on aging. *Journal of the American Geriatrics Society* 2001; **49**(4): 443-9.
109. Manton KG, Gu X, Lamb VL. Change in chronic disability from 1982 to 2004/2005 as measured by long-term changes in function and health in the U.S. elderly population. *Proceedings of the National Academy of Sciences of the United States of America* 2006; **103**(48): 18374-9.
110. Seeman TE, Merkin SS, Crimmins EM, Karlamangla AS. Disability trends among older Americans: National Health And Nutrition Examination Surveys, 1988-1994 and 1999-2004. *American Journal of Public Health* 2010; **100**(1): 100-7.

111. Jagger C, Gillies C, Moscone F, et al. Inequalities in healthy life years in the 25 countries of the European Union in 2005: a cross-national meta-regression analysis. *Lancet* 2008; **372**(9656): 2124-31.
112. Eurostat. Eurostat Database. <http://ec.europa.eu/eurostat/data/database> (accessed 23/01/2017).
113. Kirkwood TB. A systematic look at an old problem. *Nature* 2008; **451**(7179): 644-7.
114. World Health Organization. Global health estimates 2013: deaths by cause, age, sex and regional grouping, 2000–2012. 2015. http://www.who.int/healthinfo/global_burden_disease/estimates/en/index1.html (accessed 24/07/2015).
115. Marengoni A, Angleman S, Melis R, et al. Aging with multimorbidity: a systematic review of the literature. *Ageing Research Reviews* 2011; **10**(4): 430-9.
116. Fernandez-Garrido J, Ruiz-Ros V, Buigues C, Navarro-Martinez R, Cauli O. Clinical features of prefrail older individuals and emerging peripheral biomarkers: a systematic review. *Archives of Gerontology and Geriatrics* 2014; **59**(1): 7-17.
117. Inouye SK, Studenski S, Tinetti ME, Kuchel GA. Geriatric syndromes: clinical, research, and policy implications of a core geriatric concept. *Journal of the American Geriatrics Society* 2007; **55**(5): 780-91.
118. Kane RL, Shamliyan T, Talley K, Pacala J. The association between geriatric syndromes and survival. *Journal of the American Geriatrics Society* 2012; **60**(5): 896-904.
119. Lordos EF, Herrmann FR, Robine JM, et al. Comparative value of medical diagnosis versus physical functioning in predicting the 6-year survival of 1951 hospitalized old patients. *Rejuvenation Research* 2008; **11**(4): 829-36.
120. The World Bank. World DataBank. <http://databank.worldbank.org/data/home.aspx> (accessed 18/01/2017).
121. Hanson BS. Social network, social support and heavy drinking in elderly men--a population study of men born in 1914, Malmo, Sweden. *Addiction* 1994; **89**(6): 725-32.
122. European Commission. Joint Report on Health Care and Long-Term Care Systems and Fiscal Sustainability 2016. http://ec.europa.eu/economy_finance/publications/eeip/pdf/ip037_vol2_en.pdf (accessed).
123. Organisation for Economic Co-operation and Development. OECD.Stat. <http://stats.oecd.org/> (accessed 17/01/2017).
124. Barros P, Machado S, Simões J. Portugal: Health system in review. *Health Systems in Transition*, 2011. http://www.euro.who.int/_data/assets/pdf_file/0019/150463/e95712.pdf (accessed).
125. NHS Providers. The NHS provider sector. <https://www.nhsproviders.org/topics/delivery-and-performance/the-nhs-provider-sector> (accessed 23 January 2017).
126. World Health Organization. European Health for All database. 18 January 2017. <http://www.euro.who.int/en/data-and-evidence/databases/european-health-for-all-database-hfa-db>.
127. Shankar A, McMunn A, Banks J, Steptoe A. Loneliness, social isolation, and behavioral and biological health indicators in older adults. *Health Psychology* 2011; **30**(4): 377-85.
128. Costa C, Santana R, Lopes S. Custos e Preços na Saúde: Passado, presente e futuro. Lisbon: Fundação Francisco Manuel dos Santos 2013.

129. Department of Health. A simple guide to payment by results, 2011.
130. Department of Health. A simple guide to Payment by Results: Department of Health, 2012.
131. Monitor. 2016/17 National Tariff Payment System 2016. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/509697/2016-17_National_Tariff_Payment_System.pdf (accessed.
132. Decreto-Lei n.º 101/2006, de 6 de junho. 2006.
133. Administração central de sistemas de saúde. Termos de Referência para contratualização de cuidados de saúde no SNS para 2017, 2016.
134. Eurostat. People in the EU – statistics on household and family structures. [http://ec.europa.eu/eurostat/statistics-explained/index.php/People in the EU %E2%80%93 statistics on household and family structures#Single-person households](http://ec.europa.eu/eurostat/statistics-explained/index.php/People_in_the_EU_%E2%80%93_statistics_on_household_and_family_structures#Single-person_households).
135. Instituto Nacional de Estatística. Censos 2011 - resultados pre-definitivos.
136. Office for National Statistics. What Does the 2011 Census Tell Us About Older People?, 2013.
137. Serviço Nacional de Saúde. BI da Reforma. <https://www.sns.gov.pt/sns/reforma-do-sns/cuidados-continuados-integrados-2/gestao-de-recursos/> (accessed 21 January 2017).
138. Cuidados Continuados - Saúde e Apoio Social. Plano de desenvolvimento da RNCCI: 2016-2019, 2016.
139. Ministério da Solidariedade Emprego e Segurança Social. Carta Social – Rede de Serviços e Equipamentos 2014. <http://www.cartasocial.pt/pdf/csocal2014.pdf> (accessed 23 January 2017).
140. National Statistics. Personal Social Services: Expenditure and Unit Costs, 2016.
141. Health and Social Care Act. UK Government; 2012.
142. Discharging older people from acute hospitals - twelfth report of session 2016–17, 2016.
143. Department of Health. The Care Bill – reforming what and how people pay for their care and support, 2013.
144. Care Act. UK Government; 2014.
145. Hancock RW, R.; Hu, B.; Morciano, M.; Comas-Herrera, A. Long-term care funding in England: an analysis of the costs and distributional effects of potential reforms Personal Social Services Research Unit London School of Economics, 2013.
146. Forder JA, S.;. Competition in the Care Homes Market, 2011.
147. Care Quality Commission. The state of health and adult social care in England 2015/16, 2016.
148. International Osteoporosis Foundation. Facts and Statistics. <https://www.iofbonehealth.org/facts-statistics#category-16>.
149. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. *Bull World Health Organ* 2003; **81**(9): 646-56.
150. Cole ZA, Dennison EM, Cooper C. Osteoporosis epidemiology update. *Current Rheumatology Reports* 2008; **10**(2): 92-6.
151. Cooper C. The crippling consequences of fractures and their impact on quality of life. *The American Journal of Medicine* 1997; **103**(2a): 12S-9S.
152. Leal J, Gray AM, Prieto-Alhambra D, et al. Impact of hip fracture on hospital care costs: a population-based study. *Osteoporosis International* 2016; **27**(2): 549-58.

153. Eastwood EA, Magaziner J, Wang J, et al. Patients with hip fracture: subgroups and their outcomes. *Journal of the American Geriatrics Society* 2002; **50**(7): 1240-9.
154. Hu F, Jiang C, Shen J, Tang P, Wang Y. Preoperative predictors for mortality following hip fracture surgery: a systematic review and meta-analysis. *Injury* 2012; **43**(6): 676-85.
155. Hernlund E, Svedbom A, Ivergard M, et al. Osteoporosis in the European Union: medical management, epidemiology and economic burden. . *Archives of Osteoporosis* 2013; **8**: 136.
156. World Health Organization. ICD-10: International statistical classification of diseases and related health problems. 10th Rev. . Geneva: World Health Organization, 2010.
157. British Orthopaedic Association. The Care of Patients with Fragility Fractures. London: British Orthopaedic Association, 2007.
158. Mitchell P, Adekunle F. Fracture Liaison Services Resource Pack, 2010.
159. Direcção Geral de Saúde. Orientação técnica sobre suplemento de Cálcio e Vitamina D em pessoas idosas, 2008.
160. Lauritzen JB, McNair PA, Lund B. Risk factors for hip fractures. A review. *Danish Medical Bulletin* 1993; **40**(4): 479-85.
161. Royal College of Physicians. National Hip Fracture Database: Anaesthesia Sprint Audit of Practice 2014.
162. Lobo E, Marcos G, Santabarbara J, et al. Gender differences in the incidence of and risk factors for hip fracture: A 16-year longitudinal study in a southern European population. *Maturitas* 2017; **97**: 38-43.
163. Kanis JA, Johnell O, De Laet C, et al. A meta-analysis of previous fracture and subsequent fracture risk. *Bone* 2004; **35**(2): 375-82.
164. von Friesendorff M, Besjakov J, Akesson K. Long-term survival and fracture risk after hip fracture: a 22-year follow-up in women. *Journal of Bone and Mineral Research* 2008; **23**(11): 1832-41.
165. Quah C, Boulton C, Moran C. The influence of socioeconomic status on the incidence, outcome and mortality of fractures of the hip. *The Journal of Bone and Joint Surgery* 2011; **93**(6): 801-5.
166. Guilley E, Herrmann F, Rapin CH, Hoffmeyer P, Rizzoli R, Chevalley T. Socioeconomic and living conditions are determinants of hip fracture incidence and age occurrence among community-dwelling elderly. *Osteoporos International* 2011; **22**(2): 647-53.
167. Direcção Geral de Saúde. Programa Nacional contra as Doenças Reumáticas, 2004.
168. Sociedade Portuguesa de Ortopedia e Traumatologia. Fracturas Osteoporóticas em Evento, 2010.
169. Santos C. Os custos das fracturas de etiologia osteoporótica em mulheres: Institucionalização na Rede Nacional de Cuidados Continuados (RNCCI) e Lares de 3ª idade: Escola Nacional de Saúde Pública, Universidade Nova de Lisboa; 2010.
170. National Institute for Health and Care Excellence. Hip fracture costing report: implementing NICE guidance. 2011.
171. Scottish Intercollegiate Guidelines Network (SIGN). Management of hip fracture in older people: A national clinical guideline. Edinburgh SIGN, 2009.
172. National Institute for Health and Care Excellence. Alendronate, etidronate, risedronate, raloxifene, strontium ranelate and teriparatide for the secondary prevention

of osteoporotic fragility fractures in postmenopausal women National Institute for Health and Care Excellence 2008.

173. Judge A, Javaid MK, Leal J, et al. Health Services and Delivery Research. Models of care for the delivery of secondary fracture prevention after hip fracture: a health service cost, clinical outcomes and cost-effectiveness study within a region of England. Southampton (UK): NIHR Journals Library; 2016.

174. Ftouh S, Morga A, Swift C. Management of hip fracture in adults: summary of NICE guidance. *Bmj* 2011; **342**: d3304.

175. Royal College of Physicians. National Hip Fracture Database: extended report 2014. 2014.

176. Guerreiro MS, A.; Botelho, M. A.; Leitão, O.; Garcia, C.,. Adaptação à população portuguesa na tradução da “Mini Mental State Examination” (MMSE). *Revista Portuguesa de Neurologia* 1994; **1**(9): 9-10.

177. Herdman M, Gudex C, Lloyd A, et al. Development and preliminary testing of the new five-level version of EQ-5D (EQ-5D-5L). *Quality of Life Research* 2011; **20**(10): 1727-36.

178. Azeredo ZM, E.,. Grau de dependência em doentes que sofreram AVC. *Revista da Faculdade de Medicina de Lisboa, 3 Série* 2003; **8**(4): 199-204.

179. Administração central de sistemas de saúde. Base de dados de elementos analíticos.

180. Departamento de Planeamento e Sistemas de Informação. Custos reais das respostas sociais desenvolvidas pelo sector solidário: Instituto da Segurança Social, 2006.

181. Instituto Nacional de Estatística. Índice de preços no consumidor (media anual). <https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ipc> (accessed 14 December 2016).

182. Eurostat. Annual gross average earnings. [http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Table1_Average_Gross_annual_Earnings_in_the_business_economy_\(full-time_employees\),_2008-2011.png&filetimestamp=20130619135352](http://epp.eurostat.ec.europa.eu/statistics_explained/index.php?title=File:Table1_Average_Gross_annual_Earnings_in_the_business_economy_(full-time_employees),_2008-2011.png&filetimestamp=20130619135352).

183. Luengo-Fernandez R, Burns R, Leal J. Economic burden of non-malignant blood disorders across Europe: a population-based cost study. *The Lancet Haematology* 2016; **3**(8): e371-e8.

184. Burns R, Leal J, Sullivan R, Luengo-Fernandez R. Economic burden of malignant blood disorders across Europe: a population-based cost analysis. *The Lancet Haematology* 2016; **3**(8): e362-e70.

185. Paul C, Fonseca, A. M., Cruz, F., Cerejo, A.,. EXCELSA - Estudo piloto sobre envelhecimento humano em Portugal. *Psicologia, Teoria, Investigacao e Pratica* 2001; **2**: 415-26.

186. Boston College. List of studies using the Lubben Social Network Scale. http://www.bc.edu/schools/gssw/lubben/bibliography/jcr_content/content/download/3/file.res/LSNS_original_10%20Selected%20Bibliography.pdf (accessed 25 August 2017).

187. Paul C F, A. M., Cruz, F., Cerejo, A.,. EXCELSA - Estudo piloto sobre envelhecimento humano em Portugal. *Psicologia, Teoria, Investigacao e Pratica*. 2001; **2**: 415-26.

188. Esgalhado M.G.; Reis M; Pereira H; Afonso RM. Influence of social support on the psychological well-being and mental health of older adults living in assisted-living residences. *International Journal of Developmental and Educational Psychology* 2010; **1**: 267-78.

189. Freitas PCB. Solidão em idosos : percepção em função da rede social. Braga: Universidade Catolica Portuguesa; 2011.
190. Covita MSA. Apoio Social e Autoavaliação da Saúde: Estudo do envelhecimento na cidade da Covilhã. Covilha: Universidade da Beira Interior; 2012.
191. George LK, Blazer DG, Hughes DC, Fowler N. Social support and the outcome of major depression. *Br J Psychiatry* 1989; **154**: 478-85.
192. South Gloucestershire Council. Social isolation and loneliness.
193. Guerreiro M SA, Botelho M, Leitão O, Castro-Caldas A, Garcia C.,. Adaptação à população portuguesa da tradução do Mini Mental State Examination. *Revista Portuguesa de Neurologia* 1994; **1**(9).
194. Folstein M. FS, McHugh P., . Mini-Mental State: A practical method for grading the cognitive state of patients for the clinician. *Journal of Psychiatric Research* 1975; **12**: 189-98.
195. Nieuwenhuis-Mark RE. The Death Knoll for the MMSE: Has It Outlived Its Purpose? *Journal of Geriatric Psychiatry and Neurology* 2010; **23**(3): 151-7.
196. Mitchell AJ. A meta-analysis of the accuracy of the mini-mental state examination in the detection of dementia and mild cognitive impairment. *J Psychiatr Res* 2009; **43**(4): 411-31.
197. EuroQol. EQ-5D-5L.
198. Sequeira C. Cuidar de idosos dependentes. Coimbra; 2007.
199. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. *Md State Med J* 1965; **14**: 61-5.
200. Manning WG, Mullahy J. Estimating log models: to transform or not to transform? *Journal of Health Economics* 2001; **20**(4): 461-94.
201. Melo M, Ferreira, P., Melo, P., Caixeiro, S. Disparidades de género no mercado de trabalho português: Instituto Superior de Economia e Gestão, 2002.
202. Martins PS, Novo AA, Portugal P. Increasing the legal retirement age: the impact on wages, worker flows and firm performance *Discussion Paper No 4187* 2009; Institute for the Study of Labor.
203. Carneiro R, Chau F, Soares C, Fialho JAS, Sacadura MJ. O Envelhecimento da População: Dependência, Ativação e Qualidade *Centro de estudos dos povos e culturas de expressão portuguesa, Faculdade de Ciências Humanas da Universidade Católica Portuguesa* 2012.
204. Cooper B, Mahnkopf B, H B. Psychiatric disease and social isolation in elderly nursing home residents: a comparative study. *Zeitschrift Fur Gerontologie Und Geriatrie* 1984; **17**(3): 117-25.
205. Royal College of Physicians. Falls and Fragility Fracture Audit Programme: National Hip Fracture Database extended report 2014.
206. Ministério das Finanças da Saúde e da Solidariedade Emprego e Segurança Social. Portaria n.º 360/2013 de 16 de dezembro.
207. Carneiro RS, C; Fialho, J A S; Sacadura, M J;. O Envelhecimento da População: Dependência, Ativação e Qualidade. Lisbon: Centro de Estudos dos Povos e Culturas de Expressao Portuguesa, Faculdade de Ciências Humanas, Universidade Católica Portuguesa, 2012.
208. Kauffman TL, Albright L, Wagner C. Rehabilitation outcomes after hip fracture in persons 90 years old and older. *Archives of physical medicine and rehabilitation* 1987; **68**(6): 369-71.

209. Department of Health. Caring for people: Community care into the next decade and beyond. London: Her Majesty Stationary Office, 1989.
210. Department of Health. Caring for people - implementation documents. Draft guidance: planning. London: Her Majesty Stationary Office, 1990.
211. Department of Health. The NHS plan : a plan for investment : a plan for reform. London: Her Majesty Stationary Office, 2000.
212. Department of Health. The Better Care Fund: Policy framework. 2014.
213. Department of Health. The Care Act 2014. 2014.
214. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *Journal of Chronic Diseases* 1987; **40**(5): 373-83.
215. Harwood RH, Ebrahim S. The validity, reliability and responsiveness of the Nottingham Extended Activities of Daily Living scale in patients undergoing total hip replacement. *Disabil Rehabil* 2002; **24**(7): 371-7.
216. Department of Communities and Local Government. English indices of deprivation 2010. <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2010>.
217. Centre HSCI. Casemix Grouper. <http://www.hscic.gov.uk/casemix> 2013.
218. Health Do. NHS reference costs 2013 to 2014. 2014; (<https://www.gov.uk/government/publications/nhs-reference-costs-2013-to-2014>).
219. Gaughan J, Gravelle H, Siciliani L. Testing the bed-blocking hypothesis: does nursing and care home supply reduce delayed hospital discharges? *Health economics* 2015; **24 Suppl 1**: 32-44.
220. Elwyn G, Williams, M., Roberts, C., Newcombe, R.G., Vincent, J. . Case management by nurses in primary care: analysis of 73 "success stories". *Quality in Primary Care* 2008; **16**(2): 75 – 82.
221. Leal J, Gray AM, Prieto-Alhambra D, et al. Impact of hip fracture on hospital care costs: a population-based study. *Osteoporosis International* 2016; **27**(2): 549-58.
222. Department of Health. NHS Reference costs 2013-14. 2015. <https://www.gov.uk/government/publications/nhs-reference-costs-2013-to-2014>.
223. UKForex. <http://www.ukforex.co.uk/forex-tools/historical-rate-tools/yearly-average-rates> (accessed 26/10/2016 2016).
224. Alves SM, Economou T, Oliveira C, et al. Osteoporotic hip fractures: bisphosphonates sales and observed turning point in trend. A population-based retrospective study. *Bone* 2013; **53**(2): 430-6.
225. Eurostat. Purchasing power parities (PPPs), price level indices and real expenditures for ESA95 aggregates. http://ec.europa.eu/eurostat/en/web/products-datasets/-/PRC_PPP_IND.
226. Alves SF, Pina MdF, Barbosa M. Epidemiologia das Fracturas do Fémur em Portugal: Fracturas do Colo do Fémur versus Fracturas de Outras Localizações Não Especificadas do Fémur. *Arquivos de Medicina* 2007; **21**: 77-81.
227. Branco JCF, P.; Monteiro, J. A epidemiologia e o impacto socio-económico das fracturas da extremidade proximal do fémur - uma reflexão sobre o padrão actual do tratamento da osteoporose grave. *Acta Reumatologica Portuguesa* 2009; **34**: 475-85.
228. Lim WK, Lambert SF, Gray LC. Effectiveness of case management and post-acute services in older people after hospital discharge. *The Medical Journal of Australia* 2003; **178**(6): 262-6.

229. Nicholson NR. A Review of Social Isolation: An Important but Underassessed Condition in Older Adults. *The Journal of Primary Prevention* 2012; **33**(2): 137-52.
230. Dahl U, Johnsen R, Sætre R, Steinsbekk A. The influence of an intermediate care hospital on health care utilization among elderly patients - a retrospective comparative cohort study. *BMC Health Services Research* 2015; **15**: 48.
231. BBC. Northampton hospital funds private care beds.
232. The Banbury Guardian. Plan to move patients from Horton General Hospital to end bed blocking has begun.
233. Ministerio da Saude. Tempos Medios de Espera - Hospital de Santa Maria. <http://tempos.min-saude.pt/#/instituicao/218> (accessed 10 Abril 2017).
234. Fusco F, Turchetti G. Telerehabilitation after total knee replacement in Italy: cost-effectiveness and cost-utility analysis of a mixed telerehabilitation-standard rehabilitation programme compared with usual care. *BMJ Open* 2016; **6**(5): e009964.
235. Van Straten A, Van Der Meulen JHP, Van Den Bos GAM, Limburg M. Length of hospital stay and discharge delays in stroke patients. *Stroke* 1997; **28** (1): 137-40.
236. Vuadens P, Schluep M, Bogousslavsky J, Regli F. Justification of hospital days and discharge delays in a non-selected population of acute stroke patients. *Journal of the Neurological Sciences* 1996; **143** (1-2): 132-6.
237. Silva C. Masters Thesis - Fracturas osteoporóticas proximais do fémur. Estudo da mortalidade e custos hospitalares. *Universidade da Beira Interior*; (June 2013).
238. Swinkels A, Mitchell T. Delayed transfer from hospital to community settings: the older person's perspective. *Health and Social Care in the Community* 2009; **17**(1): 45-53.
239. Procter S, Wilcockson J, Pearson P, Allgar V. Going home from hospital: the carer/patient dyad. *Journal of Advanced Nursing* 2001; **35**(2): 206-17.
240. Baumann M, Evans S, Perkins M, et al. Organisation and features of hospital, intermediate care and social services in English sites with low rates of delayed discharge. *Health & Social Care in the Community* 2007; **15**(4): 295-305.
241. Shepperd S, Doll H, Angus RM, et al. Hospital at home admission avoidance. *The Cochrane database of systematic reviews* 2008; (4): CD007491-CD.
242. Joint improvement team. Ten actions to transform discharge. <http://www.jitscotland.org.uk/wp-content/uploads/2015/02/Home-First-V4.pdf>.
243. NHS Lanarkshire. Integrated Community Support Team. <http://www.nhslanarkshire.org.uk/Services/rcop/projects/Pages/ICST.aspx>.
244. Cooper MS, Palmer AJ, Seibel MJ. Cost-effectiveness of the Concord Minimal Trauma Fracture Liaison service, a prospective, controlled fracture prevention study. *Osteoporosis International* 2012; **23**(1): 97-107.
245. McLellan AR, Wolowacz SE, Zimovetz EA, et al. Fracture liaison services for the evaluation and management of patients with osteoporotic fracture: a cost-effectiveness evaluation based on data collected over 8 years of service provision. *Osteoporosis International* 2011; **22**(7): 2083.
246. Leal J, Gray AM, Hawley S, et al. Cost-Effectiveness of Orthogeriatric and Fracture Liaison Service Models of Care for Hip Fracture Patients: A Population-Based Study. *Journal of Bone and Mineral Research* 2017; **32**(2): 203-11.
247. Coffey AL-W, P; Savage, E; Hegarty, J; Cornally, N; Rose-Day, M; Maher, B; Browne, J; Sahm, L; O'Caoimh, R; Flynn, M; Hutton, S; Healy, E; O'Connor, C; McGrath, K; O'Mahony, A; Arenella, K;. A systematic literature review on tackling delayed discharges

in acute hospitals inclusive of hospital (re)admission avoidance. *Department of Health Dublin* 2015.

248. Shepperd S, McClaran J, Phillips CO, et al. Discharge planning from hospital to home. *The Cochrane Database of Systematic Reviews* 2010; (1): Cd000313.

249. Naylor MD, Aiken LH, Kurtzman ET, Olds DM, Hirschman KB. The care span: The importance of transitional care in achieving health reform. *Health Affairs* 2011; **30**(4): 746-54.

250. Verhaegh KJ, MacNeil-Vroomen JL, Eslami S, Geerlings SE, de Rooij SE, Buurman BM. Transitional care interventions prevent hospital readmissions for adults with chronic illnesses. *Health Affairs* 2014; **33**(9): 1531-9.

251. Allen J, Hutchinson AM, Brown R, Livingston PM. Quality care outcomes following transitional care interventions for older people from hospital to home: a systematic review. *BMC Health Services Research* 2014; **14**: 346.

252. Guerin M, Grimmer K, Kumar S. Community services' involvement in the discharge of older adults from hospital into the community. *International Journal of Integrated Care* 2013; **13**: e032.

253. Rennke S, Nguyen OK, Shoeb MH, Magan Y, Wachter RM, Ranji SR. Hospital-initiated transitional care interventions as a patient safety strategy: a systematic review. *Annals of Internal Medicine* 2013; **158**(5 Pt 2): 433-40.

254. Linertova R, Garcia-Perez L, Vazquez-Diaz JR, Lorenzo-Riera A, Sarria-Santamera A. Interventions to reduce hospital readmissions in the elderly: in-hospital or home care. A systematic review. *Journal of Evaluation in Clinical Practice* 2011; **17**(6): 1167-75.

255. Englander H, Michaels L, Chan B, Kansagara D. The Care Transitions Innovation (C-TrIn) for Socioeconomically Disadvantaged Adults: Results of a Cluster Randomized Controlled Trial. *Journal of General Internal Medicine* 2014; **29**(11): 1460-7.

256. Brotons C, Falces C, Alegre J, et al. Randomized clinical trial of the effectiveness of a home-based intervention in patients with heart failure: the IC-DOM study. *Revista Espanola de Cardiologia* 2009; **62**(4): 400-8.

257. Prvu Bettger J, Alexander KP, Dolor RJ, et al. Transitional care after hospitalization for acute stroke or myocardial infarction: a systematic review. *Annals of Internal Medicine* 2012; **157**(6): 407-16.

258. Prieto-Centurion V, Markos MA, Ramey NI, et al. Interventions to reduce rehospitalizations after chronic obstructive pulmonary disease exacerbations. A systematic review. *Annals of the American Thoracic Society* 2014; **11**(3): 417-24.

259. Nicholson NR, Jr. Social isolation in older adults: an evolutionary concept analysis. *Journal of Advanced Nursing* 2009; **65**(6): 1342-52.

260. Wenger GC, Davies R, Shahtahmasebi S, Scott A. Social Isolation and Loneliness in Old Age: Review and Model Refinement. *Ageing and Society* 2008; **16**(3): 333-58.

261. Masi CM, Chen H-Y, Hawkey LC, Cacioppo JT. A Meta-Analysis of Interventions to Reduce Loneliness. *Personality and Social Psychology Review* 2011; **15**(3): 10.1177/1088868310377394.

262. Dickens AP, Richards SH, Greaves CJ, Campbell JL. Interventions targeting social isolation in older people: a systematic review. *BMC Public Health* 2011; **11**(1): 1-22.

263. Nancy AP, Ken L, Constança P. Loneliness and Health in Later Life. 'Oxford University Press'; 2014.

264. Cohen-Mansfield J, Parpura-Gill A. Loneliness in older persons: a theoretical model and empirical findings. *International Psychogeriatrics* 2007; **19**(2): 279-94.

265. de Jong-Gierveld J. Developing and testing a model of loneliness. *Journal of Personality and Social Psychology* 1987; **53**(1): 119-28.
266. Iliffe S, Kharicha K, Harari D, Swift C, Gillmann G, Stuck AE. Health risk appraisal in older people 2: the implications for clinicians and commissioners of social isolation risk in older people. *The British Journal of General Practice* 2007; **57**(537): 277-82.
267. Jang Y, Mortimer JA, Haley WE, Small BJ, Chisolm TEH, Graves AB. The Role of Vision and Hearing in Physical, Social, and Emotional Functioning Among Older Adults. *Research on Aging* 2003; **25**(2): 172-91.
268. Gavira Iglesias FJ, Caridad y Ocerin JM, Perez del Molino Martin J, et al. Prevalence and psychosocial impact of urinary incontinence in older people of a Spanish rural population. *The Journals of Gerontology - Series A* 2000; **55**(4): M207-14.
269. de Leon CFM, Gold DT, Glass TA, Kaplan L, George LK. Disability as a Function of Social Networks and Support in Elderly African Americans and Whites: The Duke EPESE 1986–1992. *The Journals of Gerontology - Series B* 2001; **56**(3): S179-S90.
270. Victor C, Scambler S, Bond J, Bowling A. Being alone in later life: loneliness, social isolation and living alone. *Reviews in Clinical Gerontology* 2000; **10**.
271. Department of Economic and Social Affairs Population Division. World Population Ageing 2015: United Nations, 2015.
272. Saito M, Fujiwara Y, Kobayashi E, Fukaya T, Nishi M, Shinkai S. Prevalence and characteristics of social isolation in the elderly in a dormitory suburb according to household composition [Japanese]. *Nihon Koshu Eisei Zasshi* 2010; **57**(9): 785-95.
273. Iliffe S, Kharicha K, Harari D, Swift C, Gillmann G, Stuck A. Health risk appraisal in older people 2: the implications for clinicians and commissioners of social isolation risk in older people. *British Journal of General Practice* 2007; **57**.
274. Hawthorne G. Perceived social isolation in a community sample: its prevalence and correlates with aspects of peoples' lives. *Social Psychiatry and Psychiatric Epidemiology* 2008; **43**.
275. White H, McConnell E, Clipp E, et al. Surfing the net in later life: A review of the literature and pilot study of computer use and quality of life. *Journal of Applied Gerontology* 1999; **18**(3): 358-78.
276. Dammeyer MM. Does social isolation among facility-dwelling elderly decrease using a reminiscence group intervention? *Dissertation Abstracts International: Section B: The Sciences and Engineering* 2004; **65**(5-B): 2618.
277. Hagan R, Manktelow R, Taylor BJ, Mallett J. Reducing loneliness amongst older people: a systematic search and narrative review. *Ageing and Mental Health* 2014; **18**(6): 683-93.
278. Chen YR, Schulz PJ. The Effect of Information Communication Technology Interventions on Reducing Social Isolation in the Elderly: A Systematic Review. *Journal of Medical Internet Research* 2016; **18**(1): e18.
279. Morris ME, Adair B, Ozanne E, et al. Smart technologies to enhance social connectedness in older people who live at home. *Australasian Journal on Ageing* 2014; **33**(3): 142-52.
280. Health Quality Ontario. Social isolation in community-dwelling seniors: an evidence-based analysis. *Ontario Health Technology Assessment Series* 2008; **8**(5): 1-49.
281. Gardiner C, Geldenhuys G, Gott M. Interventions to reduce social isolation and loneliness among older people: an integrative review. *Health and Social Care in the Community* 2016.

282. Findlay R. Interventions to reduce social isolation amongst older people: where is the evidence? *Ageing Society* 2003; **23**.
283. Cattan M, White M, Bond J, Learmouth A. Preventing social isolation and loneliness among older people: a systematic review of health promotion interventions. *Ageing Society* 2005; **25**.
284. Choi M, Kong S, Jung D. Computer and internet interventions for loneliness and depression in older adults: a meta-analysis. *Healthcare Informatics Research* 2012; **18**(3): 191-8.
285. Landeiro FB, P; Nuttall Musson, E; Gray, A; Leal, J. Reducing social isolation and loneliness in older people: a systematic review protocol. *BMJ Open*.
286. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *British Medical Journal* 2009; **339**.
287. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. *Bmj* 2009; **339**: b2700.
288. Welch V, Petticrew M, Tugwell P, et al. PRISMA-Equity 2012 extension: reporting guidelines for systematic reviews with a focus on health equity. *PLoS Medicine* 2012; **9**(10): e1001333.
289. World Health Organisation. Active ageing: a policy framework, 2002.
290. Lubben JE. Assessing social networks among elderly populations. *Family & Community Health* 1988; **11**(3): 42-52.
291. Powers JR, Goodger B, Byles JE. Assessment of the abbreviated Duke Social Support Index in a cohort of older Australian women. *Australasian Journal on Ageing* 2004; **23**(2): 71-6.
292. Cattan M, White M, Bond J, Learmouth A. Preventing social isolation and loneliness among older people: a systematic review of health promotion interventions. *Ageing & Society* 2005; **25**(01): 41-67.
293. The Cochrane Collaboration. Data collection forms for intervention reviews: RCTs and non-RCTs. Version 3. . 2014.
294. The Cochrane Collaboration. Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. 2011.
295. McMaster University Faculty of Health Sciences. Quality assessment tool for quantitative studies. In: Effective public health practice project. 2009.
296. Armijo-Olivo S, Stiles CR, Hagen NA, Biondo PD, Cummings GG. Assessment of study quality for systematic reviews: a comparison of the Cochrane Collaboration Risk of Bias Tool and the Effective Public Health Practice Project Quality Assessment Tool: methodological research. *Journal of Evaluation in Clinical Practice* 2012; **18**(1): 12-8.
297. Dictionary for the Effective Public Health Practice Project Quality Assessment Tool For Quantitative Studies. 1998.
298. Lipsey M. W. WDB. Practical Meta-analysis.; 2001.
299. Harris R, Bradburn M, Deeks J, Harbord R, Altman D, Sterne J. metan: fixed- and random-effects meta-analysis. *Stata Journal* 2008; **8**(1): 3-28.
300. StataCorp. 2011. Stata Statistical Software: Release 12. College Station, TX: StataCorp LP. 2011.
301. R Development Core Team. R: A Language and Environment for Statistical Computing. 2008.

302. Viechtbauer W. Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software* 2010; **36**(3): 1-48.
303. Organisation for Economic Co-operation and Development. OECD Data Purchasing power parities. 2016.
304. Greaves CJ, Farbus L. Effects of creative and social activity on the health and well-being of socially isolated older people: outcomes from a multi-method observational study. *Journal of the Royal Society for the Promotion of Health* 2006; **126**(3): 134-42.
305. Bartsch DA, Rodgers VK. Senior reach outcomes in comparison with the Spokane Gatekeeper program. *Care Management Journals* 2009; **10**(3): 82-8.
306. Kim SH. Effects of a volunteer-run peer support program on health and satisfaction with social support of older adults living alone. *Journal of Korean Academy of Nursing* 2012; **42**(4): 525-36.
307. Saito T, Kai I, Takizawa A. Effects of a program to prevent social isolation on loneliness, depression, and subjective well-being of older adults: a randomized trial among older migrants in Japan. *Archives of Gerontology & Geriatrics* 2012; **55**(3): 539-47.
308. Jones RB, Ashurst EJ, Atkey J, Duffy B. Older people going online: its value and before-after evaluation of volunteer support. *Journal of Medical Internet Research* 2015; **17**(5): e122.
309. Stewart M, Craig D, MacPherson K, Alexander S. Promoting positive affect and diminishing loneliness of widowed seniors through a support intervention. *Public Health Nursing* 2001; **18**(1): 54-63.
310. Mendieta M, Martin MAG. Effects of the social support groups on loneliness, social support and quality of life in the elderly. *Revista de Psicologia Social Aplicada* 2003; **13**(1): 55-72.
311. Torp S, Hanson E, Hauge S, Ulstein I, Magnusson L. A pilot study of how information and communication technology may contribute to health promotion among elderly spousal carers in Norway. *Health and Social Care in the Community* 2008; **16**(1): 75-85.
312. Woodward AT, Freddolino PP, Blaschke-Thompson CM, et al. Technology and Aging Project: Training Outcomes and Efficacy from a Randomized Field Trial. *Ageing International* 2011; **36**(1): 46-65.
313. Brennan PF, Moore SM, Smyth KA. The effects of a special computer network on caregivers of persons with Alzheimer's disease. *Nursing Research* 1995; **44**(3): 166-72.
314. Drentea P, Clay OJ, Roth DL, Mittelman MS. Predictors of improvement in social support: Five-year effects of a structured intervention for caregivers of spouses with Alzheimer's disease. *Social Science and Medicine* 2006; **63**(4): 957-67.
315. Routasalo PE, Tilvis RS, Kautiainen H, Pitkala KH. Effects of psychosocial group rehabilitation on social functioning, loneliness and well-being of lonely, older people: randomized controlled trial. *Journal of Advanced Nursing*; 2009. p. 297-305.
316. Tsai H-H, Tsai Y-F, Wang H-H, Chang Y-C, Chu HH. Videoconference program enhances social support, loneliness, and depressive status of elderly nursing home residents. *Aging & Mental Health* 2010; **14**(8): 947-54.
317. Tsai H-H, Tsai Y-F. Changes in depressive symptoms, social support, and loneliness over 1 year after a minimum 3-month videoconference program for older nursing home resident. *Journal of Medical Internet Research* 2011; **13**(4): 373-84.
318. Tse MM. Therapeutic effects of an indoor gardening programme for older people living in nursing homes. *Journal of Clinical Nursing* 2010; **19**(7-8): 949-58.

319. Winningham RG, Pike NL. A cognitive intervention to enhance institutionalized older adults' social support networks and decrease loneliness. *Aging & Mental Health* 2007; **11**(6): 716-21.
320. Drentea P, Clay OJ, Roth DL, Mittelman MS. Predictors of improvement in social support: Five-year effects of a structured intervention for caregivers of spouses with Alzheimer's disease. *Soc Sci Med* 2006; **63**.
321. Victor C. Loneliness in old age is not inevitable. Society Now. 2016.
322. Bemelmans R, Gelderblom GJ, Jonker P, de Witte L. Socially assistive robots in elderly care: a systematic review into effects and effectiveness. *Journal of the American Medical Directors Association* 2012; **13**(2): 114-20.e1.
323. McCusker J, Cardin S, Bellavance F, Belzile E. Return to the emergency department among elders: patterns and predictors. *Academic Emergency Medicine* 2000; **7**(3): 249-59.
324. Mistry R, Rosansky J, McGuire J, McDermott C, Jarvik L. Social isolation predicts re-hospitalization in a group of older American veterans enrolled in the UPBEAT Program. Unified Psychogeriatric Biopsychosocial Evaluation and Treatment. *International Journal of Geriatric Psychiatry* 2001; **16**(10): 950-9.
325. Nagayoshi M, Everson-Rose SA, Iso H, Mosley TH, Jr., Rose KM, Lutsey PL. Social network, social support, and risk of incident stroke: Atherosclerosis Risk in Communities study. *Stroke* 2014; **45**(10): 2868-73.
326. Shankar A, Hamer M, McMunn A, Steptoe A. Social isolation and loneliness: relationships with cognitive function during 4 years of follow-up in the English Longitudinal Study of Ageing. *Psychosomatic Medicine* 2013; **75**(2): 161-70.
327. Beland F, Zunzunegui MV, Alvarado B, Otero A, Del Ser T. Trajectories of cognitive decline and social relations. *The Journals of Gerontology - Series B* 2005; **60**(6): P320-p30.
328. Kaplan GS, J; Cohen, R; Brand, R; Leonard, S; Puska, P. Social connections and mortality from all causes and from cardiovascular disease: prospective evidence from Eastern Finland. *American Journal of Epidemiology* 1988; **128**(2): 370-80.
329. Gray AMC, P. M.; Wolstenholme, J. L.; Wordsworth, S.;. Applied methods of cost-effectiveness analysis in health care: Oxford University Press; 2011.
330. Briggs AH. Handling Uncertainty in Cost-Effectiveness Models. *Pharmacoeconomics* 2000; **17**(5): 479-500.
331. Eurostat. Consumer prices - inflation and comparative price levels [http://ec.europa.eu/eurostat/statistics-explained/index.php/Consumer_prices - inflation and comparative price levels#Price level indices: comparison of price levels between countries](http://ec.europa.eu/eurostat/statistics-explained/index.php/Consumer_prices_-_inflation_and_comparative_price_levels#Price_level_indices:_comparison_of_price_levels_between_countries).
332. Allen IP, E.;. The futur of family care. London; 1995.
333. Kendig HH, A.; Coppard, L. C.;. Family support for the elderly: the international experience. Oxford; 1992.
334. Woolf AD, Pfleger B. Burden of major musculoskeletal conditions. *Bulletin of the World Health Organization* 2003; **81**: 646-56.
335. World Health Organization. Fact sheet - dementia. April 2016. <http://www.who.int/mediacentre/factsheets/fs362/en/>.
336. World Health Organization. The future of CVD. http://www.who.int/cardiovascular_diseases/en/cvd_atlas_25_future.pdf?ua=1.
337. Healy JT, A; Seargeant, J.; Victor, C.;. Coming up for care: assessing the post-hospital care needs of older people. London; 1999.

338. Help Age. Global age watch index: life expectancy at 60. <http://www.helpage.org/global-agewatch/population-ageing-data/life-expectancy-at-60/> (accessed 5 April 2017).
339. Index Mundi - Portugal. http://www.indexmundi.com/portugal/age_structure.html (accessed 20 October 2016).
340. Index Mundi - United Kingdom. http://www.indexmundi.com/united_kingdom/age_structure.html (accessed 20 October 2016).
341. Gray H, Lewis WH. Anatomy of the Human Body. 20th ed. <http://www.bartleby.com/107/> (accessed).
342. Seeley RR, Stephens TD, Tate P. Anatomy and Physiology. 8 ed. Iowa: McGraw-Hill 2008.
343. Barwick JF, Nowotarski PJ. Femur Shaft Fractures (Broken Thighbone). 2011. <http://orthoinfo.aaos.org/topic.cfm?topic=A00521>.
344. Cailliet R. Functional anatomy of the hip joint. Illustrated Guide to Functional Anatomy of the Musculoskeletal System. USA: AMA Press; 2004: 237-50.
345. Mears S. Fixing Hip Fractures. http://www.hopkinsmedicine.org/gec/series/fixing_hip_fractures#femoral_neck_fractures.
346. Herring W. Fractures of the Proximal Femur. 2006. <http://www.learningradiology.com/archives06/COW%20213-Hip%20fracture-intertrochanteric/hipfxtrochcorrect.htm>.
347. Lloyd-Jones G. Trauma X-ray - Lower limb: Hip fracture. http://www.radiologymasterclass.co.uk/tutorials/musculoskeletal/x-ray_trauma_lower_limb/hip_fracture_x-ray.
348. Chan O. ABC of Emergency Radiology 3rd edition ed; 2013.
349. Healthwise staff. Hip Fracture Repair (Hip Pinning). 2011. <http://www.webmd.com/osteoporosis/hip-fracture-repair-hip-pinning>.
350. Sandhu HS. Management of fracture neck of femur. *Indian Journal of Orthopaedics* 2005; **39**(2): 130-6.
351. Massoud EI. Fixation of basicervical and related fractures. *Int Orthop* 2010; **34**(4): 577-82.
352. Carpintero P, Caeiro JR, Carpintero R, Morales A, Silva S, Mesa M. Complications of hip fractures: A review. *World Journal of Orthopedics* 2014; **5**(4): 402-11.
353. Royal College of Physicians. The National Hip Fracture Database: annual report 2012/2012. [http://www.nhfd.co.uk/20/hipfractureR.nsf/945b5efcb3f9117580257ebb0069c820/e16f4e75d1e1a7d180257a6e002f1a5c/\\$FILE/NHFD%20National%20Report%202012.pdf](http://www.nhfd.co.uk/20/hipfractureR.nsf/945b5efcb3f9117580257ebb0069c820/e16f4e75d1e1a7d180257a6e002f1a5c/$FILE/NHFD%20National%20Report%202012.pdf) (accessed).
354. Hippisley-Cox JB, J.; Potter, J.; Fenty, J.; Parker, C. Evaluation of standards of care for osteoporosis and falls in primary care - Final Report to The Information Centre for health and social care 2007.
355. Chami G, Jeys L, Freudmann M, Connor L, Siddiqi M. Are osteoporotic fractures being adequately investigated?: A questionnaire of GP & orthopaedic surgeons. *BMC Family Practice* 2006; **7**(1): 7.
356. Kurup HV, Andrew JG. Secondary prevention of osteoporosis after Colles fracture: Current practice. *Joint Bone Spine* 2008; **75**(1): 50-2.

357. Chakravarthy J, Ali A, Iyengar S, Porter K. Secondary prevention of fragility fractures by orthopaedic teams in the UK: a national survey. *International Journal of Clinical Practice* 2008; **62**(3): 382-7.

Appendix 1: Search syntax used in systematic review on prevalence and costs of delayed discharges

Table A.1.1: MEDLINE, EMBASE, GLOBAL HEALTH, CAB Abstracts, ECONLIT

Searches	Search terms
1	(delay* adj3 discharg*).mp.
2	"block* bed*".mp.
3	"bed* block*".mp.
4	"prolong* hospital* stay*".mp.
5	("prolong* stay*" adj3 hospital*).mp.
6	"prolong* hospitali*".mp.
7	"protract* hospital* stay*".mp.
8	("protract* stay*" adj3 hospital*).mp.
9	"protract* hospitali*".mp.
10	"inappropriat* hospital* stay*".mp.
11	("inappropriat* stay*" adj3 hospital*).mp.
12	"inappropriat* hospitali*".mp.
13	"nonmedical stay*".mp.
14	"social stay*".mp.
15	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14
16	exp Aged/
17	elder*.mp.
18	geriatric*.mp.
19	"older patient*".mp.
20	"older adult*".mp.
21	"older people*".mp.
22	"older person*".mp.
23	"older individual*".mp.
24	"old age".mp.
25	16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24
26	15 and 25
27	limit 26 to yr="1990 -Current"

mp=abstract, title, original title, broad terms, heading words

Table A.1.2: WEB OF KNOWLEDGE

Searches	Search terms
1	Topic=((delay* NEAR/3 discharg*))
2	Topic=("block* bed*")
3	Topic=("bed* block*")
4	Topic=("prolong* hospital* stay*")
5	Topic=((("prolong* stay* NEAR/3 hospital*)))
6	Topic=("prolong* hospitali*")
7	Topic=("protract* hospital* stay*")
8	Topic=("protract* stay*" NEAR/3 hospital*")
9	Topic=("protract* hospitali*")
10	Topic=("inappropriate* hospital* stay*")
11	Topic=("inappropriate* stay*" NEAR/3 hospital*")
12	Topic=("inappropriate* hospitali*")
13	Topic=("nonmedical stay*")
14	Topic=("social stay*")
15	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #12 OR #13 OR #14
16	Topic=(elder*)
17	Topic=(geriatric*)
18	Topic=("older patient*")
19	Topic=("older adult*")
20	Topic=("older people*")
22	Topic=("older person*")
23	Topic=("older individual*")
24	Topic=("old* age*")
25	#16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24
26	#10 AND #18

Table A.1.3: EBSCO – CINAHL

Searches	Search terms
1	delay* N3 discharg*
2	"block* bed"
3	"bed* block"
4	"prolong* hospital* stay"
5	"prolong* stay*" N3 hospital*
6	"prolong* hospitali"
7	"protract* hospital* stay"
8	"protract* stay*" N3 hospital*
9	"protract* hospitali"
10	"inappropriat* hospital* stay"
11	"inappropriat* stay*" N3 hospital*
12	"inappropriat* hospitali"
13	"nonmedical stay"
14	"social stay"
15	S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14
16	(MH "Aged+")
17	elder*
18	geriatric*
19	"older patient"
20	"older adult"
21	"older people"
22	"older person"
23	"older individual"
24	"old age"
25	S16 or S17 or S18 or S19 or S20 or S21 or S22 or S23 or S24
26	S15 and S25
27	Published Date from 19900101-20111231

Table A.1.4: THE COCHRANE LIBRARY

Searches	Search terms
1	delay* NEAR/3 discharg*
2	block* NEXT bed*
3	bed* NEXT block*
4	prolong* NEXT hospital* NEXT stay*
5	prolong* NEXT stay* NEAR/3 hospital*
6	prolong* NEXT hospitali*
7	protract* NEXT hospital* NEXT stay*
8	protract* NEXT stay* NEAR/3 hospital*
9	protract* NEXT hospitali*
10	inappropriat* NEXT hospital* NEXT stay*
11	inappropriat* NEXT stay* NEAR/3 hospital*
12	inappropriat* NEXT hospitali*
13	nonmedical NEXT stay*
14	social NEXT stay*
15	(#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13
16	OR #14)
17	MeSH descriptor Aged explode all trees
18	elder*
19	geriatric*
20	older NEXT patient*
21	older NEXT adult*
22	older NEXT people*
23	older NEXT person*
24	older NEXT individual*
25	"old age"
26	(#16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24)
27	(#15 AND #25)
	(#26) from 1990 to 2012

Table A.1.5: HEALTH MANAGEMENT INFORMATION CONSORTIUM

Searches	Search terms
1	(delay* adj3 discharg*).mp.
2	"block* bed*".mp.
3	"bed* block*".mp.
4	"prolong* hospital* stay*".mp.
5	("prolong* stay*" adj3 hospital*).mp.
6	"prolong* hospitali*".mp.
7	"protract* hospital* stay*".mp.
8	("protract* stay*" adj3 hospital*).mp.
9	"protract* hospitali*".mp.
10	"inappropriat* hospital* stay*".mp.
11	("inappropriat* stay*" adj3 hospital*).mp.
12	"inappropriat* hospitali*".mp.
13	"nonmedical stay*".mp.
14	"social stay*".mp.
15	delayed discharge/ or blocked beds/
16	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15
17	exp older people/
18	elder*.mp.
19	geriatric*.mp.
20	"older patient*".mp.
21	"older adult*".mp.
22	"older people*".mp.
23	"older person*".mp.
24	"older individual*".mp.
25	"old age".mp.
26	17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25
27	16 and 26
28	limit 27 to yr="1990 -Current"

Table A.1.6: SOCIAL CARE ONLINE

Search terms
((freetext="delay* discharg*") OR (freetext="block* bed*") OR (freetext="bed* block*") OR (freetext="prolong* hospital* stay*") OR (freetext="prolong* stay*") OR (freetext="prolong* hospitali*") OR (freetext="protract* hospital* stay*") OR (freetext="protract* stay*") OR (freetext="protract* hospitali*") OR (freetext="inappropriat* hospital* stay*") OR (freetext="inappropriat* stay*") OR (freetext="inappropriat* hospitali*") OR (freetext="nonmedical stay*") OR (freetext="social stay*")) AND ((freetext="elder*") OR (freetext="geriatric*") OR (freetext="older patient*") OR (freetext="older adult*") OR (freetext="older person*") OR (freetext="older individual*") OR (freetext="old age")) AND publicationdate>1989

Appendix 2: Data extraction pro-forma for the systematic review on prevalence and costs of delayed discharges

Reviewer		
Date form completed		
Study Details		
Title		
First author		
Year Published		
Journal		
Location (country/city)		
Language		
		Location in text (page/figure/table/other)
Study design	Randomised controlled trial ☐ Non-randomised controlled trial ☐ Quasi-experimental study ☐ Case-control study ☐ Cohort study ☐ Cross-sectional study ☐ Other: _____	
Timeframe of analysis	Start date: _____ End date: _____	
Aim of the study		
Setting	Single centre ☐ Multicentre ☐ Information not available ☐ Name of the hospital: _____	
Wards		
Type of Participants		
Enrolment Eligibility	Inclusion criteria: _____ Exclusion criteria: _____	
Total number randomised (or total population for non-RCT)		
Sample size		
Age range (mean age)		

Gender (% female)			
Diseases treated			
Any other relevant sociodemographic information			
Any subgroups established			
Notes			
Interventions			
			Location in text (page/figure/table/other)
Intervention	Description		
	Duration of each intervention episode		
	Duration of intervention studied (total study duration)		
	Frequency (daily/weekly etc.)		
	Provider (i.e. no., profession, training)		
Compliance			
Notes			
Outcomes			
Description as stated in paper/report			Location in text (page/figure/table/other)
Delayed discharges			
Number of days of delayed discharge			
Total length of hospital stay			
Proportion of delayed discharges			
Costs of delayed discharges			
Unit cost			
Total cost			
Currency			

Year of costing		
Unit costs derived from	National reference costs ☐ Charges ☐ Own costs ☐ Previous studies ☐ Not clear/mentioned ☐	
Costs included		
Social isolation		
Analysis of some sort of social isolation	Yes ☐ No ☐	
Outcome tool validated	Yes ☐ No ☐ Unclear ☐	
		Location in text (page/figure/table/other)
Any outcomes other than social isolation measured?	Yes ☐ Detail: _____ _____ No ☐	
Findings		
Reasons for delay in discharge		
Effect of the intervention on delayed discharges		
		Location in text (page/figure/table/other)
Comparison		
Outcome		
Subgroup		

Time point (from start or end of intervention)							
Results	Intervention			Comparison			
	Mean	SD (or other variance, specify)	No participantss	Mean	SD (or other variance, specify)	No participants	
Any other results reported							
Statistical method used							
Notes							
Other Information							
							Location in text (page/figure/table/other)
Author's conclusions							
References to other relevant studies							
							Location in text (page/figure/table/other)
Reviewer's conclusions							
Notes							

Appendix 3: List of references included in the systematic literature review on prevalence and costs of delayed discharges

Barisonzo R, Wiedermann W, Unterhuber M, et al. Length of stay as risk factor for inappropriate hospital days: interaction with patient age and co-morbidity. *Journal of Evaluation in Clinical Practice* 2013;19(1):80-5.

Becchi MA, Pescetelli M, Caiti O, et al. Characteristics of patients in a ward of Academic Internal Medicine: implications for medical care, training programmes and research. *Internal and Emergency Medicine* 2010;5(3):205-13.

Benson RT, Drew JC, Galland RB. A waiting list to go home: An analysis of delayed discharges from surgical beds. *Annals of the Royal College of Surgeons of England* 2006;88 (7):650-52.

Bianco A, Pileggi C, Rizza P, et al. An assessment of inappropriate hospital bed utilization by elderly patients in southern Italy. *Aging Clinical and Experimental Research* 2006;18(3):249-56.

Brown SH, Hafeez U, Abdelhafiz AH. Use of multicompartiment compliance aids for elderly patients: patient viewpoints and hospital length of stay. *Postgraduate Medicine* 2010;122 (4):186-91.

Bryan K, Gage H, Gilbert K. Delayed transfers of older people from hospital : causes and policy implications. *Health Policy* 2006;76(2):194-201.

Caminiti C, Meschi T, Braglia L, et al. Reducing unnecessary hospital days to improve quality of care through physician accountability: a cluster randomised trial. *BMC Health Services Research* 2013;13:14.

Carey MR, Sheth H, Braithwaite RS. A prospective study of reasons for prolonged hospitalizations on a general medicine teaching service. *Journal of General Internal Medicine* 2005;20(2):108-15.

Chen A, Zagorski B, Chan V, et al. Acute care alternate-level-of-care days due to delayed discharge for traumatic and non-traumatic brain injuries. *Healthcare Policy* 2012;7(4):41-55.

Chin JJ, Sahadevan S, Tan CY, et al. Critical role of functional decline in delayed discharge from an acute geriatric unit. *Annals of the Academy of Medicine, Singapore* 2001;30 (6):593-99.

Chopard P, Perneger TV, Gaspoz JM, et al. Predictors of inappropriate hospital days in a department of internal medicine. *International Journal of Epidemiology* 1998;27(3):513-9.

Costa A P PJW, Peirce T, Hirdes J P. Acute care inpatients with long-term delayed-discharge: evidence from a Canadian health region. *BMC Health Service Research* 2012;12:172.

De Bey JS, Huijsman R, Van Der Cammen TJM. Delayed discharge of older patients from the Department of Geriatric Medicine of the Erasmus Medical Centre and factors affecting the length of stay; July 2001-June 2002. [Dutch]. *Nederlands Tijdschrift voor Geneeskunde* 2004;148 (49):2438-42.

De Coster C, Bruce S, Kozyrskyj A. Use of acute care hospitals by long-stay patients: Who, how much, and why? *Canadian Journal on Aging* 2005;24:97-106.

DeCoster C, Roos NP, Carrière KC, et al. Inappropriate hospital use by patients receiving care for medical conditions: targeting utilization review. *Canadian Medical Association Journal* 1997;157(7):889-96.

Edirimanne S, Roake JA, Lewis DR. Delays in discharge of vascular surgical patients: a prospective audit. *ANZ Journal of Surgery* 2010;80(6):443-46.

Epstein J, Kaplan G, Lavi B, et al. A description of inappropriate hospital stays in selected in-patient services: A study of cases receiving social work services. *Social Work in Health Care* 2001;32 (4):43-65.

Falcone D. Waiting for placement : an exploratory analysis of determinants of delayed discharges of elderly hospital patients. *Health Services Research* 1991;26(3):339-74.

Fenn A. Inappropriate bed usage in a district general hospital. *Journal of Clinical Excellence* 2000;1(4):2221-227.

Fillit H, Howe JL, Fulop G, et al. Studies of hospital social stays in the frail elderly and their relationship to the intensity of social work intervention. *Social Work in Health Care* 1992;18 (1):1-22.

Foer D, Ornstein K, Soriano TA, et al. Nonmedical factors associated with prolonged hospital length of stay in an urban homebound population. *Journal of Hospital Medicine* 2012;7 (2):73-78.

Gallagher P, Henry C, O'Callaghan N. Do relatives of elderly patients block the discharge process? *Irish Medical Journal* 2008;101(3):70-2.

Godden S, McCoy D, Pollock A. Policy on the rebound: trends and causes of delayed discharges in the NHS. *Journal of the Royal Society of Medicine* 2009;102(1):22-8.

Hanif I, Rathod B. Delays in discharging elderly psychiatric in-patients. *Psychiatric Bulletin* 2008;32 (6):211-13.

Hayee BH, Miell J. Delayed hospital discharge. *Clinical Medicine* 2001;1 (6):518-19.

Hendy P, Patel JH, Kordbacheh T, et al. In-depth analysis of delays to patient discharge: a metropolitan teaching hospital experience. *Clinical Medicine* 2012;12(4):320-3.

Hermans E, Anten HW, Diederiks JP, et al. Patient characteristics with predictive significance for 'blocked bed' problems in the neurological department of a general hospital. [Dutch]. *Nederlands Tijdschrift voor Geneeskunde* 1995;139 (17):890-94.

Ingold BB, Yersin B, Wietlisbach V, et al. Characteristics associated with inappropriate hospital use in elderly patients admitted to a general internal medicine service. *Aging-Clinical and Experimental Research* 2000;12(6):430-38.

Jasinarachchi KH, Ibrahim IR, Keegan BC, et al. Delayed transfer of care from NHS secondary care to primary care in England: its determinants, effect on hospital bed days, prevalence of acute

medical conditions and deaths during delay, in older adults aged 65 years and over. *BMC Geriatrics* 2009;9:4.

Koffman J, Fulop NJ, Pashley D, et al. No way out: The delayed discharge of elderly mentally ill acute and assessment patients in North and South Thames Regions. *Age and Ageing* 1996;25(4):268-72.

Koffman J, Hudson M. Assessing the impact of delayed discharge on acute care. *Nursing Standard* 1996;10(20):41-43.

Kossovsky MP, Chopard P, Bolla F, et al. Evaluation of quality improvement interventions to reduce inappropriate hospital use. *International Journal for Quality in Health Care* 2002;14(3):227-32.

Lenzi J, Mongardi M, Rucci P, et al. Sociodemographic, clinical and organisational factors associated with delayed hospital discharges: a cross-sectional study. *BMC Health Services Research* 2014;14:128.

Lewis R, Glasby J. Delayed discharge from mental health hospitals: results of an English postal survey. *Health & Social Care in the Community* 2006;14(3):225-30.

Majeed MU, Williams DT, Pollock R, et al. Delay in discharge and its impact on unnecessary hospital bed occupancy. *BMC Health Services Research* 2012;12:410.

Mayo NE, Wood-Dauphinee S, Gayton D, et al. Nonmedical bed-days for stroke patients admitted to acute-care hospitals in Montreal, Canada. *Stroke* 1997;28 (3):543-49.

McClaran J, Tover-Berglas R, Glass KC. Chronic status patients in a university hospital: bed-day utilization and length of stay. *CMAJ Canadian Medical Association Journal* 1991;145(10):1259-65.

Mendoza Giraldo D, Navarro A, Sanchez-Quijano A, et al. Impact of delayed discharge for nonmedical reasons in a tertiary hospital internal medicine department. [Spanish]. *Revista Clinica Espanola* 2012;212(5):229-34.

Merom D, Shohat T, Harari G, et al. Factors associated with inappropriate hospitalization days in internal medicine wards in Israel: A cross-national survey. *International Journal for Quality in Health Care* 1998;10 (2):155-62.

Meschi T, Fiaccadori E, Cocconi S, et al. Analisi del problema "dimissioni difficili" nell'Azienda Ospedaliera-Universitaria di Parma. *Annali Italiani di Medicina Interna*. [Italian] 2004(19):109-17.

Mohammed A. Audit of orthopaedic bed utilisation. *Health Bulletin* 2001;59(6):353-55.

Monteis Catot J, Martin-Baranera M, Soler N, et al. Impact of a clinical self-evaluation intervention on the appropriateness of hospital stays. *Gaceta Sanitaria* 2007;21(4):290-7.

Mould-Quevedo JF, Garcia-Pea C, Contreras-Hernandez I, et al. Direct costs associated with the appropriateness of hospital stay in elderly population. *BMC Health Services Research* 2009;9(151).

Moya-Ruiz C, Peiro S, Meneu R. Effectiveness of feedback to physicians in reducing inappropriate use of hospitalization: A study in a Spanish hospital. *International Journal for Quality in Health Care* 2002;14 (4):305-12.

Namdarán F, Burnet C, Monroe S. Bed blocking in Edinburgh hospitals. *Health Bulletin* 1992;50(3):223-27.

Paillé-Ricolleau C, Hamidou M, Lombrail P, et al. Revue de pertinence des journées d'hospitalisation en médecine et chirurgie : un tiers de journées inappropriées au CHU de Nantes. [French] *La Presse Médicale* 2009;38(4):541-50.

Paldi Y, Porath A, Friedman L, et al. Factors associated with inappropriate hospitalization in medical wards: a cross-sectional study in two university hospitals. *International Journal for Quality in Health Care* 1995;7 (3):261-65.

Panayiotou BN, Hanstock G, Sinha SK. Prolonged stay in a unit for acute care and rehabilitation of the elderly. *Medical Audit News* 1995;5(1):10-11.

Panero F, Gruden G, Zucco C, et al. Delayed discharge: a rising cause of concern in general internal medicine wards. *Minerva Medica* 2013;104(1):113-5.

Panis LJGG, Verheggen FWSM, Pop P. To stay or not to stay. The assessment of appropriate hospital stay, a Dutch report. *International Journal for Quality in Health Care* 2002;14(1):55-67.

Rockwood K. Delays in discharge of elderly patients. *Journal of Clinical Epidemiology* 1990;43(9):971-75.

Rodriguez-Vera FJ, Marin Fernandez Y, Sanchez A, et al. Adecuación de los ingresos y estancias en un servicio de Medicina Interna de un hospital de segundo nivel utilizando la versión concurrente del AEP (Appropriateness Evaluation Protocol) [Spanish]. *Anales de Medicina Interna* 2003;20(6):297-300.

Saez GC, Sanchez Lorenzo AA. Evaluation of the suitability and cost of hospitalization for cardiac insufficiency. [Spanish]. *Anales de Cirugía Cardíaca y Vascular* 2004;10 (5):284-92.

San Roman JA, Luquero FJ, de la Fuente L, et al. Assessment of Inappropriate Hospital Stays in a Cardiology Department. [Spanish]. *Revista Española de Cardiología* 2009;62 (2):211-15.

Styrborn K. Early discharge planning for elderly patients in acute hospitals--an intervention study. *Scandinavian Journal of Social Medicine* 1995;23(4):273-85.

Styrborn K, Thorslund M. 'Bed-blockers': Delayed discharge of hospital patients in a nationwide perspective in Sweden. *Health Policy* 1993;26 (2):155-70.

Suarez Garcia F, Oterino de la Fuente D, Peiro S, et al. Factors associated with hospitalization use and appropriateness for patients over 64 years of age. [Spanish]. *Revista Española de Salud Pública* 2001;75 (3):237-48.

Tadros G, Kelson E, Balloo S, et al. Discharge delays in the elderly from Birmingham City Hospital. *International Psychogeriatrics* 2011;23:S246-S47.

Van Straten A, Van Der Meulen JHP, Van Den Bos GAM, et al. Length of hospital stay and discharge delays in stroke patients. *Stroke* 1997;28 (1):137-40.

Victor CR. A survey of the delayed discharge of elderly people from hospitals in an inner-London health district. *Archives of Gerontology and Geriatrics* 1990;10(2):199-205.

Vieira NB, Rodriguez-Vera FJ, Ferrao E, et al. Adequacao do internamento num servico de medicina interna utilizando o Appropriateness Evaluation Protocol. [Portuguese]. *Acta Medica Portuguesa* 2006(19):67-70.

Villalta J, Sisó A, Cereijo A-C, et al. Adecuación de la hospitalización en una unidad de estancia corta de un hospital universitario: un estudio controlado. [Spanish] *Medicina Clínica* 2004;122(12):454-56.

Vuadens P, Schlupe M, Bogousslavsky J, et al. Justification of hospital days and discharge delays in a non-selected population of acute stroke patients. *Journal of the Neurological Sciences* 1996;143 (1-2):132-36.

Zambrana Garcia JL, Delgado Fernandez M, Cruz Caparros G, et al. Predictive factors for inappropriate hospital stays in an internal medicine department. [Spanish]. *Medicina Clínica* 2001;117 (3):90-92.

Appendix 4: Data from studies included in the systematic literature review on prevalence and costs of delayed discharges

Table A.4.1: Description of the studies included in the systematic review

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Barisonzo (2013)	IT	CS	3 days in September 2010	Medical	n.a. (373)	164	44.0%	n.a.
Becchi (2010)	IT	CO	October 2007 - September 2008	Medical	1,330 (2,584)	1,058	40.9%	n.a.
Benson (2006)	GB	CS	1 weekday in December 2003	Surgical	75 (509)	179	35.2%	n.a.
Bianco (2006)	IT	CS	April - July 2004	Medical and surgical	529 (529)	209	39.5%	n.a.
Brown (2010)	GB	CO	3 months	Medical	51 (n.a.)	65	n.a.	n.a.
Bryan (2006)	GB	CO	2 separate weeks between April 2011 and March 2002	Medical and surgical	125 (n.a.)	4,029	n.a.	n.a.
Caminiti (2013)	IT	RCT	12 months assessed on an index day	Medical	Intervention group: n.a. (1,688) Control group: n.a. (1,810)	Intervention group: 885 Control group: 1,046	Intervention group: 52.4% Control group: 57.8%	n.a.

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Carey (2005)	US	CO	25 September - 1 November 2002	Medical	151 (2,762)	373	13.5%	n.a.
Chen (2012)	CA	CO	3 Fiscal years 2007/8 - 2009/10	Medical and surgical	Traumatic brain injury: 2,555 (n.a.) Non-traumatic brain injury: 6,556 (n.a.)	Traumatic brain injury: 58,473 Non-traumatic brain injury: 134,886	n.a.	n.a.
Chin (2001)	SG	CO	December 1996 - March 1997	Medical	172 (2,427)	233	9.6%	53,007
Chopard (1998)	CH	CO	November 1994 - February 1995	Medical	500 (5,665)	1,584	28.0%	n.a.
Costa (2012)	CA	CO	April 2009 - March 2011	Medical and surgical	17,111 (n.a.)	294,198	n.a.	n.a.
De Bey (2004)	NL	CO	July 2001 - June 2002	Medical	123 (2,706)	1,107	40.9%	n.a.
De Coster (2005)	CA	CO	1998/9	Medical and surgical	39 (3,381)	2,188	64.7%	n.a.
DeCoster (1997)	CA	CO	1 year between 1993/4	Medical	2,322 (25,215)	179,951	71.4%	n.a.

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Edirimanne (2010)	NZ	CO	6 months in 2006	Surgical	150 (729)	135	18.4%	n.a.
Epstein (2001)	IL	CO	1994 - 1996	Medical and surgical	5,235 (n.a.)	10,403	n.a.	4,955,268
Falcone (1991)	US	CO	May 1989	Medical and surgical	3,111 (n.a.)	51,954	n.a.	n.a.
Fenn (2000)	GB	CO	25 days in June and July 1994	Medical and surgical	542 (3,393)	1,441	42.5%	n.a.
Fillit (1993)	US	CO	April 1987 - June 1988	Medical	233 (6,291)	1,992	31.7%	n.a.
Foer (2012)	US	CO	2007	Medical and surgical	17 (428)	136	31.8%	255,484
Gallagher (2008)	IE	CO	2 years	Medical and surgical	1,240 (n.a.)	2,436	n.a.	n.a.
Godden (2009)	GB	AD	1 year between 2006/7	Medical and surgical	n.a. (n.a.)	n.a.	1.6%	n.a.
Hanif (2008)	GB	CO	October - December 2005	Psychiatric	50 (2,997)	706	23.6%	330,297

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Hayee (2001)	GB	CO	4 months	n.a.	317 (3,653)	1,477	40.4%	n.a.
Hendy (2012)	GB	CO	7 weeks starting on 12/10/2010	Medical	83 (888)	239	26.9%	99,721
Hermans (1995)	NL	CO	1992	Medical	232 (16,740)	3,348	20.0%	n.a.
Ingold (2000)	CH	CO	July 1995 - February 1996	Medical	196 (2,098)	550	26.2%	n.a.
Jasinarachchi (2009)	GB	CO	February 2007	Medical	158 (n.a.)	682	n.a.	n.a.
Koffman (1996)	GB	CS	15 June 1994	Psychiatric	1,510 (1,510)	368	24.4%	n.a.
Koffman (1996)	GB	CO	8 weeks	Medical and surgical	118 (n.a.)	331	n.a.	165,068
Kossovsky (2002)	CH	QE	December 1994 - February 1995 18 November 1996 - 14 February 1997	Medical	1994/5: 500 (5,665) 1996/7: 498 (6,095)	1994/5: 1,586 1996/7: 1,512	1994/5: 28.0% 1996/7: 24.8%	n.a.

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Lenzi (2014)	IT	CS	First day of an index period of 15 consecutive days between 30 April and 31 May 2011	Medical and surgical	6,325 (6,325)	510	8.1% (3.1%: general surgery; 6.4%: geriatrics; 6.1%: internal medicine; 9.6%: orthopaedics; 15.2%: long- term/rehabilitation)	n.a.
Lewis (2006)	GB	CS	12 September - 18 September 2004	Psychiatric	n.a. (14,788)	2,366	16.0%	n.a.
Majeed (2012)	GB	CO	January - April 2010	Surgical	99 (1,408)	271	19.3%	n.a.
Mayo (1997)	CA	CO	1991	Medical	2,232 (60,279)	25,668	42.6%	n.a.
McClaran (1991)	CA	CO	31 July 1987 - 31 July 1989	Medical and surgical	115 (101,585)	92,705	91.3%	n.a.
Mendoza- Giraldo (2012)	ES	CO	February 2008 - January 2009	Medical	170 (n.a.)	1,603	n.a.	n.a.
Merom (1998)	IL	CS	1 day in the end of November 1995 and 1 day in the end of February 1996	Medical	1,003 (1,003)	182	18.1%	n.a.

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Meschi (2004)	IT	CO	July 2001 - June 2002	Medical and surgical	591 (n.a.)	6,106	n.a.	n.a.
Mohammed (2001)	GB	CO	September - November 1998	Surgical	621 (3,159)	255	8.1%	n.a.
Monteis Catot (2007)	ES	QE	15 days pre- intervention + 9 intervention days between October - November 2003 + 15 days post- intervention	Medical and surgical	Intervention group: n.a. (1,594) Control group: n.a. (1,495)	Intervention group: 619 Control group: 651	Intervention group: 40.0% Control group: 43.5%	n.a.
Mould- Quevedo (2009)	MX	CO	2004	Medical and surgical	724 (3,891)	198	51.9%	45,719

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Moya-Ruiz (2002)	ES	QE	21 days distributed fortnightly between October 1997 - July 1998	Medical and surgical	Intervention group: n.a. (305 pre-intervention; 314 during intervention; 199 post-intervention) Control group: n.a. (176 pre-intervention; 150 during intervention; 108 post-intervention)	Intervention group: 124 pre- intervention; 111 during intervention; 74 post- intervention Control group: 54 pre-intervention; 44 during intervention; 36 post-intervention	Intervention group: 40.7% pre- intervention; 35.3% during intervention; 37.2% post- intervention Control group: 30.7% pre-intervention; 29.3% during intervention; 33.3% after intervention	n.a.
Namdaran (1992)	GB	CS	1 - 7 November 1988 and 1 - 7 August 1990	Medical and surgical	First week: 1,170 (1,170) Second week: 1,171 (1,171)	First week: 224 Second week: 214	First week: 19.1% Second week 18.2%	n.a.
Paillé- Ricolleau (2008)	FR	CS	1 day in Spring 2006	Medical and surgical	219 (219)	71	32.4%	n.a.
Paldi (1995)	IL	CS	1 hospitalization day chosen randomly between August and September 1992	Medical	Hospital A: 147 (147) Hospital B: 150 (150)	Hospital A: 35 Hospital B: 20	Hospital A: 26.1% Hospital B: 14.2%	n.a.
Panayiotou (1995)	GB	CO	April 1993 - March 1994	Medical	15 (2,182)	360	16.5%	n.a.

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Panero (2013)	IT	CO	September 2008 - February 2009	Medical	450 (7,069)	1,699	24.0%	n.a.
Panis (2002)	NL	CS	143 index days selected between October 1998 - April 1999 and August 1999 - February 2000	Medical and surgical	Surgery: 408 (1,991); internal medicine: 176 (899); obstetrics and gynaecology: 480 (1,167); neurology: 314 (966); neurosurgery: 150 (496)	Surgery: 265; internal medicine: 127; obstetrics and gynaecology: 107; neurology: 623; neurosurgery: 105	Surgery: 26.7%; internal medicine: 14.1%; obstetrics and gynaecology: 9.2%; neurology: 66.0; neurosurgery: 21.2%	n.a.
Rockwood (1990)	CA	CO	October 1986 - 31 March 1987	Medical	80 (1,362)	286	21.0%	n.a.
Rodríguez- Vera (2003)	ES	CS	27 February 2002	Medical	59 (n.a.)	n.a.	33.0%	n.a.
Sáez (2004)	CU	CO	January - June 2001	Medical	100 (870)	170	19.5%	7,717
San Román (2009)	ES	CO	2004	Medical	202 (909)	222	27.0%	n.a.

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Styrborn (1995)	SE	QE	3 months in Autumn 1991	Medical and surgical	Intervention group: 180 (1,728) Control group B: 166 (1,743) Control group C: 190 (2,071)	Intervention group: 255 Control group B: 395 Control group C: 629	Intervention group: 14.8% Control group B: 22.7% Control group C: 30.4%	7,319,116
Styrborn (1993)	SE	CS	One day in each year: 1989, 1990, 1991, 1992 (March and September)	Medical and surgical	1989: 3,964 (3,964) 1990: 3,959 (3,959) 1991: 3,512 (3,512) March 1992: 1,752 (1,752) September 1992: 1,491 (1,491)	1989: 3,964 1990: 3,959 1991: 3,512 March 1992: 1,752 September 1992: 1,491	1989: 15.4% 1990: 15.0% 1991: 13.9% March 1992: 7.0% September 1992: 6.6%	4,068,727
Suárez-García (2001)	ES	CO	October 1994 - March 1996	Medical and surgical	367 (6,220)	3,103	49.9%	n.a.
Tadros (2011)	GB	CS	1 day	Medical and surgical	96 (n.a.)	n.a.	60.0%	n.a.
Van Straten (1997)	NL	CO	November 1992 - January 1994	Medical	154 (4,316)	1,554	36.0%	n.a.
Victor (1990)	GB	CS	1 day in May 1988	Medical and surgical	287 (287)	43	15.0%	n.a.

First author (Publication year)	Country code	Study design	Time frame	Wards	Sample size: number of patients (hospitalisation days)	Days of delayed discharges	Proportion of delayed discharges	Total cost of delayed discharges (USD 2011)
Vieira (2006)	PT	CS	13 March 2003	Medical	22 (22)	6	27.3%	n.a.
Villalta (2004)	ES	CC	6 months in 2001	Medical	Cases: 352 (1,317) Controls: 203 (1,268)	Cases: 87 Controls: 247	Cases: 6.9% Controls: 18.7%	n.a.
Vuadens (1996)	CH	CO	5 months	Medical	118 (2,047)	513	25.1%	n.a.
Zambrana- García (2001)	ES	CS	1998	Medical	n.a. (1,046)	176	16.8%	n.a.

Country code: CA– Canada; CH– Switzerland; CU– Cuba; ES– Spain; FR– France; GB– United Kingdom; IE– Ireland; IL– Israel; IT– Italy; MX– Mexico; NL– The Netherlands; NZ– New Zealand; PT– Portugal; SE– Sweden; SG– Singapore; US– United States of America

Study design: AD– Study using administrative data; CC– Case-control study; CO– Cohort study; CS– Cross-sectional study; QE– Quasi-experimental study; RCT– Randomised controlled trial

Appendix 5: Detail of covariates included in the meta-regression on the prevalence of delayed discharges

Table A.5.1: Covariates included in the meta-regression by study

First author (Publication year)	Mean age of the sample participants	Criteria used to determine delayed discharge	Main type of funding of the country's health system	Existence of co-payment in the country of the study
Barisonzo (2013)	<75	AEP or derivative	Tax funded	Co-payment
Becchi (2010)	≥75	Other	Tax funded	Co-payment
Benson (2006)	≥75	Other	Tax funded	No co-payment
Bianco (2006)	≥75	AEP or derivative	Tax funded	Co-payment
Brown (2010)	≥75	Other	Tax funded	No co-payment
Bryan (2006)	n.a.	Other	Tax funded	No co-payment
Caminiti (2013)	≥75	AEP or derivative	Tax funded	Co-payment
Carey (2005)	n.a.	Other	Social or private insurance	Co-payment
Chen (2012)	n.a.	Other	Tax funded	No co-payment
Chin (2001)	≥75	Other	Social or private insurance	Co-payment
Chopard (1998)	<75	AEP or derivative	Social or private insurance	Co-payment
Costa (2012)	≥75	Other	Tax funded	No co-payment
De Bey (2004)	≥75	Other	Social or private insurance	No co-payment
De Coster (2005)	≥75	Other	Tax funded	No co-payment
De Coster (1997)	n.a.	AEP or derivative	Tax funded	No co-payment
Edirimanne (2010)	<75	Other	Tax funded	No co-payment

First author (Publication year)	Mean age of the sample participants	Criteria used to determine delayed discharge	Main type of funding of the country's health system	Existence of co-payment in the country of the study
Epstein (2001)	<75	Other	Social or private insurance	No co-payment
Falcone (1991)	≥75	Other	Social or private insurance	Co-payment
Fenn (2000)	n.a.	Other	Social or private insurance	No co-payment
Fillit (1993)	≥75	Other	Social or private insurance	Co-payment
Foer (2012)	<75	Other	Social or private insurance	Co-payment
Gallagher (2008)	≥75	Other	Tax funded	Co-payment
Godden (2009)	n.a.	Other	Tax funded	No co-payment
Hanif (2008)	≥75	Other	Tax funded	No co-payment
Hayee (2001)	n.a.	Other	Tax funded	No co-payment
Hendy (2012)	<75	Other	Tax funded	No co-payment
Hermans (1995)	<75	Other	Social or private insurance	No co-payment
Ingold (2000)	≥75	Other	Social or private insurance	Co-payment
Jasinarachchi (2009)	≥75	Other	Tax funded	No co-payment
Koffman (1996)	≥75	Other	Tax funded	No co-payment
Koffman (1996)	n.a.	Other	Tax funded	No co-payment
Kossovsky (2002)	<75	AEP or derivative	Social or private insurance	No co-payment
Lenzi (2014)	<75	Other	Tax funded	Co-payment
Lewis (2006)	n.a.	Other	Tax funded	No co-payment
Majeed (2012)	n.a.	AEP or derivative	Tax funded	No co-payment
Mayo (1997)	<75	Other	Tax funded	No co-payment

First author (Publication year)	Mean age of the sample participants	Criteria used to determine delayed discharge	Main type of funding of the country's health system	Existence of co-payment in the country of the study
McClaran (1991)	<75	Other	Tax funded	No co-payment
Mendoza-Giraldo (2012)	≥75	Other	Tax funded	Co-payment
Merom (1998)	<75	Other	No co-payment	Social or private insurance
Meschi (2004)	≥75	Other	Tax funded	Co-payment
Mohammed (2001)	n.a.	Other	Tax funded	No co-payment
Monteis Catot (2007)	<75	AEP or derivative	Tax funded	No co-payment
Mould-Quevedo (2009)	≥75	AEP or derivative	Social or private insurance	No co-payment
Moya-Ruiz (2002)	n.a.	AEP or derivative	Tax funded	No co-payment
Namdaran (1992)	n.a.	Other	Tax funded	No co-payment
Paillé-Ricolleau (2008)	<75	AEP or derivative	Social or private insurance	Co-payment
Paldi (1995)	<75	AEP or derivative	Tax funded	No co-payment
Panayiotou (1995)	n.a.	Other	Tax funded	No co-payment
Panero (2013)	≥75	Other	Tax funded	Co-payment
Panis (2002)	n.a.	AEP or derivative	Social or private insurance	No co-payment
Rockwood (1990)	≥75	Other	Tax funded	No co-payment
Rodríguez-Vera (2003)	<75	AEP or derivative	Tax funded	No co-payment
Sáez (2004)	<75	AEP or derivative	Tax funded	No co-payment
San Román (2009)	<75	AEP or derivative	Tax funded	No co-payment
Styrborn (1995)	≥75	Other	Tax funded	Co-payment
Styrborn (1993)	n.a.	Other	Tax funded	Co-payment

First author (Publication year)	Mean age of the sample participants	Criteria used to determine delayed discharge	Main type of funding of the country's health system	Existence of co-payment in the country of the study
Suárez-García (2001)	<75	AEP or derivative	Tax funded	No co-payment
Tadros (2011)	n.a.	Other	Tax funded	No co-payment
Van Straten (1997)	<75	Other	Social or private insurance	No co-payment
Victor (1990)	n.a.	Other	Tax funded	No co-payment
Vieira (2006)	<75	AEP or derivative	Tax funded	Co-payment
Villalta (2004)	≥75	AEP or derivative	Tax funded	No co-payment
Vuadens (1996)	<75	AEP or derivative	Social or private insurance	Co-payment
Zambrana-García (2001)	n.a.	AEP or derivative	Tax funded	No co-payment

Appendix 6: Quality assessment of each reference included in the systematic review on prevalence and costs of delayed discharges

The quality of randomised controlled trials was assessed using the Jadad scale. A maximum of 5 points could be awarded, with a score of three or more indicating “good” quality. The quality of cohort, cross-sectional and quasi-experimental studies was assessed using the Newcastle-Ottawa scale questionnaires. For ease of understanding, an equal weight was assumed for all items. Studies were classified as “poor” (fulfilled <50% of applicable quality criteria); “fair” (fulfilled between 50% and 80% of applicable quality criteria) and “good” quality (fulfilled >80% of quality criteria).

Table A.6.1: Summary of quality rating for each paper included in the systematic review

First author (Publication year)	Study design	Scale	Selection	Comparability	Outcome	Total Score	%
Barisonzo (2013)	Cross-sectional study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Becchi (2010)	Cohort study	NOS	★ ★ ★ ★	★ ★	★ ★ ★	9/9	100%
Benson (2006)	Cross-sectional study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Bianco (2006)	Cross-sectional study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Brown (2010)	Cohort study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Bryan (2006)	Cohort study	NOS	★ ★ ★		★ ★ ★	6/9	67%
Caminiti (2013)	Randomised controlled trial	Jadad	2	2		4/5	80%
Carey (2005)	Cohort study	NOS	★ ★ ★ ★	★ ★	★ ★ ★	9/9	100%
Chen (2012)	Cohort study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Chin (2001)	Cohort study	NOS	★ ★ ★ ★	★ ★	★ ★ ★	9/9	100%

First author (Publication year)	Study design	Scale	Selection	Comparability	Outcome	Total Score	%
Chopard (1998)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%
Costa (2012)	Cohort study	NOS	★★★	★★	★★★	8/9	89%
De Bey (2004)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%
De Coster (2005)	Cohort study	NOS	★★		★★★	5/9	56%
De Coster (1997)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%
Edirimanne (2010)	Cohort study	NOS	★★★	★★	★★★	8/9	89%
Epstein (2001)	Cohort study	NOS	★★★	★★	★★★	8/9	89%
Falcone (1991)	Cohort study	NOS	★★★	★★	★★	7/9	78%
Fenn (2000)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%
Fillit (1993)	Cohort study	NOS	★★★	★★	★★	7/9	78%
Foer (2012)	Cohort study	NOS	★★		★★★	5/9	56%
Gallagher (2008)	Cohort study	NOS	★★		★★	4/9	44%
Godden (2009)	Study using administrative data	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Hanif (2008)	Cohort study	NOS	★★★★		★★★	7/9	78%
Hayee (2001)	Cohort study	NOS	★	★	★★	4/9	44%
Hendy (2012)	Cohort study	NOS	★★★★	★	★★★	8/9	89%
Hermans (1995)	Cohort study	NOS	★★★	★★	★★★	8/9	89%
Ingold (2000)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%
Jasinarachchi (2009)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%

First author (Publication year)	Study design	Scale	Selection	Comparability	Outcome	Total Score	%
Koffman (1996)	Cross-sectional study	NOS	★ ★ ★	★ ★	★ ★	7/9	78%
Koffman (1996)	Cohort study	NOS	★ ★ ★ ★		★ ★	6/9	67%
Kossovsky (2002)	Quasi-experimental study	NOS	★ ★ ★ ★	★ ★	★ ★ ★	9/9	100%
Lenzi (2014)	Cross-sectional study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Lewis (2006)	Cross-sectional study	NOS	★ ★ ★		★ ★	5/9	56%
Majeed (2012)	Cohort study	NOS	★ ★ ★ ★	★ ★	★ ★ ★	9/9	100%
Mayo (1997)	Cohort study	NOS	★ ★ ★ ★	★ ★	★ ★ ★	9/9	100%
McClaran (1991)	Cohort study	NOS	★ ★ ★		★ ★ ★	6/9	67%
Mendoza-Giraldo (2012)	Cohort study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Merom (1998)	Cross-sectional study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Meschi (2004)	Cohort study	NOS	★ ★ ★		★ ★ ★	6/9	67%
Mohammed (2001)	Cohort study	NOS	★ ★ ★ ★	★	★ ★ ★	8/9	89%
Monteis Catot (2007)	Quasi-experimental study	NOS	★ ★ ★ ★		★ ★ ★	7/9	78%
Mould-Quevedo (2009)	Cohort study	NOS	★ ★ ★ ★	★ ★	★ ★ ★	9/9	100%
Moya-Ruiz (2002)	Quasi-experimental study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Namdaran (1992)	Cross-sectional study	NOS	★ ★ ★		★ ★ ★	6/6	67%
Paillé-Ricolleau (2008)	Cross-sectional study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Paldi (1995)	Cross-sectional study	NOS	★ ★ ★	★ ★	★ ★ ★	8/9	89%
Panayiotou (1995)	Cohort study	NOS	★ ★ ★ ★	★ ★	★ ★ ★	9/9	100%

First author (Publication year)	Study design	Scale	Selection	Comparability	Outcome	Total Score	%
Panero (2013)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%
Panis (2002)	Cross-sectional study	NOS	★★★		★★★	6/9	67%
Rockwood (1990)	Cohort study	NOS	★★★★	★★	★★	8/9	89%
Rodríguez-Vera (2003)	Cross-sectional study	NOS	★★★		★★★	6/9	67%
Sáez (2004)	Cohort study	NOS	★★★★		★★★	7/9	78%
San Román (2009)	Cohort study	NOS	★★★★	★★	★★	8/9	89%
Styrborn (1995)	Quasi-experimental study	NOS	★★★★	★★	★★	8/9	89%
Styrborn (1993)	Cross-sectional study	NOS	★★★		★★★	6/9	67%
Suárez-García (2001)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%
Tadros (2011)	Cross-sectional study	NOS	★★★	★★	★★★	8/9	89%
Van Straten (1997)	Cohort study	NOS	★★★★	★★	★★★	9/9	100%
Victor (1990)	Cross-sectional study	NOS	★★★	★★	★★★	8/9	89%
Vieira (2006)	Cross-sectional study	NOS	★★★		★★★	6/6	83%
Villalta (2004)	Case control study	NOS	★★★	★★	★★★	8/9	89%
Vuadens (1996)	Cohort study	NOS	★★★	★★	★★★	8/9	89%
Zambrana-García (2001)	Cross-sectional study	NOS	★★★	★★	★★★	8/9	89%

NOS: Newcastle-Ottawa

scale Jadad: Jadad scale

Good quality
 Fair quality
 Poor quality

Average 84.1%

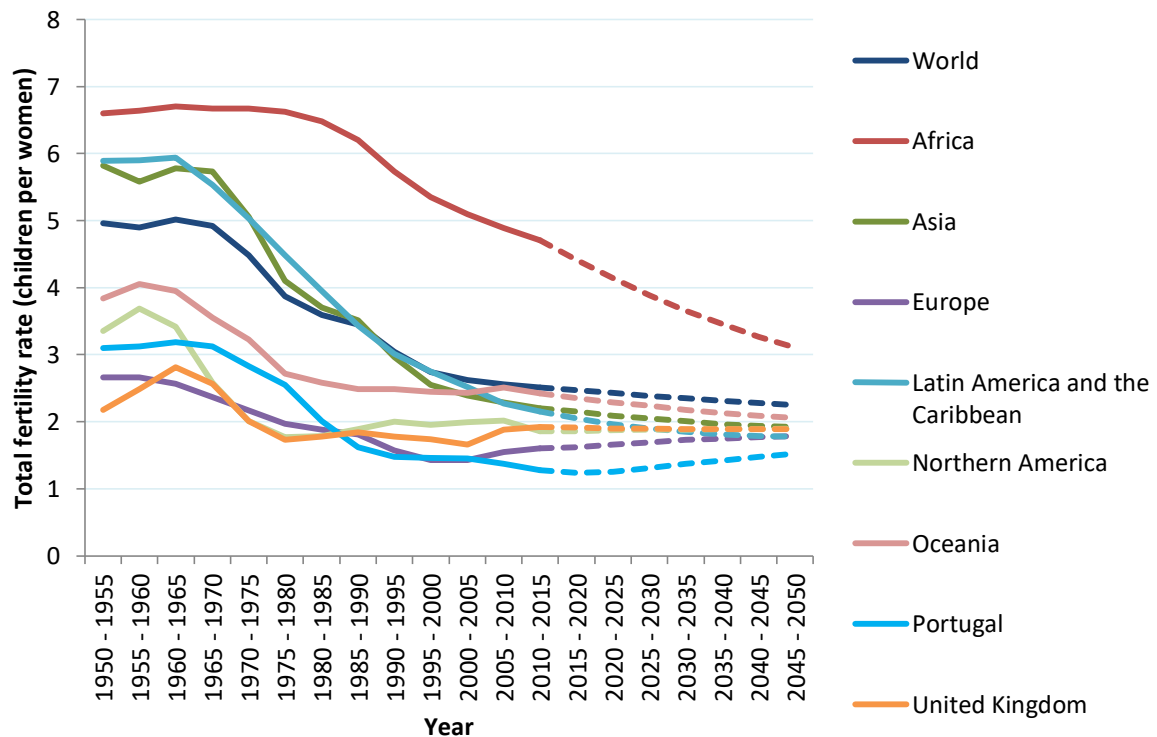
Appendix 7: Demographic drivers of population ageing in Portugal and the United Kingdom

The increase in ageing populations is due to three main factors:

- Decreased fertility;
- Declining mortality rates leading to increased life expectancy;
- Net migration.

Declining fertility rates are the most influential factor in determining the rate of growth in the numbers and proportion of older people in the population in the long run. **Figure A.7.1** shows that total fertility rates have been falling in every region of the world¹⁰³. Whereas in Europe, North America and Oceania this demographic transition started in late 19th century, the decrease in fertility rates only happened in the mid-20th century in Asia, Latin America and Africa¹⁰³.

Figure A.7.1: Total fertility rate for the world and regions (1950-2050)



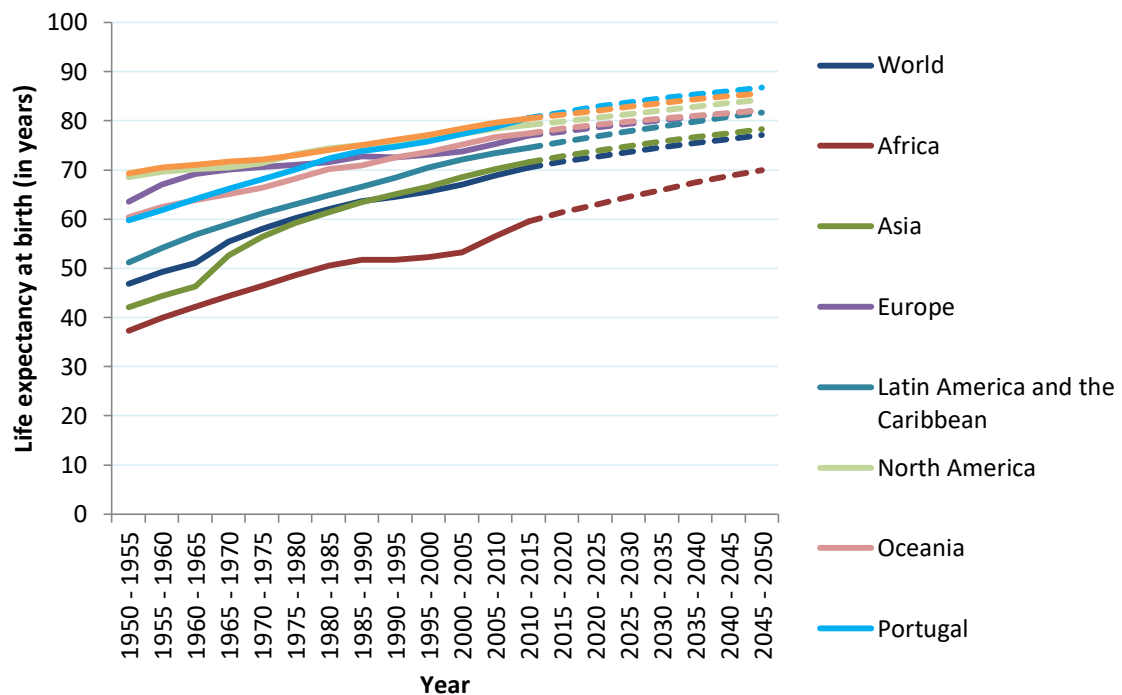
Source: UN (2015), World Population Prospects: the 2015 revision (visited on 3 January 2017)

In the UK, the fertility rate decreased below the replacement rate of 2.1 children per woman in the period 1970-1975, and hit a minimum of 1.6 children per woman between 2000-2005, but since 2010 it has reached a level that is expected to remain stable, at 1.9 children per woman. In Portugal, the fertility rate declined below the replacement rate a decade later than in the UK, reaching a minimum of 1.2 children per woman in 2015, and this is expected to increase slowly over the coming years, reaching 1.5 children per woman in 2050. In both countries fertility rates are expected to remain under the replacement rate over the next 35 years, leading to an ageing of the population¹⁰⁴.

The next main driver of population ageing is increasing life expectancy. **Figure A.7.2** shows that life expectancy has been steadily increasing in all regions of the world since

1950, driven by mortality decline at various ages. Whilst in Africa, Asia, and Latin America and the Caribbean, life expectancy was improved by reduction in mortality in younger ages, in Europe, North America, and Oceania more than half of the total increase in longevity was driven by improvement in survival at age 60 or over¹⁰³.

Figure A.7.2: Life expectancy at birth for the world and regions (1950-2050)



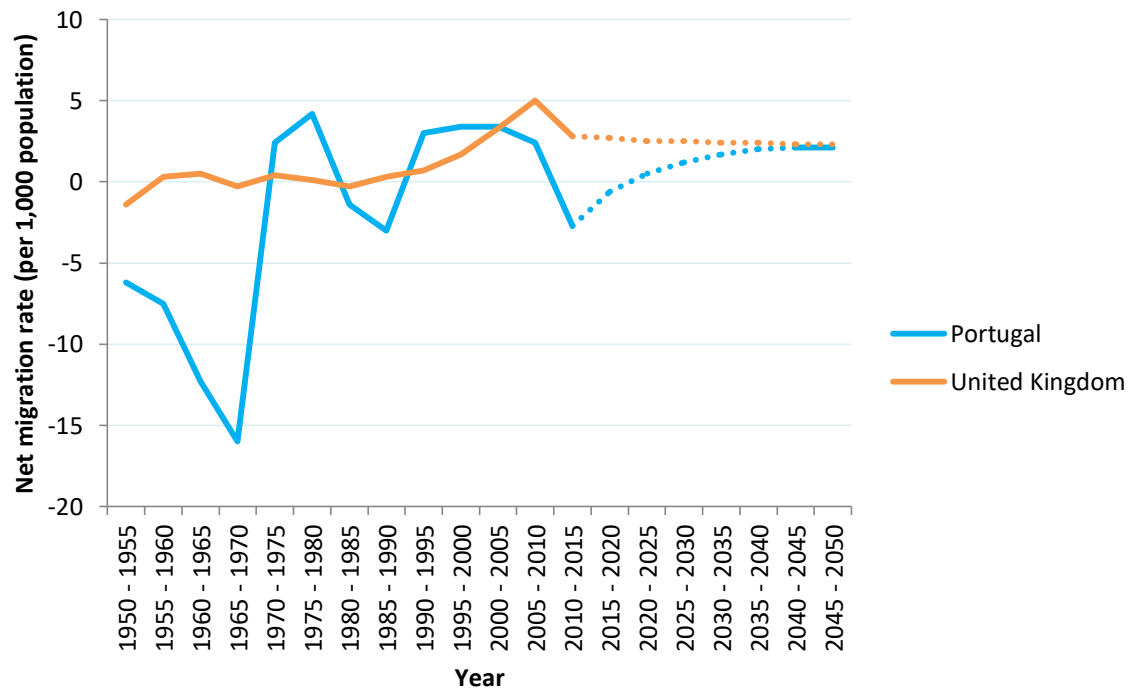
Source: UN (2015), World Population Prospects: the 2015 revision (visited on 3 January 2017)

Life expectancy at birth in Portugal increased by 20 years in a 60-year period reaching an average of 80.6 years for both genders in 2010-2015. In the UK, the increase in life expectancy was smaller (10 years) for the same period, registering an average life expectancy of 80.5 years in 2010-2015. Life expectancy at birth is expected to increase at a slower rate until 2050 in both countries (an additional 7 years in Portugal and 6 in the UK)¹⁰⁴. In 2015, life expectancy at 60 was 24 years both in Portugal and in the UK³³⁸.

Whilst decreases in fertility and mortality are the main drivers of population ageing, migration patterns also contribute to changing population age structures in some regions of the world. Large immigration flows can, in the short run, slow the ageing process of the population but, in the long run, they will contribute to the ageing of the population of that country.

In Portugal, the net migration rate was negative before the end of the fascist regime in 1974, having oscillated since then with higher flows of emigration in periods of financial or political crisis (**Figure A.7.3**). In the UK, net migration has been increasing since 1980-1985, with a more pronounced increase since 2004, coinciding with enlargement of the EU and opening of the UK labour market to workers from these countries. The net migration rate is expected to stabilise at an immigration rate of 2.0 for every 1,000 people living in Portugal after 2030-2035 and at 2.8 immigrants in the UK after 2010-2015. However, these expected positive net migration rates will not be enough to offset the demographic ageing in both countries' populations¹⁰⁴.

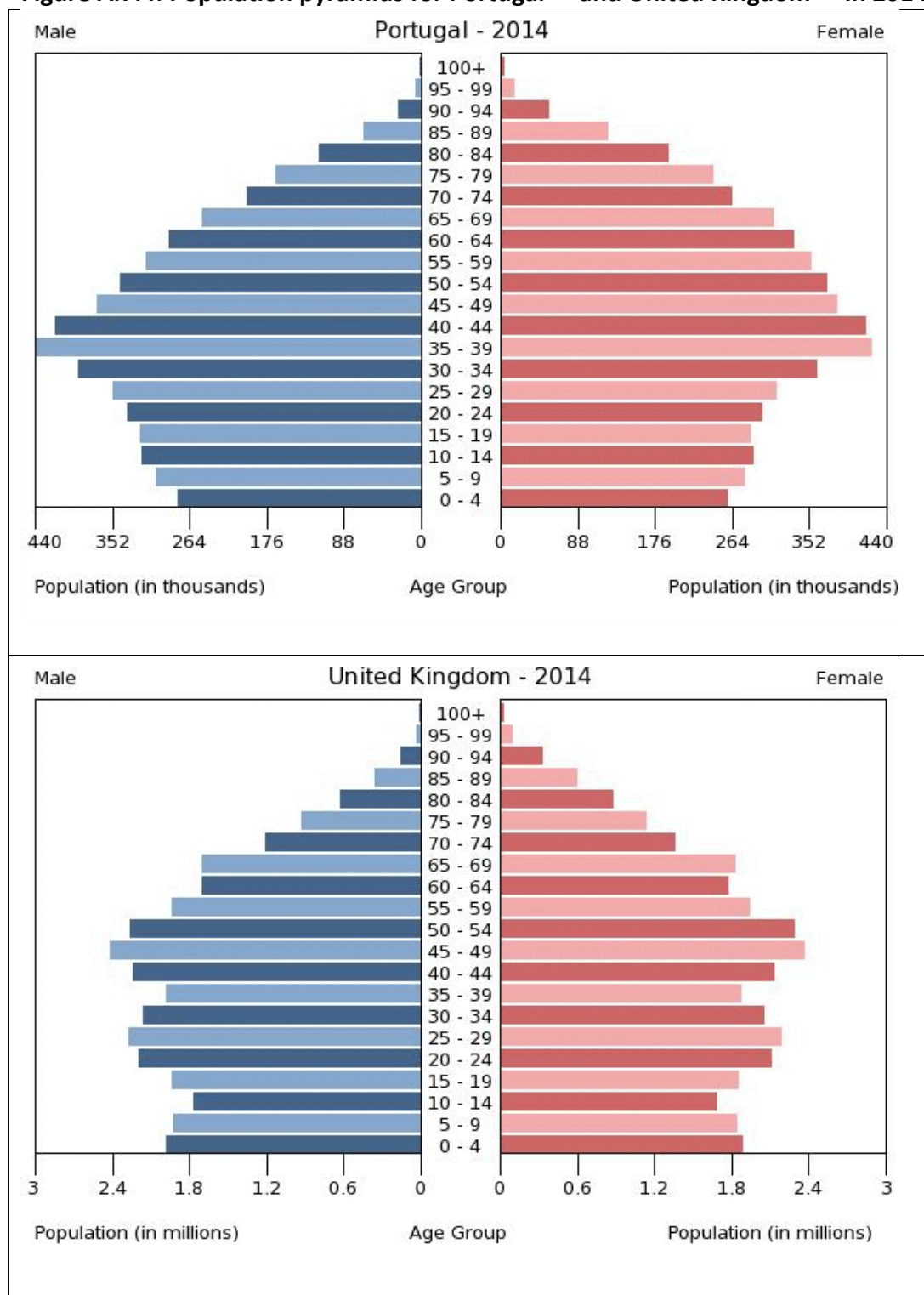
Figure A.7.3: Net migration rate for Portugal and United Kingdom (1950-2050)



Source: UN (2015), World Population Prospects: the 2015 revision (visited on 3 January 2017)

Increasing life expectancies in combination with declining in birth rates and net migration has led to significant changes in population pyramids in Portugal and UK. There has been a decline of the base and an increased representation of top layers indicating an ageing in the population structure of both countries (**Figure A.7.4**).

Figure A.7.4: Population pyramids for Portugal³³⁹ and United Kingdom³⁴⁰ in 2014



Source: Index Mundi, http://www.indexmundi.com/portugal/age_structure.html and http://www.indexmundi.com/united_kingdom/age_structure.html (visited on 20 September 2016)

Appendix 8: Summary of legislation and guidance related to delayed discharges in England

Table A.8.1: Summary of legislation and guidance related to delayed discharges in England

Year	Document	Type	Summary of legislation and guidance
1957	Boucher Report: Survey of Services available to the Chronic Sick and Elderly	Report	Survey of services available to the chronically sick and elderly. Identified patients taking up beds that did not need acute care. Advised measures to prevent hospital admissions in the first place and for voluntary services to offer greater support.
1963	Discharge of Patients from Hospital and Arrangements for After-Care*	Guidance	Guidance on discharging patients from hospital and highlighted that both social and health care needed to be taken into account at discharge.
1988	Griffiths report. Community Care: An Agenda for Action	Report	Basis for the Community Care Act. Griffiths clearly defined roles for the first time: - Hospitals: for elderly patients who needed both medical and nursing supervision over 24 hours (i.e. hospitals should only provide acute care); - Local authorities: lead authority for community care. Responsible for providing all domiciliary and nursing/ residential care. They were given a grant for this and therefore in charge of its funding.
1989	HC(89)5/LAC(89)7 Discharge of patients from Hospital*	Guidance	Update to 1963 guidance.
1990	Community Care Act	Act	Transferred responsibility of residential and nursing care to local authorities. New funding structure that allocated care to patients on basis of need and not income.
1994	Hospital discharge workbook*	Guidance	Detailed guidance and self-auditing tool. First questioned use of the word "discharge" from hospital and described it in terms of "transfer" of care from one service to another. Identified all parties involved in patient care and decision making.
1995	HSG(95)8/LAC(95)5*	Guidance	Update to 1989 guidance but less detailed. Clarifies administrative responsibilities. Puts the consultant to decide when patients no longer need acute care and to determine if they require: - Ongoing NHS care; - NHS rehabilitation; - Residential or nursing home; - Home with package of care (social and/or health); Makes clear that patients "do not have a right to occupy indefinitely an NHS bed"

Year	Document	Type	Summary of legislation and guidance
1995	Carers (recognition and Services) Act	Act	Assessment of needs for those providing care on a regular basis.
1999	Health Act	Act	Puts focus on a Duty of Partnership on health authorities and councils which is reflected in Health Improvement Programmes
2000	Local Government Act	Act	Provides additional powers for councils to work in partnership with other local agencies to improve economic, social and environmental well-being.
2001	Health and Social Care Act	Act	New care trusts providing both health and social care. Local strategic partnerships to bring together public, private, voluntary and community sectors.
2001	Continuing Care: NHS and Local Councils' responsibilities	Circular	Ensure the NHS and local councils agree together how they will meet continuing health and social care needs, bearing in mind that local councils' responsibility for providing nursing care by a registered nurse will be removed by section 49 of the Health and Social Care Act 2001.
2001	NHS Plan, the National Service Framework for Older People and waiting time targets*	Guidance	Standard 3 for intermediate care, aimed to prevent admission to hospital and support delayed discharge. This is to include: - 5,000 extra intermediate care and 1,700 supported intermediate care places, benefiting 150,000 people - rapid response teams and avoidable admission prevention schemes to benefit 70,000 people - 50,000 more people enabled to live at home through additional home care and other support - carers' respite care services extended to further 75,000 carers - 1,000 less beds taken up by delayed discharged patients.
2001	Intermediate Care*	Circular	A new layer of care, between primary care and specialist services, to prevent unnecessary hospital admission, support early discharge and reduce or delay the need for long-term residential care. Should be in the patient's own home or a community setting. In rare cases, in a "discrete" area of an acute hospital. £405 million earmarked. For those who are likely to require 6 weeks of care or less.
2001	£300 million "cash for change" initiative to tackle "bed blocking"*	Press release	Money given to social services over two years to enter longer term agreements placing older people in care homes or giving them other forms of support. Aimed to free up 1,000 hospital beds.
2001	Shifting the Balance of Power within the NHS: securing delivery	Guidance	Does not mention delays in transfers of care directly. However, 75% of NHS funds to be transferred to Primary Care Trusts. These were to assess need, plan and secure health services and forge partnerships with local communities. Care trusts to be established.

Year	Document	Type	Summary of legislation and guidance
2002	Health and Social Care Change Agent Team*	Action Plan	A new team to improve hospital discharge arrangements, encouraging a single health and social care system: - plans and commissions care; - assesses need, targets help to health and social care communities to reduce delayed transfers of care; - supports the implementation of the National Service Framework for Older People impacting on delayed transfers of care; - develops intermediate care and housing.
2002	Delivering the NHS Plan: next steps on investment, next steps on reform.*	Guidance	Increase in National Insurance contributions to give 7.5% per annum increase in NHS spending for five years, 6% per annum increase in social care over three years. System of "cross charging" with social services having to use their increased budget to fund "blocked beds" which they could otherwise use for other services such as improvement of care homes (although NHS hospitals would be fined for readmissions if discharge too early). First mention of pooling of assets from health and social services in the amount of £1 billion. Established the first "Care Trusts" to bring together health and social care for older people. £50 million performance fund for intermediate care.
2002	Milburn's Statement on Services for Older People	Press release	Package of measures to improve services for older people: - faster assessment of need (within 48 hours and completed in 30 days); - Extra funding to help local authorities pay higher fees for people needing higher levels of care in nursing/ residential homes; - Expansion of rehabilitation services and sheltered housing; - Improvement in home care and abolition of charges for home equipment (e.g. hand rails); - Mandatory direct payments to older people so they can choose between provided services or paying for own care; - Double carer grants.
2003	Discharge from hospital: pathway, process and practice*	Guidance	Updates the 1994 guidance. Includes the use of the Change Agent Teams.

Year	Document	Type	Summary of legislation and guidance
2003	Community Care (Delayed Discharges) Act*	Act	Imposes financial penalties for social services departments in England unable to provide the community care services required to discharge patients within set timescales. When patients are medically fit to be transferred out of hospital, social services have three days to organise the discharge. If patients do not leave on day three, social services is fined up to £120 per day per person.
2010	Personal Care at Home Act	Act	Drawn up but never passed by the coalition government that came into power in 2010. Free personal care was to be given at home for those with greatest need, helping 400,000 people and guaranteeing free personal care for top 280,000 most needy. First step to establish National Care Service. Removes the previous time limit of six weeks that local authorities could provide free community care services.
2010	Ready to go? Planning the discharge and the transfer of patients from hospital and intermediate care*	Guidance	Practical resource for practitioners and organisations with advice to support improvements in how they manage the discharge of individuals and transfer of care between settings (gives 10 steps for discharge and 10 operating principles).
2012	Health and Social Care Act	Act	Removed the responsibility for health from central government and kept it at arm's length via NHS England. In turn, NHS England distributed most of the funds to Clinical Commissioning Groups to organise and pay for services. Primary Care Trusts were abolished.
2014	Care Act	Act	Does not talk about delayed transfers of care directly. However, changes to community care should help to improve smooth transition. In particular it focuses on: - preventative measures to reduce or delay care needs; - care costs will be capped at a lifetime cap of £72 thousand and extension to means testing income so that everyone can be means tested below £118 thousand; - all carers can be assessed for support.
2016	Discharging older people from acute hospitals	Report	On the basis of 2016 audit undertaken by National Audit Office. It identified problem areas of delayed transfers of care. In particular that we do not fully understand scale of problem and that, although guidance existed, implementation was poor and that there was no effective line of accountability. It encouraged better communication between NHS and local authorities

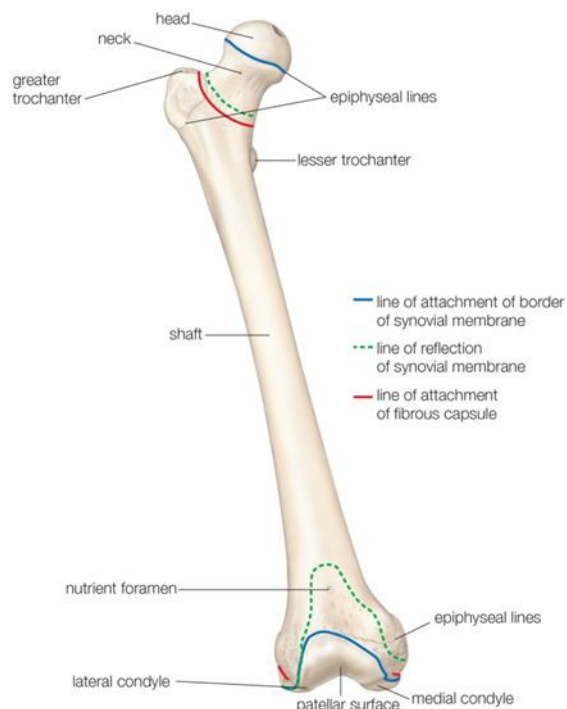
*These documents directly refer to delays in transfer of care, delayed discharges or bed blocking. The remaining documents refer to the implementation of changes which will have impacted delayed transfers of care either indirectly or by default.

Appendix 9: Proximal femoral fractures: anatomy and treatment

Anatomy

The femur is the longest and strongest bone of the human body. It is classified as a long bone and is composed of a central long body (shaft or diaphysis) and two extremities (epiphysis), one on each end (proximal and distal epiphysis)³⁴¹⁻³⁴³.

Figure A.9.1: Anterior view of the right femur

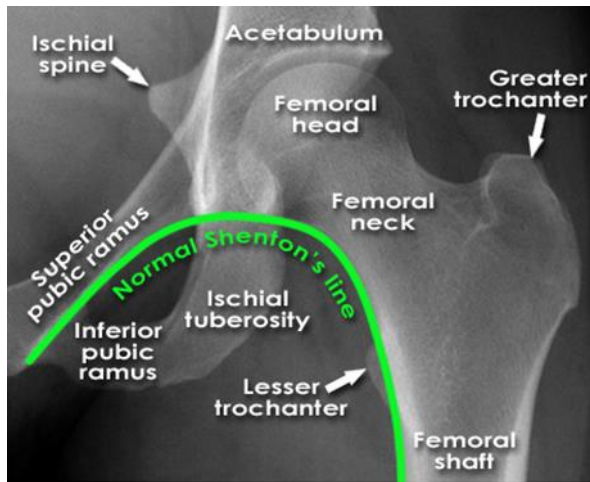


Source: *Encyclopædia Britannica, Inc.* <https://www.britannica.com/science/femur>

The upper extremity or proximal epiphysis is part of the coxal or hip joint, joining the acetabulum, the concave articular surface in the lateral aspect of the iliac bone, in a perfect fit, just allowing some space for the lubricating synovial fluid in between. Numerous muscles move the hip joint, which enables humans to stand and walk, bearing

their own weight as well as a wide range of movements (i.e. flexion, extension, abduction, adduction, rotation, and circumduction)^{341,342,344}. The upper extremity of the femur is divisible into a head, a neck, and a greater and a lesser trochanter.

Figure A.9.2: Composition of the proximal femur (hip x-ray)



Source: http://www.radiologymasterclass.co.uk/tutorials/musculoskeletal/x-ray_trauma_lower_limb/hip_fracture_x-ray#top_1st_img

The head of the femur is a near complete ball-shaped articulating structure that is attached to the acetabulum, secured by ligaments and supported by the femoral neck.

Fractures

Most proximal femoral fractures (PFFs) occur due to osteoporosis. Osteoporosis is the most common chronic bone disease among both women and men¹⁵⁸ and it remains asymptomatic until a pathological fracture occurs¹⁵⁷. The primary investigation of choice in making a diagnosis of PFF is plain radiographs. If there is no fracture visible but there is sufficient clinical suspicion, then further investigation is done through magnetic

resonance imaging or computed tomography scan and, very rarely, an isotope bone scan is requested^{157,345} in some particular situations.

PFF patients almost always feel pain. Very rarely patients will be capable of weight bearing and walking¹⁵⁷, which only happens when the fracture is minimally displaced.

PFFs are classified according to where in the femur the fracture line is mainly located¹⁵⁷. Classification allows identification of a specific fracture type and the best treatment options available for that type.

Table A.9.1: Types of proximal femoral fractures^{157,343,346-348}

General location	Designation	Line of fracture
Intracapsular	<i>Subcapital</i>	Just below the head of the femur (junction with neck)
	<i>Transcervical</i>	Across the middle of the femoral neck
	<i>Basicervical</i>	Base of the femoral neck (junction with intertrochanteric region)
Extracapsular	<i>Transtrochanteric</i>	In between the greater and the lesser trochanters
	<i>Subtrochanteric</i>	Within 5cm distally of the lesser trochanter

Note: all fractures of the diaphysis or distal epiphysis are not classified as hip fractures.

Figure A.9.3: Types of fractures according to the location of the line of fracture



Source: http://www.radiologymasterclass.co.uk/tutorials/musculoskeletal/x-ray_trauma_lower_limb/hip_fracture_x-ray#top_1st_img

All patients requiring surgical intervention should be administered antibiotic prophylaxis¹⁵⁷ and have their procedure done within 48 hours of admission⁴³; according to recent studies, pre-operation traction is no longer proven to have any beneficial effects¹⁵⁷.

There are two types of fracture repair: 1) internal fixation, the bone is realigned and stabilized by insertion of surgical nails, rods, plates or screws; 2) joint replacement with a prosthesis. If the latter is required, there may be the need to change the head of the femur only (i.e. hemiarthroplasty) or to undergo a total hip replacement (where both the femoral head and the acetabular articular surface are substituted)^{349,350}.

Table A.9.2: Surgical procedures according to the type of fracture^{157,343,345,350,351}

General location	Designation	Surgical Interventions (indicated)
Intracapsular	Subcapital	Internal fixation with screws, Hemiarthroplasty or total hip replacement
	Transcervical	Internal fixation with screws, Hemiarthroplasty or total hip replacement
	Basicervical	Closed reduction, internal fixation with dynamic hip screw + derotation screw
Extracapsular	Trochanteric	Sliding hip screw, including: dynamic hip screw, compression hip screw and ambi hip screw.
	Transtrochanteric	Sliding pin plate, Intramedullary nail, compression hip screw
	Subtrochanteric	Sliding hip screw, intramedullary nail

All surgical interventions carry a certain level of risk and in the case of orthopaedic PFF surgery, these mainly consist of the need for revision (additional operations) due to periprosthetic fracture or dislocation of the prosthesis or fixating devices (such as pins, nails and plates), haematoma, and infection or sepsis^{157,349}. Furthermore, there are several postoperative medical complications associated with this procedure, the most frequent being: cognitive decline (delirium) and neurological alterations, cardiopulmonary effects, venous thromboembolism, gastrointestinal tract bleeding, urinary tract complications, perioperative anaemia, electrolyte and metabolic disturbances, and pressure ulcers³⁵².

Post-operative analgesia is crucial as optimal pain management brings comfort and confidence. The healthcare team should aim for full weight bearing mobilisation on the first day post-operation if no contra-indications are noted¹⁵⁷. For the time that the person is laying on his/her bed, regular pressure area skin inspections, regular repositioning and

adequate nutrition are of great importance to prevent pressure sores³⁵³, known to delay discharges and consume important resources.

Nevertheless, after a first fragility fracture and despite the high levels of quality of care while in the hospital, 80% of those people will suffer secondary fractures within three years of the original episode¹⁵⁸, justifying the British Orthopaedics Association's opinion that secondary prevention, mainly post-hospital discharge has been the Achilles' tendon of PFF care¹⁵⁷.

According to the first ever UK national evaluation of osteoporosis and falls care³⁵⁴ only 25% of the females over 75 years, with previous medical history of fragility fracture were receiving treatment for osteoporosis. Surveys were conducted in the UK to explore the reasons for the lack of integrated care for fragility fracture patients³⁵⁵⁻³⁵⁷ with the study conducted by Chami et al.³⁵⁵ indicating that the main reason was that both orthopaedic surgeons and general practitioners consistently fail to initiate a treatment course for chronic bone diseases by themselves. It is true that metabolic bone diseases are not the specialist field of any of them but, as recent reports revealed, with a good level of efficiency and coordination within the multidisciplinary team, continuing high quality care for these patients can be achieved¹⁵⁷.

As recommended in the Portuguese and English care guidelines for osteoporosis, published by the Direcção Geral de Saúde and the National Institute for Health and Clinical Excellence, respectively, the use of bisphosphonates should be classed as the first line treatment for prevention of pathological fractures and the use of calcium and vitamin

D supplements are also corroborated¹⁵⁸. In recent years there has been an increased emphasis on expedited discharge from an acute hospital with continuing care provided in a community setting. However, with such high pressures on the health and social care systems and large numbers of PFFs, in reality it is not always practical to discharge all patients with a PFF through this pathway.

As Mitchell et al.¹⁵⁸ point out in their work, more active involvement of the Clinical Commissioning Groups in England is needed to improve the support and leadership provided to the Primary Care Trusts to ensure that the NICE guidelines for people who sustain pathological fractures are followed and that those same people may be followed-up, aiming to reduce the number of cases of multiple pathological fractures over short periods of time. The same authors suggest that this “dead space” should be filled in by a nationwide network of Fracture Liaison Services (FLS), which are a specialized team composed of an orthopaedic nurse specialist and a medical specialist in metabolic bone disease. Such teams would be responsible for the secondary prevention of pathologic fractures, identifying potential high risk patients through an active case-finding system, taking place in both hospital inpatient and outpatient departments.

This approach seems to be efficient as the existing FLS in the United Kingdom have proven to have followed up over 95% of the fragility fracture patients admitted to the hospitals where they were based¹⁵⁸.

Appendix 10: Letters of approval to conduct the study at the Hospital de Santa Maria

CENTRO HOSPITALAR
LISBOA NORTE, EPE



HOSPITAL DE
SANTAMARIA



Hospital
Pulido Valente

Exma. Senhora
Dra. Filipa Isabel Trigo Landeiro
Avenida da República, n.º 22 - 8º Esq.
1050 - 192 LISBOA

Refª PCA - 22.MAIO.2012 - 0351

Assunto: Projecto de Investigação "The cost of loneliness among older people to the National Health Service".

Tenho o prazer de informar V. Exa. que o projecto de investigação em epígrafe foi aprovado pela Comissão de Ética para a Saúde do CHLN, e autorizado pelo Conselho de Administração em 18 de Maio de 2012.

Com os melhores cumprimentos,

O Presidente do Conselho de Administração

Prof. Dr. J. A. Correia da Cunha

/MC

CONSELHO DE
ADMINISTRAÇÃO

Av. Professor Egas Moniz
1649-035 LISBOA
Tel: 217 805 000 - Fax: 217 805 610

www.chln.pt

Alameda das Linhas de Torres, 117
1769-001 LISBOA
Tel: 217 548 000 - Fax: 217 548 215

www.chln.pt

1



Presidente

Prof. Doutor João Lobo Antunes (CHLN/FML)

Vice-Presidente

Profª. Doutora Maria Luisa Figueira /CHLN)

Membros

Dra. Ana Luisa Figueiras (CHLN)
Prof. Doutor Carlos Calhaz Jorge (CHLN)
Dra. Elisa Pedro (CHLN)
Padre Fernando Sampaio (CHLN)
Dra. Graça Nogueira (CHLN)
Mestre Entª. Isabel Corte-Real (CHLN)
Dr. Mário Miguel Rosa (CHLN)
Prof. Doutor António Barbosa (FML)
Prof. Doutor António Vaz Carneiro (FML)
Prof. Doutor João Lavínha (FML)
Prof. Doutor Manuel Villaverde Cabral (FML)
Prof. Doutor José Barata Moura (FML)
Profª. Doutora Maria Do Céu Rueff (FML)

Exma. Senhora

Dra. Filipa Isabel Trigo Landeiro

Avenida da República, N° 22 - 8° Esq.

1050-192 LISBOA

Lisboa, 26 de Abril de 2012

Assunto: Projecto de Investigação "The cost of loneliness among older people to the National Health Service"

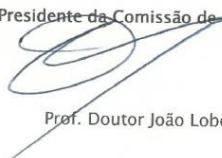
Relator - Profª. Doutora Maria Luisa Figueira

Pela presente informamos que o aditamento ao projecto citado em epígrafe obteve na reunião realizada em 29 de Março de 2012, parecer favorável da Comissão de Ética.

Mais se informa que o referido Estudo foi enviado ao Director Clínico, Prof. Dr. Correia da Cunha, a fim de obter a autorização final para a sua realização.

Com os melhores cumprimentos,

O Presidente da Comissão de Ética para a Saúde


Prof. Doutor João Lobo Antunes

**COMISSÃO DE
ÉTICA CHLN/FML**

Secretariado: Ana Cristina Pimentel Neves e Patrícia Fernandes
Tel. - 21 780 54 05; Fax - 21 780 56 90
Av. Professor Egas Moniz
1649-035 LISBOA

www.chln.pt

Alameda das Linhas de Torres, 117
1769-001 LISBOA
Tel: 217 548 000 - Fax: 217 548 215

Appendix 11: Case report form for the Hospital de Santa Maria

Mini Mental State Examination

Avaliação inicial destinada a determinar a capacidade de consentir do doente.

1. Orientação (1 ponto por cada resposta correcta)

Em que ano estamos? _____
Em que mês estamos? _____
Em que dia do mês estamos? _____
Em que dia da semana estamos? _____
Em que estação do ano estamos? _____

Nota: _____

Em que país estamos? _____
Em que distrito estamos? _____
Em que terra vive? _____
Em que casa estamos? _____
Em que piso estamos? _____

Nota: _____

2. Retenção (contar 1 ponto por cada palavra correctamente repetida)

“Vou dizer três palavras; queria que as repetisse, mas só depois de eu as dizer todas; procure ficar a sabê-las de cor”.

Pêra _____
Gato _____
Bola _____

Nota: _____

3. Atenção e Cálculo (1 ponto por cada resposta certa. Se der uma errada mas depois continuar a subtrair bem, consideram-se as seguintes como correctas. Parar ao fim de 5 respostas).

“Agora peço-lhe que me diga quantos são 30 menos 3 e depois ao número encontrado volta a tirar 3 e repete assim até eu lhe dizer para parar.”

27 – 24 – 21 – 18 – 15

Nota: _____

4. Evocação (1 ponto por cada resposta correcta).

“Veja se consegue dizer as três palavras que pedi há pouco para decorar”.

Pêra _____
Gato _____
Bola _____

Nota: _____

5. Linguagem (1 ponto por cada resposta certa)

a. “Como se chama isto?” Mostrar os objectos:

Relógio _____

Lápis _____

Nota: _____

b. “Repita a frase que eu vou dizer: O RATO ROEU A ROLHA”

Nota: _____

c. “Quando eu lhe der esta folha de papel, pegue nela com a mão direita, dobre-a ao meio e ponha sobre a mesa”; dar a folha segurando com as duas mãos.

Pega com a mão direita _____

Dobra ao meio _____

Coloca onde deve _____

Nota: _____

d. “Leia o que está neste cartão e faça o que lá diz”. Mostrar um cartão com a frase bem legível, “FECHE OS OLHOS”; sendo analfabeto lê-se a frase.

Fechou os olhos _____

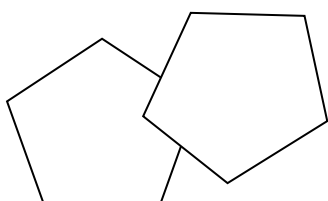
Nota: _____

e. “Escreva uma frase inteira aqui”. Deve ter sujeito e verbo e fazer sentido; os erros gramaticais não prejudicam a pontuação.

Nota: _____

6. Habilidade Construtiva (1 ponto pela cópia correcta)

Deve copiar um desenho. Dois pentágonos parcialmente sobrepostos, cada um deve ficar com 5 lados, dois dos quais intersectados. Não valorizar tremor ou rotação.



Nota: _____

TOTAL (Máx. 30 pontos): _____

Considera-se com defeito cognitivo: analfabetos ≤ 15 pontos

1 a 11 anos de escolaridade ≤ 22 pontos

com escolaridade superior a 11 anos ≤ 27 pontos

QUESTIONÁRIO

Este questionário destina-se à realização de um trabalho de investigação na área de saúde pública sendo garantido o total anonimato, confidencialidade e proteção dos seus dados. Se concordar participar, pedimos-lhe que responda a todas as questões sendo sincero nas suas respostas.

O questionário está dividido em quatro partes e para cada uma delas apresentamos as respetivas instruções de preenchimento.

Obrigada pela sua colaboração!

Parte I

Para cada item apresentado escolha a opção que melhor se ajustar à sua situação particular, preenchendo os espaços deixados em branco, quando for caso disso.

1.1 – Género: 1.Masculino [] 2.Feminino []

1.2 – Idade: [] anos e [] meses]

1.3 – Naturalidade: _____

1.4 – Etnia: 1.Caucasiana [] 2.Negra [] 3.Asiática []
4.Latino-americana [] 5.Outra []

Qual? _____

1.5 – Freguesia onde reside: _____

1.6 – Estado Civil: 1.Solteiro(a) [] 2.Casado(a) []
3.Divorciado(a)/Separado (a) [] 4.Viúvo (a) []
5.União de facto [] 6. Outro []

Qual? _____

1. Solteiro	[]	
2. Com Espos(a) / Companheiro(a)	[]	Idade: _____
3. Com Filho(a)	[]	Idade: _____
4. Com Mãe / Pai / Sogra(o)	[]	Idade: _____
5. Com Irmão / Irmã	[]	Idade: _____
6. Com Neto / Neta	[]	Idade: _____
7. Com outro familiar	[]	Idade: _____
8. Com outro não familiar	[]	Idade: _____

1.8 – A casa em que vive é:

- 1.9 – Tem filhos?** 1.Sim [] 2.Não []
 3.Quantos? _____

1.Não frequentou a escola	[]	2.Ensino primário	[]
3.Ensino liceal / industrial / comercial até ao 5º ano	[]		
4.Ensino liceal / industrial / comercial até ao 7º ano / secções	[]		
5.Ensino médio (bacharelato)	[]		
6.Ensino superior	[]		

1.12 – Nível de rendimentos mensal:

1.Inferior a 250€	[]	2.Entre 250€ e 500€	[]
3.Entre 501€ e 750€	[]	4. Entre 751€ e 1.000€	[]
5.Entre 1.001€ e 1.500€	[]	6.Entre 1.501€ e 2.000€	[]
7.Entre 2.001€ e 3.000€	[]	8.Superior a 3.001€	[]
9.Não sabe	[]	10.Não responde	[]

1.13 – De um modo geral, diga que a sua saúde é:

1. Muito boa	[]	2. Boa	[]
3. Razoável	[]	4. Má	[]
5. Muito Má	[]	6. Não sabe	[]
7. Não responde	[]		

1.14 – Tem alguma doença ou incapacidade de longa duração? (Por longa duração entende-se que tenha durado, ou que seja expectável que dure, mais de 6 meses)

1. Sim	[]	2. Não	[]
3. Não sabe	[]	4. Não responde	[]

1.15 – Durante os últimos seis meses, em que medida tem estado limitado nas suas atividades diárias devido a um problema de saúde?

1. Bastante limitado	[]	2. Moderadamente limitado	[]
3. Nada limitado	[]	4. Não sabe	[]
5. Não responde	[]		

1.16 – Nos últimos 12 meses, teve algum internamento hospitalar?

1. Sim	[]	2. Não	[]
3. Não sei	[]	4. Não responde	[]

1.17 – Quantos episódios de internamento hospitalar teve nos últimos 12 meses?

1. _____ episódios			
2. Não sei	[]	3. Não responde	[]

1.18 – Nos últimos 12 meses, houve alguma ocasião em que tivesse indicação médica para ser hospitalizado, mas que não o tivesse feito?

1. Sim	[]	2. Não	[]
3. Não sei	[]	4. Não responde	[]

1.19 – Qual foi a principal razão para não ser hospitalizado?

1. Teve dificuldades financeiras
 2. A lista de espera era muito longa
 3. Falta de tempo por razões profissionais, prestação de cuidados a crianças ou outras
 4. Distância / falta de meios de transporte
 5. Medo da cirurgia / tratamento
 6. Outra razão
- Qual? _____

1.20 – Quando foi a última vez que foi ao seu médico de família?

1. Menos de 1 ano	[]	2. Mais de 1 ano	[]
3. Nunca	[]	4. Não tenho	[]
5. Não responde	[]	6. Não sei	[]

1.21 – Nas últimas 4 semanas, quantas vezes foi ao seu médico de família?

1. _____ vezes	
2. Não sabe	[]
3. Não responde	[]

1.22 – Quando foi a última vez que consultou um especialista médico ou cirúrgico?

1. Menos de 1 ano	[]	2. Mais de 1 ano	[]
3. Nunca	[]	4. Não sei	[]
5. Não respondo	[]		

1.23 – Sofreu alguma queda nos últimos 12 meses?

1. Sim	[]	2. Não	[]
3. Não sei	[]	4. Não respondo	[]

1.24 – Quantas vezes caiu nos últimos 12 meses?

1. _____ vezes

1.25 – Nalguma dessas quedas, magoou-se o suficiente para requerer tratamento médico?

1. Sim	[]	2. Não	[]
3. Não sei	[]	4. Não respondo	[]

1.26 – Já efectuou alguma cirurgia de substituição de uma articulação? Qual?

1. Sim	[]		
Qual? _____			
2. Não	[]	3. Não sei	[]
4. Não respondo	[]		

1.27 – Neste momento, o que é que ajudaria a melhorar a sua qualidade de vida?

Parte II

AVALIAÇÃO DE GANHOS EM SAÚDE - EQ-5D-5L

Assinale com uma cruz apenas um quadrado de cada um dos seguintes grupos, indicando qual das afirmações descreve melhor o seu estado de saúde hoje.

MOBILIDADE

Não tenho problemas em andar	[] 1
Tenho ligeiros problemas em andar	[] 2
Tenho alguns problemas em andar	[] 3
Tenho graves problemas em andar	[] 4
Tenho de estar na cama	[] 5

CUIDADOS PESSOAIS

Não tenho problemas em cuidar de mim	[] 1
Tenho ligeiros problemas a lavar-me ou vestir-me	[] 2
Tenho alguns problemas a lavar-me ou vestir-me	[] 3
Tenho graves problemas a lavar-me ou vestir-me	[] 4
Sou incapaz de me lavar ou vestir sozinho/a	[] 5

ACTIVIDADES HABITUAIS (ex. trabalho, estudos, actividades domésticas, actividades em família ou de lazer)

Não tenho problemas em desempenhar as minhas actividades habituais	[] 1
Tenho ligeiros problemas em desempenhar as minhas actividades habituais	[] 2
Tenho alguns problemas em desempenhar as minhas actividades habituais	[] 3
Tenho graves problemas em desempenhar as minhas actividades habituais	[] 4
Sou incapaz de desempenhar as minhas actividades habituais	[] 5

DOR / MAL ESTAR

Não tenho dores ou mal estar	[] 1
Tenho dores ou mal estar ligeiros	[] 2
Tenho dores ou mal estar moderados	[] 3
Tenho dores ou mal estar graves	[] 4
Tenho dores ou mal estar extremos	[] 5

ANSIEDADE / DEPRESSÃO

Não estou ansioso/a ou deprimido/a	[] 1
Estou ligeiramente ansioso/a ou deprimido/a	[] 2
Estou moderadamente ansioso/a ou deprimido/a	[] 3
Estou bastante ansioso/a ou deprimido/a	[] 4
Estou extremamente ansioso/a ou deprimido/a	[] 5

Comparado com o meu nível geral de saúde durante os últimos 12 meses, o meu estado de saúde hoje é:

Melhor	[] 1
O mesmo	[] 2
Pior	[] 3

Copyright © EuroQol Group

Copyright © Versão Portuguesa, 1997, 1998. Centro de Estudos e Investigação em Saúde da Universidade de Coimbra

Parte III

ESCALA DE REDE DE APOIO SOCIAL DE LUBBEN (Lubben, 1998)

Seguem-se algumas questões sobre vários aspetos da sua relação com outras pessoas. Cada pergunta tem várias respostas possíveis. Assinale a quadrícula que melhor corresponde à sua situação. Por favor, assinale apenas uma quadrícula por questão.

REDE FAMILIAR

3.1 – Quantos familiares vê ou fala pelo menos uma vez por mês? (Incluir parentes por afinidade)

3.1.1 – Zero	[] 0
3.1.2 – Um	[] 1
3.1.3 – Dois	[] 2
3.1.4 – Três ou quatro	[] 3
3.1.5 – Cinco a oito	[] 4
3.1.6 – Nove ou mais	[] 5

3.2 – Sobre o familiar com quem contacta mais, qual a frequência com que fala ou se encontra com essa pessoa?

3.2.1 – De meses a meses	[] 0
3.2.2 – Mensalmente	[] 1
3.2.3 – Algumas vezes por mês	[] 2
3.2.4 – Semanalmente	[] 3
3.2.5 – Algumas vezes por semana	[] 4
3.2.6 – Diariamente	[] 5

3.3 – Quantos familiares considera que lhe são próximos, ou seja, com quantos deles se sente à vontade para falar sobre assuntos pessoais, ou a quem pode pedir ajuda?

3.3.1 – Zero	[] 0
3.3.2 – Um	[] 1
3.3.3 – Dois	[] 2
3.3.4 – Três ou quatro	[] 3
3.3.5 – Cinco a oito	[] 4
3.3.6 – Nove ou mais	[] 5

REDE DE AMIGOS

3.4 – Tem amigos íntimos, isto é, amigos com quem se sente à vontade, com quem pode falar sobre assuntos pessoais ou a quem pode pedir ajuda?

3.4.1 – Zero	[] 0
3.4.2 – Um	[] 1
3.4.3 – Dois	[] 2
3.4.4 – Três ou quatro	[] 3
3.4.5 – Cinco a oito	[] 4
3.4.6 – Nove ou mais	[] 5

3.5 – Com quantos desses amigos se encontra ou conversa, pelo menos uma vez por mês?

3.5.1 – Zero	[] 0
3.5.2 – Um	[] 1
3.5.3 – Dois	[] 2
3.5.4 – Três ou quatro	[] 3
3.5.5 – Cinco a oito	[] 4
3.5.6 – Nove ou mais	[] 5

3.6 – Diga quantas vezes se encontra ou conversa com o amigo com quem contacta mais?

3.6.1 – Menos do que uma vez por mês	[] 0
3.6.2 – Mensalmente	[] 1
3.6.3 – Algumas vezes por mês	[] 2
3.6.4 – Semanalmente	[] 3
3.6.5 – Algumas vezes por semana	[] 4
3.6.6 – Diariamente	[] 5

RELAÇÕES DE CONFIANÇA

3.7 – Quando tem que tomar alguma decisão importante, tem alguém com quem conversar?

3.7.1 – Sempre	[] 5
3.7.2 – Com muita frequência	[] 4
3.7.3 – Frequentemente	[] 3
3.7.4 – Às vezes	[] 2
3.7.5 – Raramente	[] 1
3.7.6 – Nunca	[] 0

3.8 – Quando outras pessoas que conhece têm alguma decisão importante a tomar, falam consigo sobre esse assunto?

3.8.1 – Sempre	[] 5
3.8.2 – Com muita frequência	[] 4
3.8.3 – Frequentemente	[] 3
3.8.4 – Às vezes	[] 2
3.8.5 – Raramente	[] 1
3.8.6 – Nunca	[] 0

AJUDA AOS OUTROS

3.9 – Há alguém à espera que faça algo por ele/ela? (Por exemplo, ir às compras, fazer o jantar, fazer pequenas reparações, limpar a casa, cuidar de crianças, etc.)

3.9.1 – Não	[] 0	Por favor responda à pergunta 3.10
3.9.2 – Sim	[] 5	Por favor passe para a pergunta 3.11

3.10 – Ajuda alguém em coisas como ir às compras, preencher formulários, fazer reparações, cuidar de crianças, etc.?

3.10.1 – Com muita frequência	[] 4
3.10.2 – Frequentemente	[] 3
3.10.3 – Às vezes	[] 2
3.10.4 – Raramente	[] 1
3.10.5 – Nunca	[] 0

COM QUEM VIVE

3.11 – Vive só ou com outras pessoas?

3.11.1 – Vive com o cônjuge e/ou com outros familiares ou amigos	[] 5
3.11.2 – Vive com pessoas que não lhe são nada	[] 4
3.11.3 – Vive com alguém a quem paga uma mensalidade	[] 1
3.11.4 – Vive só	[] 0

Parte IV

ESCALA MODIFICADA DE BARTHEL

Seguem-se algumas questões sobre a capacidade de realização de actividades básicas de vida diária. Cada pergunta tem várias respostas possíveis. Assinale com um círculo a que melhor corresponde à sua situação. Por favor, assinale apenas uma resposta por questão.

CATEGORIA 1: HIGIENE PESSOAL

1. O paciente é incapaz de realizar higiene pessoal sendo dependente em todos os aspetos.
2. Paciente necessita de assistência em todos os passos da higiene pessoal.
3. Alguma assistência é necessária em um ou mais passos da higiene pessoal.
4. Paciente é capaz de conduzir a própria higiene, mas requer mínima assistência antes e/ou depois da tarefa.
5. Paciente pode lavar as mãos e face, limpar os dentes e barbear, pentear ou maquiar-se.

CATEGORIA 2: BANHO

1. Totalmente dependente para banhar-se.
2. Requer assistência em todos os aspetos do banho.
3. Requer assistência para transferir-se, lavar-se e/ou secar-se; incluindo a incapacidade em completar a tarefa pela condição ou doença.
4. Requer supervisão por segurança no ajuste da temperatura da água ou na transferência.
5. O paciente deve ser capaz de realizar todas as etapas do banho, mesmo que necessite de equipamentos, mas não necessita que alguém esteja presente.

CATEGORIA 3: ALIMENTAÇÃO

1. Dependente em todos os aspetos e necessita ser alimentado.
2. Pode manipular os utensílios para comer, usualmente a colher, porém necessita de assistência constante durante a refeição.
3. Capaz de comer com supervisão. Requer assistência em tarefas associadas, como colocar leite e açúcar no chá, adicionar sal e pimenta, passar manteiga, virar o prato ou montar a mesa.
4. Independência para se alimentar um prato previamente montado, sendo a assistência necessária para, por exemplo, cortar carne, abrir uma garrafa ou um frasco. Não é necessária a presença de outra pessoa.
5. O paciente pode se alimentar de um prato ou bandeja quando alguém coloca os alimentos ao seu alcance. Mesmo tendo necessidade de algum equipamento de apoio, é capaz de cortar carne, serve-se de temperos, passar manteiga, etc.

CATEGORIA 4: TOILETE

1. Totalmente dependente no uso vaso sanitário.
2. Necessita de assistência no uso do vaso sanitário
3. Pode necessitar de assistência para se despir ou vestir, para transferir-se para o vaso sanitário ou para lavar as mãos.
4. Por razões de segurança, pode necessitar de supervisão no uso do sanitário. Um penico pode ser usado a noite, mas será necessária assistência para seu esvaziamento ou limpeza.
5. O paciente é capaz de se dirigir e sair do sanitário, vestir-se ou despir-se, cuida-se para não se sujar e pode utilizar papel higiênico sem necessidade de ajuda. Caso necessário, ele pode utilizar uma comadre ou penico, mas deve ser capaz de os esvaziar e limpar.

CATEGORIA 5: SUBIR ESCADAS

1. O paciente é incapaz de subir escadas.
2. Requer assistência em todos os aspectos relacionados a subir escadas, incluindo assistência com os dispositivos auxiliares.
3. O paciente é capaz de subir e descer, porém não consegue carregar os dispositivos, necessitando de supervisão e assistência.
4. Geralmente, não necessita de assistência. Em alguns momentos, requer supervisão por segurança.
5. O paciente é capaz de subir e descer, com segurança, um lance de escadas sem supervisão ou assistência mesmo quando utiliza os dispositivos.

CATEGORIA 6: VESTUÁRIO

1. O paciente é dependente em todos os aspectos do vestir e incapaz de participar das atividades.
2. O paciente é capaz de ter algum grau de participação, mas é dependente em todos os aspectos relacionados ao vestuário.
3. Necessita assistência para se vestir ou se despir.
4. Necessita assistência mínima para abotoar, prender o soutien, fechar o zipper, amarrar sapatos, etc.
5. O paciente é capaz de vestir-se, despir-se, amarrar os sapatos, abotoar e colocar um colete ou órtese, caso eles sejam prescritos.

CATEGORIA 7: CONTROLE ESFINCTERIANO (BEXIGA)

1. O paciente apresenta incontinência urinária.
2. O paciente necessita de auxílio para assumir a posição apropriada e para fazer as manobras de esvaziamento.
3. O paciente pode assumir a posição apropriada, mas não consegue realizar as manobras de esvaziamento ou limpar-se sem assistência e tem frequentes acidentes. Requer assistência com as fraldas e outros cuidados.
4. O paciente pode necessitar de supervisão com o uso do supositório e tem acidentes ocasionais.
5. O paciente tem controle urinário, sem acidentes. Pode usar supositório quando necessário.

CATEGORIA 8: CONTROLE ESFINCTERIANO (INTESTINO)

1. O paciente não tem controle de esfínteres ou utiliza o cateterismo.
2. O paciente tem incontinência, mas é capaz de assistir na aplicação de auxílios externos ou internos.
3. O paciente fica geralmente seco ao dia, porém não à noite e necessita dos equipamentos para o esvaziamento.
4. O paciente geralmente fica seco durante o dia e a noite, porém tem acidentes ocasionais ou necessita de assistência com os equipamentos de esvaziamento.
5. O paciente tem controle de esfínteres durante o dia e a noite e/ou é independente para realizar o esvaziamento.

CATEGORIA 9: DEAMBULACAO

1. Totalmente dependente para deambular.
 2. Necessita da presença constante de uma ou mais pessoas durante a deambulação.
 3. Requer assistência de uma pessoa para alcançar ou manipular os dispositivos auxiliares.
 4. O paciente é independente para deambular, porém necessita de auxílio para andar 50 metros ou supervisão em situações perigosas.
 5. O paciente é capaz de colocar os braces, assumir a posição ortostática, sentar e colocar os equipamentos na posição para o uso.
- O paciente pode ser capaz de usar todos os tipos de dispositivos e andar 50 metros sem auxílio ou supervisão.

Não pontue esta categoria caso o paciente utilize cadeira de rodas

CATEGORIA 9: CADEIRA DE RODAS *

1. Dependente para conduzir a cadeira de rodas.
2. O paciente consegue conduzi-la em pequenas distâncias ou em superfícies lisas, porém necessita de auxílio em todos os aspectos.
3. Necessita da presença constante de uma pessoa e requer assistência para manipular a cadeira e transferir-se.
4. O paciente consegue conduzir a cadeira por um tempo razoável e em solos regulares. Requer mínima assistência em espaços apertados.
5. Paciente é independente em todas as etapas relacionadas a cadeira de rodas (manipulação de equipamentos, condução por longos percursos e transferências).

Não se aplica aos pacientes que deambulam.

CATEGORIA 10: TRANSFERENCIAS CADEIRA/CAMA

1. Incapaz de participar da transferência. São necessárias duas pessoas para transferir o paciente com ou sem auxílio mecânico.
2. Capaz de participar, porém necessita de máxima assistência de outra pessoa em todos os aspectos da transferência.
3. Requer assistência de outra pessoa para transferir-se.
4. Requer a presença de outra pessoa, supervisionando, como medida de segurança.
5. O paciente pode, com segurança, aproximar-se da cama com a cadeira de rodas, freiar, retirar o apoio dos pés, mover-se para a cama, deitar, sentar ao lado da cama, mudar a cadeira de rodas de posição, e voltar novamente para cadeira com segurança. O paciente deve ser independente em todas as fases da transferência.

Pontuação do Índice de Barthel Modificado

Item	Incapaz de realizar a tarefa	Requer ajuda substancial	Requer moderada ajuda	Requer mínima ajuda	Totalmente independente
Higiene Pessoal	0	1	3	4	5
Banho	0	1	3	4	5
Alimentação	0	2	5	8	10
Toalete	0	2	5	8	10
Subir escadas	0	2	5	8	10
Vestuário	0	2	5	8	10
Controle de Bexiga	0	2	5	8	10
Controle intestino	0	2	5	8	10
Deambulação	0	3	8	12	15
Ou cadeira de rodas*	0	1	3	4	5
Transferência cadeira/cama	0	3	8	12	15
TOTAL					100

Interpretação do Resultado	75 a 51 pontos - dependência moderada
100 pontos – totalmente independente	50 a 26 pontos – dependência severa
99 a 76 pontos – dependência leve	25 e menos pontos – dependência total

Appendix 12: Social and clinical information form

Parte V INFORMAÇÃO CLÍNICA E SOCIAL

5.1 - Local de residência antes de ser internado por fractura de anca:

Em casa sozinho(a)	[]	Em casa com esposo(a)	[]
Em casa com família	[]	Em casa com cuidador pago	[]
Em casa com apoio domiciliário	[]	Nº de horas por dia	_____
Em casa com refeições	[]	Em casa com centro de dia	[]
Lar	[]	Unidade de cuidados continuados	[]
Hospital	[]		

5.2 - Diagnóstico principal

5.3 - Outras co-morbilidades

5.4 - Estado funcional na altura da admissão (Escala de Barthel)

5.5 - Estado funcional na altura da alta hospitalar (Escala de Barthel)

5.6 - Mini Mental Test Score

5.7 - História de quedas

5.8 - Data de admissão

5.9 – Data da cirurgia

5.10 – Data de alta clínica

____/____/____

5.11 - Data de alta hospitalar

____/____/____

5.12 - Nº de dias de internamento clínico

_____ dias

5.13 – Nº de dias de protelamento de alta

_____ dias

5.14 - Destino após alta:

Em casa sozinho(a)	[]	Em casa com esposo(a)	[]
Em casa com família	[]	Em casa com cuidador pago	[]
Em casa com apoio domiciliário	[]	Nº de horas por dia	_____
Em casa com refeições	[]	Em casa com centro de dia	[]
Lar	[]	Unidade de cuidados continuados	[]
Hospital	[]		

5.15 – Freguesia de destino:

Appendix 13: Logistic regression models on the occurrence of delayed discharges at the Hospital de Santa Maria

Table A.13.1 – Logistic regression model on the occurrence of delayed discharge

	Univariate model		Multivariate model	
	Coefficient	P> z	Coefficient	P> z
Level of social isolation				
Low risk	Reference	Reference	Reference	Reference
Moderate risk	0.02	0.97	0.33	0.47
High risk	0.80	0.04	1.23	0.01
Socially isolated	-0.04	0.93	1.27	0.03
Source of admission				
Own home	Reference	Reference	Reference	Reference
Care home or mental health facility	-1.67	<0.01	-1.76	<0.01
Intended discharge destination				
Other	Reference	Reference	Reference	Reference
Publicly-funded rehabilitation unit	2.25	<0.01	2.02	<0.01
Age	0.01	0.75	0.02	0.48
Gender				
Female	Reference	Reference	Reference	Reference
Male	0.16	0.65	-0.09	0.83
Dementia				
No record of dementia	Reference	Reference	Reference	Reference
Having dementia	-0.95	0.04	-1.25	0.02

Appendix 14: Negative binomial regression models on the occurrence of delayed discharges at the Hospital de Santa Maria

Table A.14.1 – Negative binomial (mean dispersion parameter) regression model on the number of days of delayed discharge

	Univariate model		Multivariate model	
	Coefficient	P> z	Coefficient	P> z
Level of social isolation				
Low risk	Reference	Reference	Reference	Reference
Moderate risk	0.30	0.62	0.89	0.03
High risk	0.55	0.29	1.09	0.01
Socially isolated	0.89	0.19	2.12	<0.01
Source of admission				
Own home	Reference	Reference	Reference	Reference
Care home or mental health facility	-3.39	<0.01	-3.35	<0.01
Intended discharge destination				
Other	Reference	Reference	Reference	Reference
Publicly-funded rehabilitation unit	3.02	<0.01	2.71	<0.01
Age	-0.05	0.19	0.05	0.07
Gender				
Female	Reference	Reference	Reference	Reference
Male	0.71	0.22	0.11	0.81
Dementia				
No record of dementia	Reference	Reference	Reference	Reference
Having dementia	-0.86	0.18	-1.22	0.04

Appendix 15: Fracture Free Study protocol

Study Title: The Fracture free study: A prospective cohort of patients presenting with a fragility fracture examining the predictors of re-fracture.

Ethics Ref: 12-SC-0091

Version: 6.0 26/01/2015

Chief Investigator:	Dr Muhammad Kassim Javaid, The Botnar Research Centre, Nuffield Orthopaedic Centre, Windmill Road, Oxford, OX3 7LD
Co-applicants:	KM Rance, G Pearson, NK Arden, G Pearson, C Cooper, AJ Carr
Sponsor:	University of Oxford
Funder:	Oxford NIHR Musculoskeletal Biomedical Research Unit
Signatures:	

TABLE OF CONTENTS

1. AMENDMENT HISTORY	3
2. SYNOPSIS	4
3. ABBREVIATIONS	5
4. BACKGROUND AND RATIONALE	6
5. OBJECTIVES	7
5.1 Primary Objective	7
5.2 Secondary Objectives	7
6. STUDY DESIGN	7
6.1 Summary of Study Design	7
6.2 Study Participants	8
6.3 Study Procedures	9
6.4 Definition of End of Study	11
7. INTERVENTIONS	11
8. SAFETY	11
9. STATISTICS AND ANALYSIS	12
9.1 Number of Participants	12
9.2 Analysis of Endpoints	12
9.3 Participant Confidentiality	14
9.4 Other Ethical Considerations	15
10. DATA HANDLING AND RECORD KEEPING	16
11. FINANCING AND INSURANCE	16
11.1 Funding	16
11.2 Negligent Harm.....	16
11.3 Non-Negligent Harm	16
12. Publication policy	17
13. References	17

1. AMENDMENT HISTORY

Amendment No.	Protocol Version No.	Date Issued	Author(s) of changes	Details of changes made
1	v2	17.12.12	Dr M K Javaid	p3. Synopsis, change study participants to 'patients presenting with a fragility fracture or are at risk of fracture'
2	v2	17.12.12	Dr M K Javaid	p6. Primary objective, as above
3	v2	17.12.12	Dr M K Javaid	p7. Inclusion criteria, as above
4	v2	17.12.12	Dr M K Javaid	p7. Study procedures, as above
5	v2	17.12.12	Dr M K Javaid	p9. 'at all subsequent contact with the FPS, added that 'the researcher will contact at 12 and 24 months'
6	v2	17.12.12	Dr M K Javaid	p10. 'consent sought at their bone density or clinic' changed to 'consent will be sought by the researcher'
7	v2	17.12.12	Dr M K Javaid	p8. Add the Lubben Social Network Scale
8	v2	17.12.12	Dr M K Javaid	p10. If not communicated a decision will be contacted after 3 months
9	v3	03.02.14	Vanshika Sharma	Insertion of appendix B: Flow diagrams for Fracture free study
10	v3	03.02.14	Kassim Javaid	Changes in line with covering letter 03.02.14
11	v4	11.03.14	Vanshika Sharma	Addition of paragraph: Patient confidentiality 9.3: Fracture free study management constitution and procedure for approval for data requests.
12	v5	06.05.14	Vanshika Sharma	Minor grammatical errors corrected.
13	v6	26.01.15	Faye Highfield	Change contact details on patient-facing materials from Vanshika Sharma to Faye Highfield. Option to tick consent form boxes instead of using initials introduced. Questionnaires shortened. Recruitment target increased from 4000 to 6000. Minor updates to eligibility criteria, and timing of reminder phone calls to patients.

2. SYNOPSIS

Study Title	The Fracture Free study
Internal ref. no.	
Study Design	Prospective cohort
Study Participants	All patients presenting with a fragility fracture, or those at risk of fracture
Number of Participants	6000
Planned Study Period	5 years
Primary Objective	Predictors of re-fracture
Secondary objectives	Predictors of non-adherence
Primary Endpoint	Re-fracture
Secondary Endpoints	Non-adherence to osteoporosis medications
Intervention(s)	N/A

3. ABBREVIATIONS

CF	Consent Form
CI	Chief Investigator
CIS	Consultee Information Sheet
CRF	Case Report Form
CTRG	Clinical Trials & Research Governance, University of Oxford
GCP	Good Clinical Practice
ICF	Informed Consent Form
NDORMS	Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences
NRES	National Research Ethics Service
OMB	Oxford Musculoskeletal Biobank
OXCREC	Oxford Research Ethics Committee C
PI	Principal Investigator
PIS	Participant/ Patient Information Sheet
R&D	NHS Trust R&D Department
REC	Research Ethics Committee
SOP	Standard Operating Procedure
TSC	Trial Steering Committee

4. BACKGROUND AND RATIONALE

Osteoporosis and fragility fractures are potentially devastating and remain underestimated by both the public and clinicians. This is evidenced by the lack of awareness amongst those who fracture of the need to have an assessment for osteoporosis¹ and also the very poor adherence to therapy². Among clinicians this is evidenced by the at best patchy provision of commissioned secondary prevention services across the UK³.

The DoH Falls and fragility fracture Strategy suggests a step down pyramid of cost effective strategies⁴. Efficient management of the hip fracture patient is the first tier followed by case finding for secondary prevention in primary and secondary care as the second tier before strategies for primary prevention in the at high risk group.

Despite the DoH recommendation of secondary prevention of fragility fracture as a cost effective model of health care, uptake of fracture liaison services (FLS) is low in England primarily because the economic modelling is not based on UK trial data but extrapolated from estimated therapeutic benefit from existing FLSS⁵.

For a secondary prevention service to be effective, it must capture as many patients as possible who are at risk of refracture⁶ as well as ensure prescribed therapies are adhered to with a medication possession ratio of at least 80%⁷.

Traditional models have used secondary care led services to guide who to start treatment and used routine primary care services to provide support for treatment adherence⁸. Despite this, there is consistent pharmaco-epidemiological evidence demonstrating unacceptable continuation of osteoporotic therapies at 6 months, with rate of 50%². The poor persistence is associated with an increased risk of fracture⁷. Further, even though up to 20% of patients presenting from a hip fracture are from care homes, these patients often do not receive bone protection due to clinical concerns regarding risks and benefits in terms of their frailty and cognitive impairment. In addition, most of our understanding of the causes and consequences of fragility fracture are from non-NHS health care systems. In this application we wish extend our understanding of the causes and consequences of fragility fracture and compare aspects of secondary fracture prevention across the UK. The findings of this study will be used to inform local and national fracture prevention services to achieve the National Osteoporosis Societies goal for a fracture free future.

5. OBJECTIVES

5.1 Primary Objective

To identify the predictors of re-fracture in all patients presenting with a fragility fracture, or are at risk of fracture.

5.2 Secondary Objectives

1. To determine the predictors of non-adherence to osteoporosis therapy for secondary prevention to inform the development of novel patient supportive strategies.
2. To determine to predictors of re-fracture in those that are adherent to therapy to inform the development of novel therapeutic strategies.
3. To identify the predictors of re-fracture in those with osteopenia and currently excluded from therapy according to NICE TA 161.
4. To improve our understanding of the causes and consequences of fracture in patients.
5. To improve our understanding of the reasons why participants/ consultees do and do not agree to participate in the Fracture Free study.

6. STUDY DESIGN

6.1 Summary of Study Design

The study design is a prospective cohort study. As we wish to examine the consequences of patients presenting with a fracture, we wish to recruit a representative patient population with as few exclusion criteria as possible. To reduce the refusal rate we have minimized the study burden for participants and applied for Section 30 approval to include those adults lacking capacity at the onset or during the study.

Participants will be followed up for up to 5 years using information from routine NHS, local authority and government data, with additional questionnaire information collected only when the participant has routine NHS follow-up visits with the fracture prevention service.

Primary and Secondary Endpoints/Outcome Measures

PRIMARY OUTCOME: The primary outcome is the proportion that has re-fractured at 24 months.

SECONDARY OUTCOME:

1. Rate and predictors of non-adherence to osteoporosis therapy for secondary prevention
2. Predictors of re-fracture in those that are adherent to therapy
3. To identify the predictors of re-fracture in those with osteopenia and currently excluded from therapy according to NICE TA 161.
4. To determine the health and social care causes and consequences of a fragility fracture.

6.2 Study Participants

Overall Description of Study Participants

Participants presenting with a fragility fracture or are at risk of fracture

6.2.1 Inclusion Criteria

- Males & females who are > 18 years.
- Fracture in the 4 months preceding consent, of any bone except the skull, digits and scaphoid, as a result of minor or moderate trauma.

6.2.2 Exclusion Criteria

The participant may not enter the study if ANY of the following apply:

1. Fracture due to road traffic incidents and falls from more than 6 feet in height.
 - Participants who suffer a fracture after falling off a bicycle are eligible for inclusion; patients who are knocked off a bike by a car are ineligible.
 - Participants who suffer a fracture after falling from a horse are eligible, as long as they have not fallen from a height greater than six feet
2. Fractures due to metastatic cancer.
3. Participants who have already been approached to take part in the study twice.
4. Fractures sustained in the course of participating in a contact sport

6.3 Study Procedures

We shall recruit from NHS services. These services see all patients at risk of a fragility fracture of any bone excluding the skull, digits and scaphoid.

Patients will be introduced to the study by their clinical team, who will give the research team permission to contact the patient if the patient agrees. The research team is responsible for obtaining written informed consent. Once consent has been obtained, participants' will asked to the quality of life questionnaire the EQ5D-5L, Bone health questionnaire, Nottingham Extended ADL Scale, Lubben Social Network Scale and the education/income questionnaire. At baseline participants will be asked to estimate their pre-injury status for the EQ5D-5L, Nottingham Extended ADL Scale, Lubben Social Network Scale and the education/income questionnaire The participants will be

asked to again complete questionnaires every year for five years for the EQ5D-5L, Nottingham Extended ADL Scale, and bone health questionnaire by the researcher. The researchers will contact the patients by telephone if a consent form and/or questionnaire has not been returned in 1 months' time. However, no extra research visits are required by the patient. Ongoing follow-up information will be abstracted from hospital, primary care and local authority records as well as the Office of National Statistics.

6.3.1 Informed Consent

The variability in service configuration for managing patients presenting with a fracture across the NHS requires locality-specific methods for potential participants to understand the key aspects of the study and then be approached for consent. We have therefore listed broad principles for obtaining consent but have not selected a specific pathway.

1. Members of the direct care team will identify eligible participants and pass on the details to the Fracture Free research team (if the patient verbally consents to their doing so). The members of the direct care team will also offer invitation cards to potential participants.
2. A member of the research team will post a recruitment pack which includes the PIS to the patient. A member of the Fracture Free research team will then call the potential participant to explain the study. Any questions related to the study will then be answered by the members of the fracture free research team.
3. After the patient and member of the research team are satisfied of the understanding of the study and the patient is willing to participate, the patient will be asked to sign the consent form, complete the questionnaires and post back to the research team. Those who have agreed to participate but do not return the forms after 3 months will be contacted by the research team.
4. Alternatively, the consent procedure can be carried out in the clinic. A member of the clinical care will give the patient information sheet or invitation card to the potential participant. A member of the Fracture Free research team will explain the study and answer any queries related to the study. If the patient and the member of the Fracture Free research team is happy, the patient will give written consent in clinic and the questionnaires completed or the patient can take questionnaires home and return them in a self-addressed envelope.

Any queries or questions about the study and obtaining consent will be undertaken by GCP certified members of staff (either research or clinical team).

We recognize this is a time of distress for participants having just had a fracture and potential participants need time to reflect on whether to take part in the study. We will also record the age in years, gender and fracture site but no other details of participants who decline to take part to inform the representativeness

of our study participants. If possible with patient consent we will ask to state up to three reasons why they declined to take part if they wish. It is not mandatory for the patients to state reasons for withdrawing from the study.

6.3.2 Study Assessments

Screening and eligibility– to be done by the GCP trained fracture prevention service practitioners as part of routine clinical practice.

Baseline assessments: Completion of the quality of life questionnaire the EQ5D-5L, Bone Health questionnaire, Nottingham Extended ADL Scale, Lubben Social Network Scale and the education/income questionnaire (Other than this no extra research visits are required and further follow-up information will be abstracted from the following source documents: hospital, primary care and local authority records as well as the Office of National Statistics registers. Patients who decline to take part will be asked to list up to three reasons if they wish why they did not take part using an anonymous card and this will be sent to the patients postally and can be returned via a self-addressed envelope.

6.4 Definition of End of Study

The end of study will be 5 years after the recruitment of the last participant.

7. INTERVENTIONS

N/A

8. SAFETY

The principle safety concern is data protection and this is discussed below.

9. STATISTICS AND ANALYSIS

9.1 Number of Participants

The re-fracture rate is approximately 12.5% at 24 months. To detect a difference of 30% in re-fracture rate (12.5% vs. 8.75%) would require 1470 in each arm. Given an attrition rate of 30% at 2 years we estimate with 90% power and 5% type I error the sample size is approximately 4000 patients in total. (This is amended to 6,000 participants in v6.0).

9.2 Analysis of Endpoints

We shall use survival analysis with time to first re-fracture as the primary outcome and death as a competing event. For counts of re-fractures at 2 and 5 years we shall use Poisson models with zero-inflation. We shall perform both univariate and multivariate analyses adjusting for gender, age, body mass index, and number of previous fracture.

ETHICS

We are requesting ethical approval for both project specific consent to access routine health and social care data on participants and single brief health economic questionnaire. We are also seeking consent to contact participants in the event of future studies.

A major ethical issue is that up to 50% patients we will recruit will be the frail, vulnerable elderly and approximately 50% of patients admitted with a hip fracture have evidence of some cognitive impairment. Of those with capacity to consent at the outset, a significant minority will then lose capacity to consent during the follow-up phase of the trial.

We recognize the higher threshold for justifying the inclusion of adults lacking capacity in clinical trials. However, those with cognitive impairment are often denied adequate fracture prevention therapy and the consequences in this group are poorly studied in the UK. For the study findings to be generalizable it is necessary to recruit and retain those with cognitive impairment. We have minimised the discomfort by not requiring any additional hospital visits. Overall we propose that the study provides knowledge of the treatments for reducing re-fracture and involves minimal risk and burden to the participant and minimal limitation of freedom of action or privacy.

We will make all practical attempts to gain written informed consent from patients throughout the duration of the study. In those judged able to give informed consent, GCP trained members of the investigating team will discuss the study with participants so they understand the objectives, risks and inconvenience of the trial and the conditions under which it is to be conducted. Participants will be able to ask questions before written informed consent is asked for, with copies of the consent form for patient, trial master file and medical notes. Using the study number and initials on CRFs and within the database will protect confidentiality of the participants. We shall also ask for consent to access the participant's hospital and primary care record, local authority record and the Office of National Statistics death certification register for up to 5 years.

We define eligible participants who cannot give informed consent as those who are unable to understand, retain or use information relevant to the decision or unable to communicate the decision in any way as defined by Section 3 of the Mental Capacity Act (MCA) 2005 as assessed by the GCP researcher. The researcher will involve family, friends or an advocate as appropriate and ensure as reasonably as possible issues such as amount of detail, pace of information, language, repeating information and fewer decisions at a time have been addressed. The investigating team will then seek advice from a consultee in line with the MCA framework for making decisions in the participant's best interests while protecting them from harm and considering their beliefs and broader interests.

We define a consultee as a hierarchy of persons who are not connected with the conduct of the trial. This includes the person appointed by a Lasting Power of Attorney, a person who is named by the participant or involved (unpaid) in their care or welfare. The consultee needs to be prepared to be consulted and they

have adequate mental capacity. If a personal consultee cannot be reasonably found then the researcher will approach a nominated consultee responsible for their treatment (GP or consultant) or a person nominated by the relevant acute NHS Trust but unrelated to the research team. The nominated consultee will advise whether patient meets inclusion criteria, is protected by safeguards and does not appear to object. The consultee will be fully informed about trial procedures, potential risk for the trial with potential direct benefit for the patient and for aspects that have no direct benefit and have an interview with a member of the investigational team with opportunity to ask questions. The consultee advice will be written signed and dated using the Consultee Information Sheet. If there is disagreement between consultees, the researcher will exclude the participant from the study. The consultee has the right to withdraw the participant from the trial at any time. The researcher will keep the consultee fully informed and provide support for the participant and be informed of all material changes to the trial or the patient's condition.

It is likely that a significant proportion of participants will lose capacity during the trial and given the observational nature of the study, it is necessary to capture these patients to give a true representation of the consequences of a fragility fracture in terms of re-fracture. We therefore seek approval for participants to remain in the study by the Section 30 approval. As consent does not survive loss of capacity, as soon as capacity is lost, we shall proceed to seek advice from a personal (or nominated consultee if a suitable personal consultee cannot be reasonably found). While it is not appropriate for the participant to be formally consented at each contact, the researcher will satisfy themselves that capacity and continued consent remains in place. We recognize that mental capacity does not necessarily relate well to mental test scores and capacity is both decision and time specific. We shall judge capacity by a conversation with the patient to recap the research study. In those who consent to take part in the study we shall seek an advance statement from the participant outlining whether they wish to continue to participate in this study as part of an advance statement that will be disclosed to the consultee (Patient advance statement). If a participant regains capacity, we will seek to obtain written informed consent at that point.

9.3 Participant Confidentiality

All patient data with personal identifiers will be linked by numerical code.

Authorized personnel will only include the central Fracture Free research team based at Oxford. Any researcher seeking permission to use this data will have to seek approval of the Fracture Free management group before they can receive anonymised data sets. The Fracture Free management group will consist of the Clinical investigator, a co-investigator, trial coordinator and the patient representative. Any researcher wishing to seek access to the data will need to fill in the data access request forms. The Fracture Free management group will meet as in when the data access request forms are received. The Fracture Free management group will review all proposals. (See Appendix C). All favourable or unfavourable opinion will be communicated to the external/internal researcher. If the Fracture free management team gives a favourable opinion on the access to data, the decision will be communicated to the database manager who will

provide requested anonymised datasets to the researchers. All transfer of data will be done by secure means like secure DVD/CD ROM, encrypted memory sticks. The database manager will maintain log of datasets transferred. Acknowledgement of receipt should always be sorted and recorded. The researchers will be expected to report back to the Fracture free management team annually by submitting an annual project report. The report requests any list of publications made using the Fracture Free data, any amendment to original data access request form or further advice needed by researcher.

In addition, if a researcher requires further patient identifiable clinical data they can apply to Fracture Free Management Team for this data. This information can be released without disclosing any personal identifiers. Finally, the link provides a mechanism of feedback for research findings of clinical significance to the patient.

The study staff will ensure that the participants' anonymity is maintained. Only initials and participant's enrolment ID number will be recorded on the CRF. The Fracture free electronic database will identify the participants using the enrolment ID. All documents will be stored securely and only accessible by study staff and authorised personnel. The study will comply with the Data Protection Act that requires data to be anonymised as soon as it is practical to do so. We will use password protection, ensuring computers cannot be accessed by people outside of the research unit. Electronic transfer of data will only use encrypted data.

9.4 Other Ethical Considerations

Given the observational nature of the study and the minimal extra burden to participants we will not exclude participants already recruited to other studies unless this violates the preceding study inclusion / exclusion criteria.

As per NHS practice, where participants have special communication needs we shall use interpreters. The health economic questionnaire we are using is the EQ5D-5L and available in 60 self-complete language versions.

10. DATA HANDLING AND RECORD KEEPING

All study data will be entered on the Fracture Free database and a study specific participant number and/or code in any database will identify the participants. The name and any other identifying detail will not be included in any study data electronic file. The data will be stored and backed up under existing data protection within the University of Oxford using password protection, ensuring computers cannot be accessed by people outside of the research unit, separating identifiers from clinical data and restricting access to the Fracture Free recruitment team. The Oxford NIHR Musculoskeletal Biomedical Research Unit Epidemiology and Biostatistics group, University of Oxford will perform all data analysis. One of our objectives is to determine predictors of re-fracture, we wish to retain personal data collected to inform future studies. The research data will be stored long term with the Fracture Free management team which will be

restricted to authorized personnel of the PI, sponsor and regulatory authorities

11. FINANCING AND INSURANCE

11.1 Funding

The Oxford NIHR Musculoskeletal Biomedical Research Unit, University of Oxford, funds this study

11.2 Negligent Harm

The University has arrangements in place to provide for harm arising from participation in the study for which the University is the Research Sponsor. NHS indemnity operates in respect of the clinical treatment that is provided.

11.3 Non-Negligent Harm

The University has arrangements in place to provide for non-negligent harm arising from participation in the study for which the University is the Research Sponsor.

12. PUBLICATION POLICY

The Investigators will be involved in reviewing drafts of the manuscripts, abstracts, press releases and any other publications arising from the study. Authors will acknowledge that Oxford NIHR Musculoskeletal Biomedical Research Unit funded the study. Authorship will be determined in accordance with the ICMJE guidelines and other contributors will be acknowledged. All analysis plans ancillary to the primary and secondary objectives of the study to be presented to the TSC. The results of the study will be disseminated in peer reviewed conference presentations, journals and also submitted to patient literature through the National Osteoporosis Society and other patient bodies. We will inform the study subjects of the core findings at the end of the study via a newsletter as part of the Oxfordshire NIHR Musculoskeletal BRU Public/Patient engagement policy.

13. REFERENCES

1. Siris ES, Gehlbach S, Adachi JD, Boonen S, Chapurlat RD, Compston JE, et al. Failure to perceive increased risk of fracture in women 55 years and older: the Global Longitudinal Study of Osteoporosis in Women (GLOW). *Osteoporos Int.* 2011; **22**(1): 27-35.
2. Sheehy O, Kindundu CM, Barbeau M, LeLorier J. Differences in persistence among different weekly oral bisphosphonate medications. *Osteoporos Int.* 2009; **20**(8): 1369-76.
3. Trembl J, Husk J, Lowe D, Vasilakis N. Falling standards, broken promises: Report of the national audit of falls and bone health in older people in 2010: Royal College of Physicians; 2011.
4. DH/SC LCdOPaD. Falls and fractures: Effective interventions in health and social care. In: Health Do, editor.; 2009.

5. DH/SC LCdOPaD. Fracture prevention services An economic evaluation. In: Health Do, editor.; 2009.
6. Siris ES, Brenneman SK, Barrett-Connor E, Miller PD, Sajjan S, Berger ML, et al. The effect of age and bone mineral density on the absolute, excess, and relative risk of fracture in postmenopausal women aged 50-99: results from the National Osteoporosis Risk Assessment (NORA). *Osteoporos Int.* 2006; **17**(4): 565-74.
7. Danese MD, Badamgarav E, Bauer DC. Effect of adherence on lifetime fractures in osteoporotic women treated with\ daily and weekly bisphosphonates. *J Bone Miner Res*\. 2009; **24**(11\): 1819-26\.
8. Gallacher SJ. Setting up an osteoporosis fracture liaison service: background and potential outcomes. *Best Pract Res Clin Rheumatol.* 2005; **19**(6): 1081-94.
9. Ingle BM, Hay SM, Bottjer HM, Eastell R. Changes in bone mass and bone turnover following distal forearm fracture. *Osteoporos Int.* 1999; **10**(5): 399-407.

Appendix 16: Approval letter from the Ethics Committee



Health Research Authority

NRES Committee South Central - Oxford C

Bristol REC Centre
Level 3, Block B
Whitefriars Building
Lewins Mead
Bristol
BS1 2NT
Tel: 01173 421383

14 March 2014

Dr Muhammad K Javaid
Senior Research Fellow In Metabolic Bone Disease
University Of Oxford
The Botnar Research Centre
Nuffield Orthopaedic Centre
Windmill Road
Ox3 7ld

Dear Dr Javaid

Study title: The Fracture free study: A prospective cohort of patients presenting with a fragility fracture examining the predictors of re-fracture.
REC reference: 12/SC/0091
Amendment number: No 2
Amendment date: 13 March 2014
IRAS project ID: 91834

Thank you for submitting the above amendment, which was received on 14 March 2014. It is noted that this is a modification of an amendment previously rejected by the Committee (our letter of 6th March 2013 refers).

The modified amendment has been considered on behalf of the Committee by the Chair.

Ethical opinion

I am pleased to confirm that the Committee has given a favourable ethical opinion of the modified amendment on the basis described in the notice of amendment form and supporting documentation.

Approved documents

The documents reviewed and approved are:

Document	Version	Date
Questionnaire: Income and Health	2.0	03 February 2014
Modified Amendment	No 2	13 March 2014
Patient Advance Statement	4.0	03 February 2014
Participant Information Sheet	4.0	03 February 2014
Advertisement	Clinic Information Flyer v1.0	03 February 2014
Advertisement	Patient Information Flyer v1.0	03 February 2014

A Research Ethics Committee established by the Health Research Authority

Health Research Authority

Protocol	4.0	11 March 2014
1 Year Follow-Up Letter	1.0	03 February 2014
Recruitment Letter	1.0	03 February 2014
Participant Information Sheet: Consultee Information Sheets	4.0	03 February 2014
Fracture Free SOP: Access to anonymised data	1.0	05 March 2014
Patient Invitation Card	1.2	03 February 2014
Participant Consent Form	4.0	03 February 2014
Data Access Request Forms	1.0	05 March 2014
Patient Reminder Card	1.0	03 February 2014
Participant Consent Form: Consultee Advice Form	4.0	03 February 2014
Fracture Free Annual Project Report	1.0	05 March 2014

R&D approval

All investigators and research collaborators in the NHS should notify the R&D office for the relevant NHS care organisation of this amendment and check whether it affects R&D approval of the research.

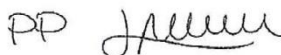
Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

We are pleased to welcome researchers and R & D staff at our NRES committee members' training days – see details at <http://www.hra.nhs.uk/hra-training/>

12/SC/0091:	Please quote this number on all correspondence

Yours sincerely



Professor Nigel Wellman
Chair

E-mail: nrescommittee.southcentral-oxfordc@nhs.net

Appendix 17: Baseline case report form for the Fracture Free Study

Fracture Free Study Questionnaire

Date completed.....

Please complete **all** sections of the questionnaire

For assistance with any section, please call

Faye Highfield, 01865 XXXXXX

Thank you for filling in this form. Please answer as many questions as you can. If you have any troubles with this questionnaire, please call the following number for assistance: 01865 XXXXXX

FRACTURE HISTORY

1. Have you broken any bones in adulthood? Yes ☐ No ☐

If yes, which ones starting with the most recent

Which bone(s)	Which Year and if possible which month	After fall/slip/trip	
		Yes	No
		Yes	No
		Yes	No
		Yes	No

If more please add overleaf:

2. Have either of your biological parents ever broken a hip? Yes ☐ No ☐

If yes, how old were your parents when they broke their hip: _____

3. For women, did you have your menopause before you were 45 years of age?

Yes ☐ No ☐ N/A ☐

4. Has a doctor ever diagnosed you with:

Rheumatoid arthritis Yes ☐ No ☐

Osteoarthritis Yes ☐ No ☐

5. Have you ever taken steroid tablets/ capsules for more than three months continuously? Yes now ☐ Yes but in past ☐ Never ☐

If in the past when was the last time?

6. Do you smoke? Yes ☐ No ☐ Ex-smoker ☐

7. Do you drink more than three units of alcohol a day? Yes ☐ No ☐

(small glass wine = 1 unit; pint beer = 2.5 units)

8. What is your current height _____ feet _____ weight _____ stone
(approx.) (approx.)

MEDICATION

9. Do you currently take any medication(s) for your bones? Yes ☐ No ☐
(this may be a weekly tablet, 6 monthly or yearly injection)

Please circle the medication(s) you take now:

Alendronate/ alendronic acid/ Fosamax/ Bonviva/ Ibandronate/ Risedronate/ Actonel/
Strontium Ranelate/ Protelos/ Didronel/ denosumab / Prolia/ Teriparatide/Forsteo/
Zoledronate/ zolendronic acid/ Aclasta

10. Have you ever taken any medication(s) for your bones? Yes ☐ No ☐

Please circle the medication(s) you have taken:

Alendronate/ alendronic acid/ Fosamax/ Bonviva/ Ibandronate/ Risedronate/ Actonel/
Strontium Ranelate/ Protelos/ Didronel/ denosumab / Prolia/ Teriparatide/Forsteo/
Zoledronate/ zolendronic acid/ Aclasta

11. Do you take any other medication or supplements? Which ones?

12. Do you have any other medical problems? (hospital visits, investigations – please state).

1- Myocardial infarction (history, not ECG changes only)	Yes ☐ No ☐
2- Congestive heart failure	Yes ☐ No ☐
3- Peripheral vascular disease (includes aortic aneurysm ≥ 6 cm)	Yes ☐ No ☐
4- Dementia	Yes ☐ No ☐
5- Chronic pulmonary disease	Yes ☐ No ☐
6- Connective tissue disease	Yes ☐ No ☐
7- Peptic ulcer disease	Yes ☐ No ☐
8- Leukaemia (acute or chronic)	Yes ☐ No ☐
9- Lymphoma	Yes ☐ No ☐
10- Tumour without metastasis (exclude if > 5 years from diagnosis)	Yes ☐ No ☐
11- Metastatic solid tumour	Yes ☐ No ☐
12- Moderate or severe renal disease	Yes ☐ No ☐
13- Cerebrovascular disease – Hemiplegia	Yes ☐ No ☐
14- Cerebrovascular disease - mild or no residual TIA	Yes ☐ No ☐
15- Liver disease- Moderate or severe	Yes ☐ No ☐
16- Liver disease - Mild (includes chronic hepatitis	Yes ☐ No ☐
17- Diabetes - end-organ damage ¹ (Retinopathy, neuropathy, nephropathy, or brittle diabetes)	Yes ☐ No ☐

18- Diabetes - Without end-organ damage

Yes ☐ No ☐

19- AIDS (Not just HIV positive)

Yes ☐ No ☐

Please state if you have any other conditions if they are not mentioned in the list:

13. Do you receive a social/healthcare package, such as a care home placement, community physiotherapy or meals on wheels? Yes / No

INCOME AND HEALTH QUESTIONNAIRE

Part I

Choose the best answer for each of the questions below.

1.1 – What was your highest degree or level of school you completed?

None ☐ GCSE/O level ☐ A level ☐ Further education ☐

Higher education (diploma/degree/PhD) ☐ other ☐.....

Do not wish to disclose ☐

1.2 – What was the title of your last paid job: _____

Do not wish to disclose ☐

1.3 – Net monthly income (from earnings, benefits, pensions and any other sources):

Less than £250 ☐ Between £250 and 500 ☐

Between £501 and £750 ☐ Between £751 and £1000 ☐

Between £1001 and £1500 ☐ Between £1501 and £2000 ☐

Between £2001 and £3000 ☐ Above £3001 ☐

Do not wish to disclose ☐

1.4 – Household composition:**Are you currently...**

Living alone	☐
Living with spouse / partner	☐
Living with son / daughter	☐
Living with parents / in-laws	☐
Living with brother / sister	☐
Living with grandson / granddaughter	☐
Living with other family	☐
Living with others not family	☐

Please specify: _____

1.5– Do you have children? Yes ☐ No ☐

If yes, How many? _____

1.6 How is your health in general? Would you say it is...

Very good	☐	Good	☐
Fair	☐	Bad	☐
Very bad	☐	Don't know	☐
Do not wish to disclose	☐		

1.7 – Have your daily living activities been limited by a health condition over the last six months?

Not limited	☐	Moderately limited	☐
Severely limited	☐		

1.8 When did you last visit your General Practitioner?

Less than one year ago	☐	More than 1 year ago	☐
Never	☐	I don't have a GP	☐

1.9 In the last 4 weeks, how many times did you visit your General Practitioner?

_____times

1.10 Have you ever had any joints replaced?

Yes	☐	If yes please specify the joint replaced.....
No	☐	



Health Questionnaire

English version for the UK

Under each heading, please tick the ONE box that best describes your health TODAY

MOBILITY

- I have no problems in walking about ☐
- I have slight problems in walking about ☐
- I have moderate problems in walking about ☐
- I have severe problems in walking about ☐
- I am unable to walk about ☐

SELF-CARE

- I have no problems washing or dressing myself ☐
- I have slight problems washing or dressing myself ☐
- I have moderate problems washing or dressing myself ☐
- I have severe problems washing or dressing myself ☐
- I am unable to wash or dress myself ☐

USUAL ACTIVITIES (*e.g. work, study, housework, family or leisure activities*)

- I have no problems doing my usual activities ☐
- I have slight problems doing my usual activities ☐
- I have moderate problems doing my usual activities ☐
- I have severe problems doing my usual activities ☐
- I am unable to do my usual activities ☐

PAIN / DISCOMFORT

- I have no pain or discomfort ☐
- I have slight pain or discomfort ☐
- I have moderate pain or discomfort ☐
- I have severe pain or discomfort ☐
- I have extreme pain or discomfort ☐

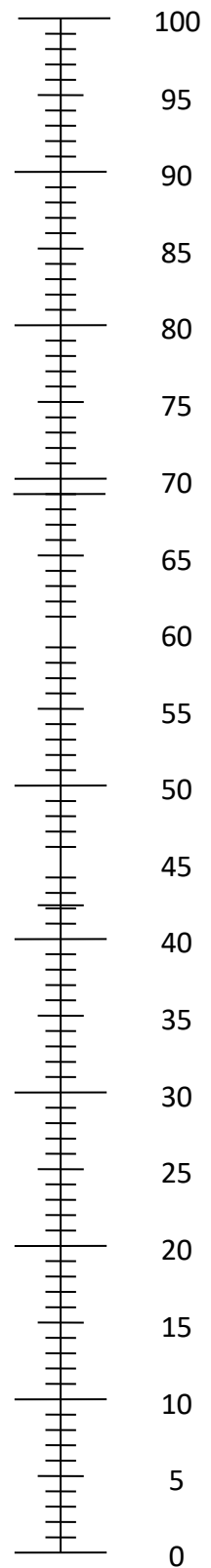
ANXIETY / DEPRESSION

- I am not anxious or depressed ☐
- I am slightly anxious or depressed ☐
- I am moderately anxious or depressed ☐
- I am severely anxious or depressed ☐
- I am extremely anxious or depressed ☐

- We would like to know how good or bad your health is TODAY
- This scale is numbered from 0 to 100.
- 100 means the best health you can imagine.
0 means the worst health you can imagine.
- Mark an X on the scale to indicate how your health is TODAY
- Now, please write the number you marked on the scale in the box below.

YOUR HEALTH TODAY =

The best health
you can imagine



The worst health
you can imagine

Nottingham Extended ADL Scale

The following questions are about everyday activities. Please answer by ticking ONE box for each question. Please record what you have ACTUALLY done in the last few weeks.

DID YOU...	Not at all	With help	On your own with difficulty	On your own
1. Walk around outside?				
2. Climb stairs?				
3. Get in and out of a car?				
4. Walk over uneven ground?				
5. Cross roads?				
6. Travel on public transport?				
7. Manage to feed yourself?				
8. Manage to make a hot drink?				
9. Take hot drinks from one room to another?				
10. Do the washing up?				
11. Make yourself a hot snack?				
12. Manage your own money when out?				
13. Wash small items of clothing?				
14. Do your own housework?				
15. Do your own shopping?				
16. Do a full clothes wash?				
17. Read newspapers or books?				
18. Use the telephone?				
19. Write letters?				
20. Go out socially?				
21. Manage your own garden?				
22. Drive a car?				

© University of Nottingham 2007

The Lubben Social Network Scale

The Lubben Social Network Scale can be used to assess the level of social support available. This can help identify a person who may need assistance or help and when. The author is from the University of California in Los Angeles.

Measures: 10 questions

(1) family networks: 3 questions

(2) friends networks: 3 questions

(3) confidant relationships: 2 questions

(4) helping others: 1 two part question

(5) living arrangements: 1 question

Question	Response
(1) How many relatives do you see or hear from at least once a month?	0
	1
	2
	3 or 4
	5 to 8
	9 or more
(2) Tell me about the relative with whom you have the most contact: How often do you see or hear from that person?	Less than monthly
	Monthly
	A few times a month
	Weekly
	A few times a week
	daily
(3) How many relatives do you feel close to? That is how many of them do you feel at ease with can talk about private matters or can call for help?	0
	1
	2
	3 or 4
	5 to 8
	9 or more

Question	Response
(4) Do you have any close friends? That is do you have any friends with whom you feel at ease can talk to about private matters or can call on for help? If so how many?	0
	1
	2
	3 or 4
	5 to 8
	9 or more
(5) How many of these friends do you see or hear from at least once a month?	0
	1
	2
	3 or 4
	5 to 8
	9 or more
(6) Tell me about the friend with whom you have the most contact. How often do you see or hear from that person?	Less than monthly
	Monthly
	A few times a month
	Weekly
	A few times a week
	daily
(7) When you have an important decision to make do you have someone you can talk to about it?	never
	seldom
	sometimes
	often
	very often
	always
(8) When other people you know have an important decision to make do they talk to you about it?	never
	seldom
	sometimes
	often
	very often
	always

Question	Response
(9a) Does anybody rely on you to something for them each day?	yes
	no (if so go to 9b)
(9b) Do you help anybody with something each day?	very often
	often
	sometimes
	seldom
	never
(10) Do you live alone or with other people?	live with spouse
	live with other relatives or friends
	Live with other unrelated individuals (paid help etc.)
	Live alone

Where:

- In-laws are considered as relatives.
- Examples of helping others: shopping, cooking, dinner, doing repairs, cleaning house, providing child care etc.?
- For item 9 I interpret the first part as referring to one person while the second part might apply to more than one person.

Reproduced from Lubben, Family & Community Health 1988;11:42-52 with permission (LWW).

Appendix 18: Social and clinical information form

QUESTIONNAIRE

TO BE FILLED IN BY RESEACHERS

1.1 – Gender: 1. Male [] 2. Female []

1.2 – Age: [] years old

1.3 – Ethnic group: 1. White [] 2. Mixed [] 3. Asian []
4. Black [] 5. Chinese [] 6. Other []

Please specify _____

1.4 – Postcode? _____

1.5 – Marital status: 1. Single, that is, never married [] 2. Married []
3. Divorced / Separated [] 4. Widowed []
5. Living together [] 6. Other []

Please specify _____

1.6 - Main diagnostic:

1.7 - Other comorbidities:

1.8 - Mini Mental Test Score

1.9 - Date of admission: ____/____/____

1.10 - Date of surgery: ____/____/____

1.11 - Date of being declared medically fit for discharge: ____/____/____

1.12 - Date of discharge: ____/____/____

1.13 - Number of days of delayed discharge: _____

1.14 - Destination after discharge:

Home alone	[]	Home with spouse	[]
Home with other family	[]	Home with paid carer	[]
Home with domiciliary care	[]	Home with meals	[]
Daycare centre	[]	Nursing home	[]
Residential home	[]	Continuing care unit	[]
Acute care hospital	[]	Other:	_____

Appendix 19: Logistic regression models on the occurrence of delayed discharges at the John Radcliffe Hospital

Table A.19.1: Univariate and multivariate logistic regression model on the occurrence of delayed discharge

	Univariate model		Multivariate model	
	Coefficient	P> z	Coefficient	P> z
Level of social isolation				
Low risk	Reference	Reference	Reference	Reference
Moderate risk	0.90	0.25	0.79	0.32
High risk	-0.20	0.73	-0.41	0.50
Socially isolated	0.66	0.24	0.29	0.63
Source of admission				
Own home	Reference	Reference	Reference	Reference
Care home or mental health facility	-0.25	0.58	n.a.	n.a.
Age	0.08	0.03	0.07	0.07
Gender				
Female	Reference	Reference	Reference	Reference
Male	-0.74	0.05	-0.67	0.08
Dementia				
No record of dementia	Reference	Reference	Reference	Reference
Having dementia	-0.22	0.63	n.a.	n.a.

Appendix 20: Log-gamma GLM regression models on the occurrence of delayed discharges at the John Radcliffe Hospital

Table A.20.1: Univariate and multivariate coefficients of the log-gamma GLM on the number of days of delayed discharges

	Univariate model		Multivariate model	
	Coefficient	P> z	Coefficient	P> z
Level of social isolation				
Low risk	Reference	Reference	Reference	Reference
Moderate risk	0.72	0.92	0.67	0.01
High risk	0.67	0.01	0.58	0.04
Socially isolated	0.75	0.02	0.70	0.01
Source of admission				
Own home	Reference	Reference	Reference	Reference
Care home or mental health facility	0.03	0.92	0.02	0.95
Age	0.02	0.04	0.02	0.09
Gender				
Female	Reference	Reference	Reference	Reference
Male	0.02	0.92	0.03	0.88
Dementia				
No record of dementia	Reference	Reference	Reference	Reference
Having dementia	-0.11	0.62	-0.24	0.29

Appendix 21: Negative binomial regression models on the number of days of delayed discharges at the HSM and the JRH

Table A.21.1: Multivariate coefficients of the negative binomial regression models on the number of days of delayed discharges at the HSM and the JRH

	Univariate model		Multivariate model	
	Coefficient	P> z	Coefficient	P> z
Level of social isolation				
Low risk	Reference	Reference	Reference	Reference
Moderate risk	0.89	0.03	0.67	0.01
High risk	1.09	0.01	0.58	0.04
Socially isolated	2.12	<0.01	0.70	0.01
Source of admission				
Own home	Reference	Reference	Reference	Reference
Care home or mental health facility	-3.35	<0.01	0.01	0.96
Age	0.05	0.07	0.02	0.10
Gender				
Female	Reference	Reference	Reference	Reference
Male	0.11	0.81	0.02	0.86
Dementia				
No record of dementia	Reference	Reference	Reference	Reference
Having dementia	-1.22	<0.01	-0.24	0.31

Appendix 22: Search syntax used in systematic review on interventions to alleviate social isolation

Table A.22.1: Ovid MEDLINE and Embase- search date 15/01/16

Searches	Search Terms
1	exp "Aged, 80 and over"/ or exp Aged/
2	older*.ti,ab.
3	elder*.ti,ab.
4	senior*.ti,ab.
5	geriatric.ti,ab.
6	aged.ti,ab.
7	OR/1-6
8	Social Isolation/
9	Loneliness/
10	isolation.ti,ab.
11	loneliness.ti,ab.
12	(social* adj3 isolat*).ti,ab.
13	(emotional* adj3 isolat*).ti,ab.
14	OR/ 8-13
15	exp Social Support/
16	"social support*".ti,ab.
17	loss.ti,ab.
18	access.ti,ab.
19	(social* adj3 activ*).ti,ab.
20	"social network*".ti,ab.
21	"social intervention*".ti,ab.
22	(promot* or prevent* or support* or self-help or "self help" or educat*).ti,ab.
23	Self Care/
24	exp Policy/
25	policy.ti,ab.
26	program*.ti,ab
27	OR/ 15-26
28	7 AND 14 AND 27
29	limit 28 to yr="1995 -Current"

ti: title; ab: abstract

Table A.22.2: PsycINFO - search date 15/01/16

Searches	Search Terms
1	exp "Aged, 80 and over"/ or exp Aged/
2	older*.ti,ab.
3	elder*.ti,ab.
4	senior*.ti,ab.
5	geriatric.ti,ab.
6	aged.ti,ab.
7	OR/1-6
8	Social Isolation/
9	Loneliness/
10	isolation.ti,ab.
11	loneliness.ti,ab.
12	(social* adj3 isolat*).ti,ab.
13	(emotional* adj3 isolat*).ti,ab.
14	OR/ 8-13
15	exp Social Support/
16	"social support*".ti,ab.
17	loss.ti,ab.
18	access.ti,ab.
19	(social* adj3 activ*).ti,ab.
20	"social network*".ti,ab.
21	"social intervention*".ti,ab.
22	(promot* or prevent* or support* or self-help or "self help" or educat*).ti,ab.
23	Self Care/
24	exp Policy Making/ or exp Health Care Policy/ or exp Government Policy Making/
25	policy.ti,ab.
26	program*.ti,ab
27	OR/ 15-26
28	7 AND 14 AND 27
29	limit 28 to yr="1995 -Current"

ti: title; ab: abstract

Table A.22.3: Cinahl - search date 15/01/16

Searches	Search Terms
1	exp "Aged, 80 and over"/ or exp Aged/
2	older*.ti,ab.
3	elder*.ti,ab.
4	senior*.ti,ab.
5	geriatric.ti,ab.
6	aged.ti,ab.
7	OR/1-6
8	Social Isolation/
9	Loneliness/
10	isolation.ti,ab.
11	loneliness.ti,ab.
12	(social* adj3 isolat*).ti,ab.
13	(emotional* adj3 isolat*).ti,ab.
14	OR/ 8-13
15	exp "Support, Psychosocial+"/
16	"social support*".ti,ab.
17	loss.ti,ab.
18	access.ti,ab.
19	(social* adj3 activ*).ti,ab.
20	"social network*".ti,ab.
21	"social intervention*".ti,ab.
22	(promot* or prevent* or support* or self-help or "self help" or educat*).ti,ab.
23	Self Care/
24	(MH "Public Policy+") OR (MH "Policy Making") OR (MH "Policy Studies+") OR (MH "Health Policy Studies") OR (MH "Health Policy+") OR (MH "Policy and Procedure Manuals") OR (MH "Organizational Policies+") OR (MH "Hospital Policies+")
25	policy.ti,ab.
26	program*.ti,ab
27	OR/ 15-27
28	7 AND 14 AND 27
29	limit 28 to yr="1995 -Current"

ti: title; ab: abstract

Table A.22.4: ASSIA - search date 20/01/16

Search Terms
((SU.EXACT.EXPLODE("Terminally ill elderly people") OR SU.EXACT.EXPLODE("Disabled elderly women") OR SU.EXACT.EXPLODE("Low income elderly people") OR SU.EXACT.EXPLODE("Visually impaired elderly women") OR SU.EXACT.EXPLODE("Visually impaired elderly people") OR SU.EXACT.EXPLODE("Terminally ill elderly women") OR SU.EXACT.EXPLODE("Widowed elderly men") OR SU.EXACT.EXPLODE("Married elderly men") OR SU.EXACT.EXPLODE("Terminally ill elderly men") OR SU.EXACT.EXPLODE("Language disordered elderly people") OR SU.EXACT.EXPLODE("Elderly widows") OR SU.EXACT.EXPLODE("Mentally ill elderly women") OR SU.EXACT.EXPLODE("Elderly husbands") OR SU.EXACT.EXPLODE("Remarried elderly people") OR SU.EXACT.EXPLODE("Elderly fathers") OR SU.EXACT.EXPLODE("Sick elderly people") OR SU.EXACT.EXPLODE("Learning disabled elderly people") OR SU.EXACT.EXPLODE("Mentally ill elderly men") OR SU.EXACT.EXPLODE("Divorced elderly people") OR SU.EXACT.EXPLODE("Sick elderly women") OR SU.EXACT.EXPLODE("Emotionally disturbed elderly people") OR SU.EXACT.EXPLODE("Disabled elderly people") OR SU.EXACT.EXPLODE("Elderly married couples") OR SU.EXACT.EXPLODE("Elderly mothers") OR SU.EXACT.EXPLODE("Mentally ill elderly people") OR SU.EXACT.EXPLODE("Disabled elderly men" OR "Elderly men" OR "Married elderly men" OR "Mentally ill elderly men" OR "Terminally ill elderly men" OR "Widowed elderly men") OR SU.EXACT.EXPLODE("Single elderly people") OR SU.EXACT.EXPLODE("Elderly relatives") OR SU.EXACT.EXPLODE("Disabled elderly men") OR SU.EXACT.EXPLODE("Brain damaged elderly people" OR "Centenarians" OR "Disabled elderly people" OR "Divorced elderly people" OR "Elderly people" OR "Emotionally disturbed elderly people" OR "Gifted elderly people" OR "Hearing impaired elderly people" OR "Homeless elderly people" OR "Housebound elderly people" OR "Language disordered elderly people" OR "Learning disabled elderly people" OR "Low income elderly people" OR "Mentally ill elderly people" OR "Remarried elderly people" OR "Retired people" OR "Sick elderly people" OR "Single elderly people" OR "Terminally ill elderly people" OR "Visually impaired elderly people") OR SU.EXACT.EXPLODE("Blind-Deaf elderly women" OR "Disabled elderly women" OR "Elderly women" OR "Married elderly women" OR "Mentally ill elderly women" OR "Sick elderly women" OR "Single elderly women" OR "Terminally ill elderly women" OR "Visually impaired elderly women") OR SU.EXACT.EXPLODE("Homeless elderly people") OR SU.EXACT.EXPLODE("Married elderly women") OR SU.EXACT.EXPLODE("Hearing impaired elderly people") OR SU.EXACT.EXPLODE("Housebound elderly people") OR SU.EXACT.EXPLODE("Elderly housing assistance programmes") OR SU.EXACT.EXPLODE("Elderly parents")) OR (ab(older* OR elder* OR senior* OR geriatric OR aged) OR ti(older* OR elder* OR senior* OR geriatric OR aged))) AND (SU.EXACT.EXPLODE("Isolation" OR "Purdah" OR "Seclusion") OR SU.EXACT.EXPLODE("Loneliness") OR (ti(isolation OR loneliness OR (social* NEAR/3 isolat*) OR (emotion* NEAR/3 isolat*)) OR ab(isolation OR loneliness OR (social* NEAR/3 isolat*) OR (emotion* NEAR/3 isolat*))) AND ((SU.EXACT.EXPLODE("Computer based social support" OR "Perceived social support" OR "Social support") OR SU.EXACT.EXPLODE("Perceived social support")) OR SU.EXACT.EXPLODE("Selfcare") OR SU.EXACT.EXPLODE("Agricultural policy" OR "Colonial policy" OR "Constitutional policy" OR "Criminal justice policy" OR "Criminal policy" OR "Economic policy" OR "Energy policy" OR "Environmental policy" OR "Fiscal equalization" OR "Fiscal policy" OR "Foreign policy" OR "Health policy" OR "Housing policy" OR "Incomes policy" OR "Industrial policy" OR "Mental health policy" OR "Monetary policy" OR "Organizational policy" OR "Penal policy" OR "Policy" OR "Public health policy" OR "Public policy" OR "Regional policy" OR "Science policy" OR "Social housing policy" OR "Social policy" OR "Technological policy" OR "Transport policy" OR "Urban policy" OR "Welfare policy") OR (ab("social support*") OR ti("social support*")) OR (ab(loss) OR ti(loss)) OR (ab(access) OR ti(access)) OR (ab((social* NEAR/3 activ*) OR "social network*" OR "social intervention*") OR ti((social* NEAR/3 activ*) OR "social network*" OR "social intervention*")) OR (ab(promot* OR prevent* OR support* OR self-help OR "self help" OR educat*) OR ti(promot* OR prevent* OR support* OR self-help OR "self help" OR educat*)) OR (ab(policy OR program*) OR ti(policy OR program*))

Table A.22.5: LILACS - search date 21/01/16

Search Terms
(aged OR older* OR elder* OR senior* OR geriatric) AND (isolat* OR loneliness) AND ("social support*" OR loss OR access OR "social* activ*" OR "social network*" OR "social intervention*" OR promot* OR prevent* OR support* OR self-help OR "self help" OR educat* OR policy OR program*)

Table A.22.6: OpenGrey - search date 21/01/16

Search Terms
(aged OR older* OR elder* OR senior* OR geriatric) AND (isolat* OR loneliness) AND ("social support*" OR loss OR access OR "social* activ*" OR "social network*" OR "social intervention*" OR promot* OR prevent* OR support* OR self-help OR "self help" OR educat* OR policy OR program*))

Table A.22.7: The Cochrane Library – search date 21/01/16

Searches	Search Terms
1	MeSH descriptor: [Aged] explode all trees
2	older* or aged or elder* or senior* or geriatric.ti,ab.
3	#1 or #2
4	MeSH descriptor: [Social Isolation] explode all trees
5	isolation.ti,ab.
6	loneliness.ti,ab.
7	(social* near/3 isolat*) .ti,ab.
8	(emotional* near/3 isolat*) .ti,ab.
9	#4 or #5 or #6 or #7 or #8
10	MeSH descriptor: [Social Support] explode all trees
11	"social support*" .ti,ab.
12	loss.ti,ab.
13	access.ti,ab.
14	(social* near/3 activ*) .ti,ab.
15	"social network*" .ti,ab.
16	"social intervention*" .ti,ab.
17	(promot* or prevent* or support* or self-help or "self help" or educat*) .ti,ab.
18	MeSH descriptor: [Self Care] explode all trees
19	MeSH descriptor: [Policy] explode all trees
20	policy.ti,ab.
21	program*.ti,ab.
22	#10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21
23	#3 and #9 and #22
	Limit by date: 1995 to present

ti: title; ab: abstract

Appendix 23: Data extraction Pro-forma for the systematic review on interventions to alleviate social isolation

Reviewer	
Date form completed	

Study Details

Title	
Author	
Year Published	
Journal	
Location (country/city)	
Language (if not English)	

		Location in text (page/figure/table/other)
Type of study	Randomised controlled trial ☐ Non-randomised controlled trial ☐ Controlled before and after study ☐ Uncontrolled before and after study ☐	
A. Start Date	A.	
B. End Date	B.	
Outcomes Measured (aims)		

Participants

		Location in text (page/figure/table/other)
Setting	Large population in unspecified setting ☐ Community: ☐ Supported living ☐ Other:	
Type of Participants		
Enrolment Eligibility		
A. Inclusion Criteria	A.	
B. Exclusion Criteria	B.	
Recruitment process (e.g. phone, mail, clinic)		
Total number randomised (or total population for non-RCT)		
Age range (mean age)		
Gender (% female)		
Ethnicity		
Sample size		
Any other relevant sociodemographic information		
Any subgroups established		
Notes		

Intervention

		Location in text (page/figure/table/other)
Intervention	Description	
	Duration of each intervention episode	
	Duration of intervention studied (total study duration)	
	Frequency (daily/weekly etc.)	
	Provider (i.e. no., profession, training)	
	Economic information (cost, resource requirements)	
Type of intervention	Group Intervention	Community based: At home ☐ Centralised location ☐ Supported Living*: ☐
	One-to-one Intervention	Community based: At home ☐ Centralised location ☐ Supported Living*: ☐
	Focus of intervention	Social skills training ☐ Enhanced social support ☐ Increased opportunity for social interaction ☐ Social cognitive training ☐ Provision of services** ☐ Other..... ☐
Intervention Mode	Technology assisted ☐ Non-technology assisted ☐	
Compliance		
Notes		

Outcomes

	Description as stated in paper/report	Location in text (page/figure/table/other)
Measure of social isolation/loneliness		
Outcome tool validated	Yes ☐ No ☐ Unclear ☐	
Any outcomes other than social isolation/loneliness measured?	Yes ☐ Details	
	No ☐	

Results: effect of the intervention on social isolation or loneliness

		Location in text (page/figure/ table/other)
Comparison		
Outcome		
Subgroup		
Time point (from start or end of intervention)		
Results	Intervention	Comparison
	Mean SD (or other variance, specify)	Mean SD (or other variance, specify)
	No participants	No participants
Effect size	Effect size: _____ Standard error: _____ Inverse variance: _____ 95% confidence interval: _____	
Any other results reported (e.g. Odds ratio)		
Statistical method used		
Notes		

Results: effects of the intervention on other outcome continuous variables

		Location in text (page/figure/ table/other)
Comparison		
Outcome		
Subgroup		
Time point (from start or end of intervention)		
Results	Intervention	Comparison
	Mean SD (or other variance, specify)	Mean SD (or other variance, specify)
	No participants	No participants
Effect size	Effect size: _____ Standard error: _____ Inverse variance: _____ 95% confidence interval: _____	
Any other results reported (e.g. Odds ratio)		
Statistical Method used		
Notes		

Results: effect of the intervention on other outcome categorical variables

		Location in text (page/figure/table/other)
Comparison		
Outcome		
Subgroup		
Time point (from start or end of intervention)		
Results	Intervention	Comparison
	No. with event	No. in group
Effect size (95% CI)		
Any other results reported (e.g. Odds ratio)		
Statistical method used		
Notes		

Other Information

	Location in text (page/figure/table/other)
Author's conclusions	
References to other relevant studies	
Reviewer's conclusions	
Notes	

*Residential or nursing care

**Provision of services such as transport, medical services, etc.

Appendix 24: Features of the studies in the systematic review on interventions to alleviate social isolation

Table A.24.1: Study information

First author (publication year)	Study design	Country	Population	Demographics			Sample size (included in analysis)	Ethics approval	Specific requirements of intervention	economic
				Participant mean age	% Female participants					
Bartsch (2009)	B&A	USA	Older people residing in 5 towns in the USA	74.1	75.4		138	No	Not stated	
Brennan (1995)	RCT	USA	Caregivers for persons with Alzheimer's disease, community based	N/A	67		96	Yes	Computers \$346 each	
Dammeyer (2004)	RCT	USA	Residents from 3 assisted living facilities	83.7	91		34	No	Not stated	
Drentea (2006)	RCT	USA	Spouse caregivers of people with Alzheimer's Disease	71.6	61.8		183	No	Not stated	
Greaves (2006)	B&A	UK	Older socially isolated people in the Mid Devon Primary Care Trust	77	76		68	Yes	Not stated	
Hombrados Menieta (2003)	B&A	Spain	Older people	63.1	89.5		38	No	Not stated	
Jones (2015)	B&A	UK	Older people in Plymouth (UK) area considered physically isolated	79	71.5		44	Yes	£708 per person	

First author (publication year)	Study design	Country	Population	Demographics		Sample size (included in analysis)	Ethics approval	Specific requirements of intervention	economic
				Participant mean age	% Female participants				
Jones (2015b)	B&A	UK	Older people in Plymouth (UK) area	79	71.5	65	Yes	£708 per person	
Kim (2012)	NRCT	South Korea	Community dwelling older adults with low income status and chronic illness	77	83	47		Not stated	
Routasalo (2009)	RCT	Finland	Home-dwelling older people experiencing loneliness	80	74.4	235	Yes	Not stated	
Saito (2012)	RCT	Japan	Older people who had relocated to city A within 2 years	72.7	60	60	Yes	Not stated	
Stewart (2001)	B&A	Canada	Widows >55 (population not otherwise specified)	66	100	17	No	Not stated	
Torp (2008)	B&A	Norway	Older carers living at home	73	42	19	Yes	Each participant family received a PC and broadband	
Tsai (2010)	NRCT	Taiwan	Older nursing home residents	76.8	58.3	49	Yes	2M/256K wireless modem using a large (15.6cm) laptop	
Tsai (2011)	NRCT	Taiwan	Older nursing home residents	76.8	57.8	90	Yes	2M/256K wireless modem using a large (15.6cm) laptop	
Tse (2010)	NRCT	Hong Kong	Older nursing home residents	84.1	96	53	Yes	Gardening equipment	
White (1999)	NRCT	USA	Retirement community residents	78	81	23	No	Computers, telephone lines, printers, internet service, personnel	
Winningham (2007)	NRCT	USA	Older people in assisted living facility	82.1	N/A	58	No	Not stated although mention most activities implemented for minimal cost	

First author (publication year)	Study design	Country	Population	Demographics		Sample size (included in analysis)	Ethics approval	Specific requirements of intervention	economic
				Participant mean age	% Female participants				
Woodward (2011)	RCT	USA	Respondents to a community based survey of technology use in older adults	72	72	83	No	Not well described: arrangements made for participants who needed computers, with costs based on ability to pay using the community agency's guidelines	

Appendix 25: Quality assessment of the studies included in the systematic review on interventions to alleviate social isolation

Table A.25.1: Quality assessment using EPHPP Quality Assessment tool

First author (publication year)	Selection bias	Study design	Confounders	Blinding	Data collection methods	Withdrawals and drop outs	Global rating
Bartsch (2009)	Moderate	Moderate	Weak	Weak	Weak	Weak	Weak
Brennan (1995)	Moderate	Strong	Strong	Moderate	Weak	Strong	Moderate
Dammeyer (2004)	Weak	Strong	Strong	Moderate	Strong	Strong	Moderate
Drentea (2006)	Weak	Strong	Strong	Moderate	Weak	Weak	Weak
Greaves (2006)	Moderate	Moderate	Weak	Weak	Weak	Moderate	Weak
Hombrados Mendieta (2003)	Weak	Moderate	Weak	Weak	Moderate	Strong	Weak
Jones 2015	Moderate	Moderate	Weak	Moderate	Moderate	Strong	Moderate
Jones 2015b	Moderate	Moderate	Weak	Moderate	Moderate	Strong	Moderate
Kim (2012)	Moderate	Strong	Strong	Moderate	Strong	Moderate	Strong
Routasalo (2009)	Moderate	Strong	Strong	Moderate	Moderate	Weak	Moderate
Saito (2012)	Weak	Strong	Strong	Moderate	Weak	Strong	Weak
Stewart 2001	Weak	Moderate	Weak	Weak	Strong	Moderate	Weak
Torp 2008	Weak	Moderate	Weak	Moderate	Weak	Strong	Weak
Tsai (2010)	Weak	Strong	Strong	Moderate	Moderate	Strong	Moderate
Tsai (2011)	Weak	Strong	Strong	Moderate	Moderate	Moderate	Moderate
Tse (2010)	Weak	Strong	Strong	Moderate	Strong	Strong	Moderate
White (1999)	Weak	Strong	Strong	Moderate	Moderate	Strong	Moderate
Winningham (2007)	Weak	Strong	Strong	Moderate	Moderate	Moderate	Moderate
Woodward (2011)	Weak	Strong	Strong	Moderate	Weak	Strong	Weak

A brief comment on the quality of the evidence

This meta-analysis included 18 studies, with a combined total number of participants of 1,400. There are few high quality RCTs in this area and overall, the quality of the studies in this field is poor (approximately half the studies were classified as “weak”, despite very conservative interpretation of the quality assessment tool). The vast majority of the studies included in this meta-analysis had a high risk of bias. Many studies relied on participants volunteering for an intervention - this may be inevitable to some extent as one cannot force individuals to participate in these interventions, but it nonetheless introduces significant bias. Those who do not volunteer may not feel socially isolated but the converse may also be true – that population may represent socially isolated older people who are even more difficult to reach.

The EPHPP quality assessment tool for quantitative studies ²⁹⁷ is recommended by the Cochrane handbook ²⁹⁴ and provides a comprehensive and objective assessment. However, there are some important parameters that do not contribute to the global rating given to each individual study that deserve mention, in particular the integrity of the intervention and analysis (e.g. performing analyses by intention to treat) and, in a broader sense, the overall experimental design. For example, some studies gave only brief descriptions of the control conditions ^{306,315}. From the reports (especially those based in the community), it is unclear whether any limitations were put on the control participants’ behaviours or, if this was not the case, whether any investigation for confounding behaviours during the study period was conducted. It is also unclear whether any limitations were put on the behaviours of the intervention participants. This may be inevitable given the study subject, the setting and the nature of the interventions.

Additionally, many identified studies did not use validated measures of social isolation. However, the use of a validated tool does not always result in appropriate measurement if it does not match the intentions of the intervention. While these issues remain the case, drawing conclusions and trying to make more specific comparisons to determine which types of interventions are most effective will be difficult.

Appendix 26: Sensitivity analysis for all interventions to alleviate social isolation

Figure A.26.1: Forest plot of all interventions with Hombrados Mendieta et al. excluded

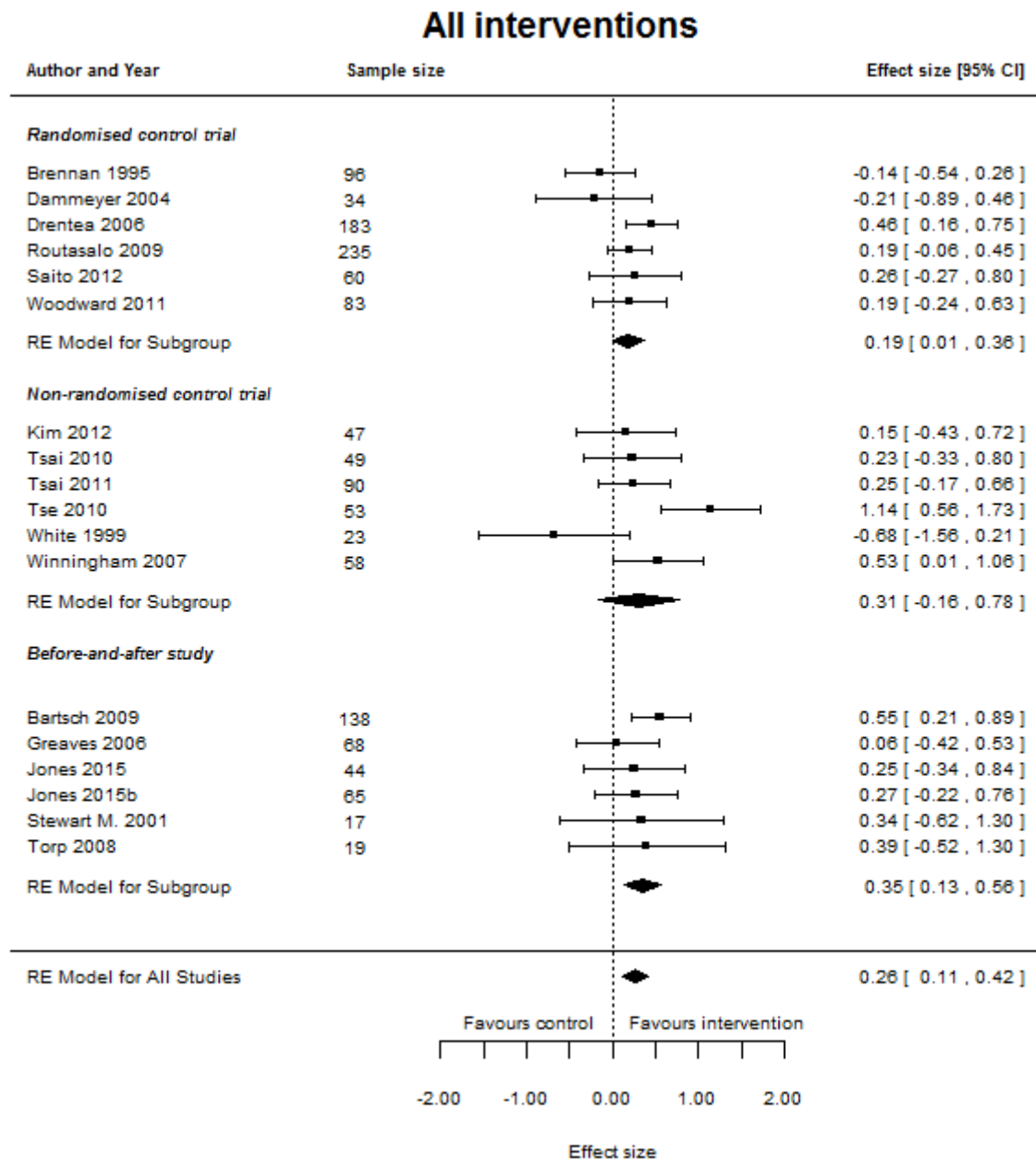
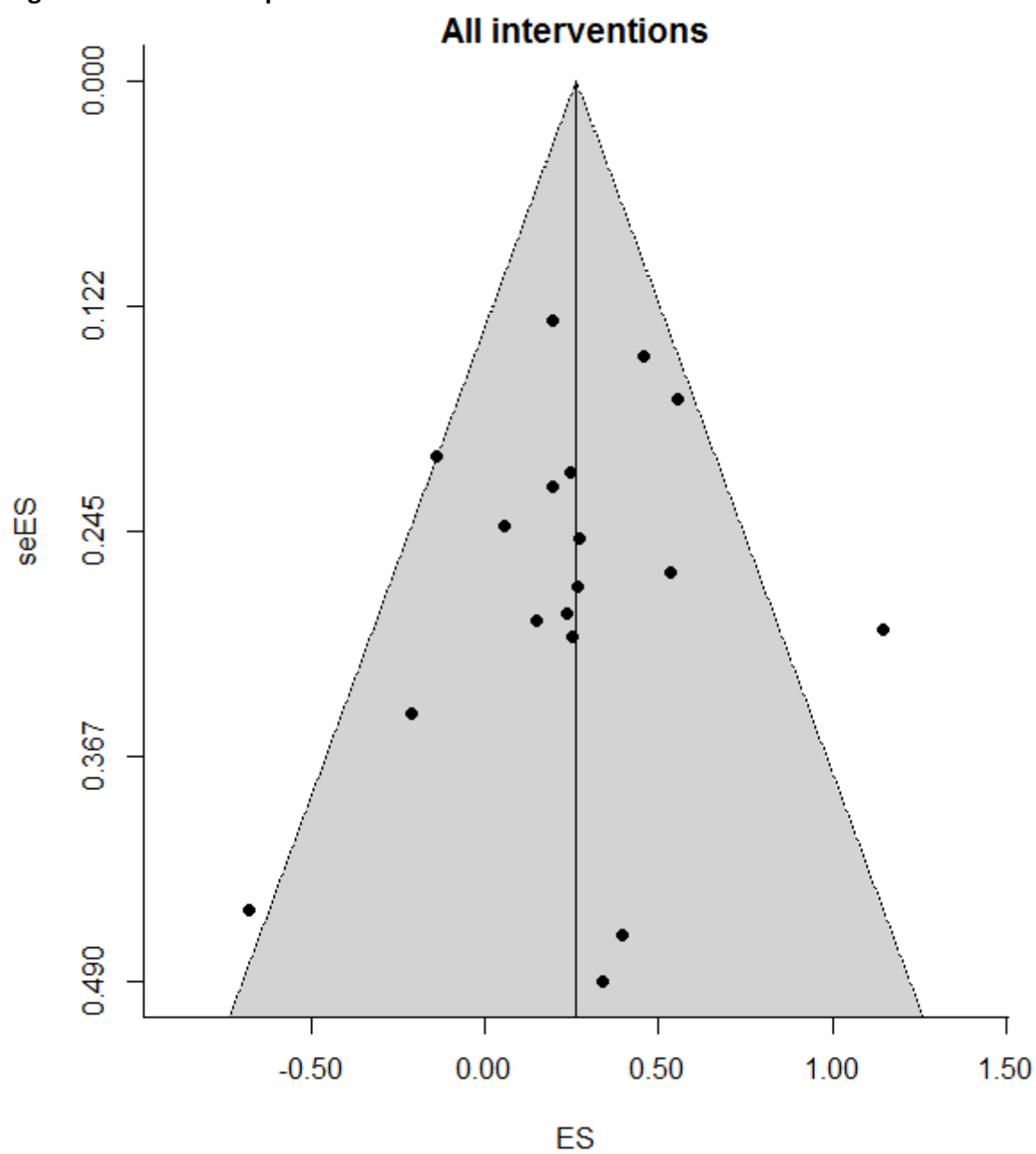
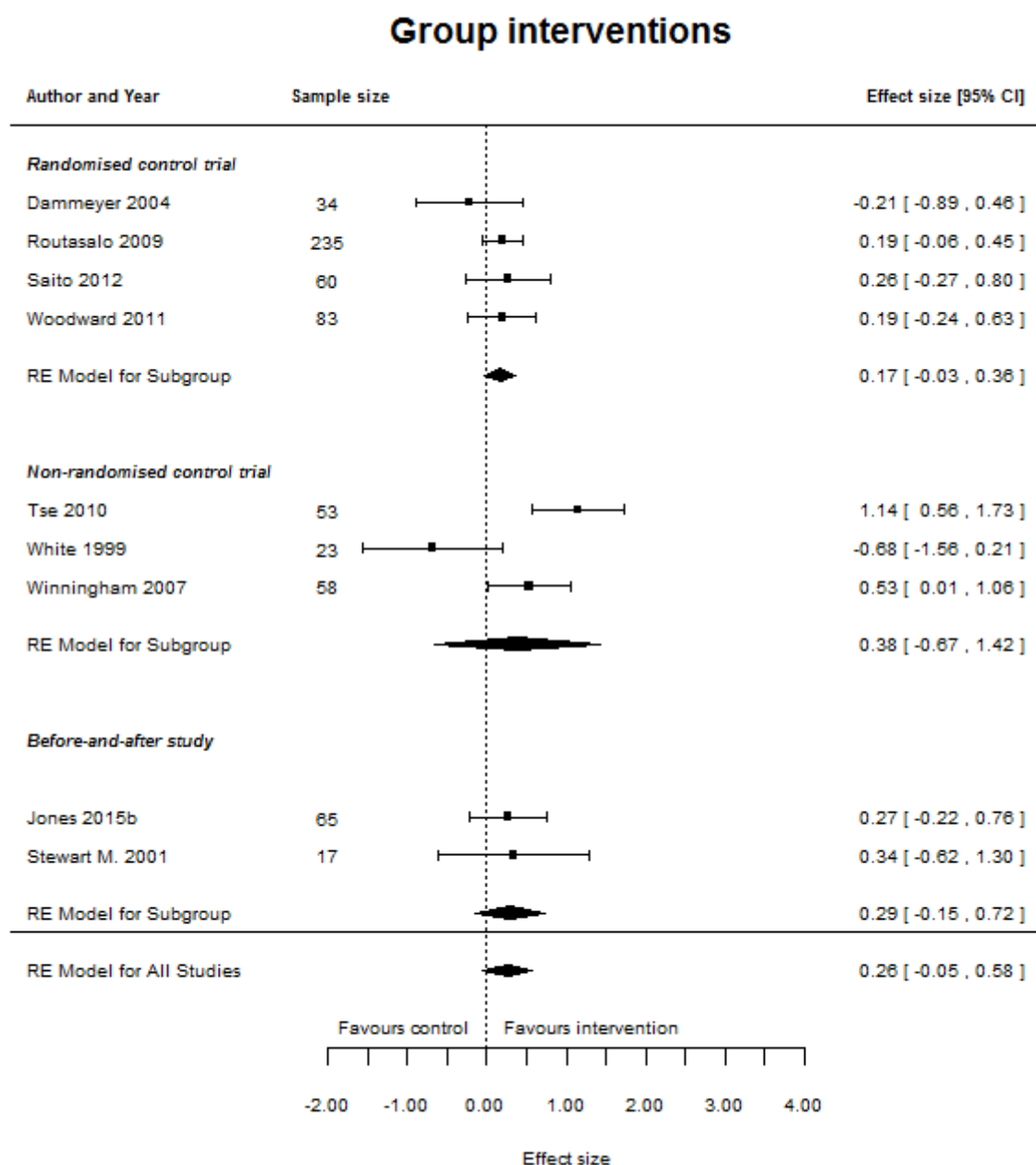


Figure A.26.2: Funnel plot of all interventions with Hombrados Mendieta et al. excluded



Appendix 27: Sensitivity analysis for group based interventions to alleviate social isolation

Figure A.27.1: Forest plot of group interventions with Hombrados Mendieta et al excluded



Appendix 28: Sensitivity analysis for non-technological interventions to alleviate social isolation

Figure A.28.1: Forest plot of non-technological interventions with Hombrados Mendieta et al. excluded

