Incidence of venous thromboembolism in care homes: a prospective cohort study

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Abstract

Background Care home residents have venous thromboembolism (VTE) risk profiles similar to medical inpatients, however, the epidemiology of VTE in care homes is unclear.

Aim To determine the incidence of venous thrombembolism in care homes.

Design and setting Observational cohort study; 45 care homes in Birmingham and Oxford.

Method A consecutive sample of care home residents was enrolled and followed up for 12 months. Data were collected via case notes reviews of care home and GP records; mortality information was supplemented with Health and Social Care Information Centre cause of death data. All potential VTE events were adjudicated by an independent committee according to three measures of diagnostic certainty: definite VTE (radiological evidence), probable VTE (high clinical indication but no radiological evidence) or possible VTE (VTE cannot be ruled out).

Results 1011 participants enrolled; mean follow up period was 312 days (SD=98). The incidence rate was 0.71 per 100 person-years of observation (95% CI 0.26 to 1.54) for definite VTE, 0.83 per 100 person-years (95% CI 0.33 to 1.70) for definite and probable VTE, and 2.48 per 100 person-years (95% CI 1.53 to 3.79) for definite, probable and possible VTE.

Conclusion The incidence of VTE in care homes in our study (0.71-2.48 per 100 person-years) is substantial compared to that in the community **(**0.117 per 100 person-years) and in people aged ≥70 years (0.44 per 100 person-years). Further research regarding risk stratification and VTE prophylaxis in this population is needed.

Keywords venous thromboembolism, care home residents, nursing home residents, VTE incidence, deep vein thrombosis, pulmonary embolism

Study registration number: ISTCTN80889792

How this fits in

What is known

Residence in a nursing home is an independent risk factor for venous thromboembolism.

What this study adds

The incidence of VTE in care home residents (with and without nursing) may be up to twenty-one times the community incidence and five times that of people aged≥70 years.

Care home residents are not risk assessed for VTE.

Introduction

Venous thromboembolism (VTE) comprising deep vein thrombosis (DVT) and pulmonary embolism (PE), is a serious global health problem associated with significant morbidity and mortality [1 2]. VTE risk significantly increases with advancing age and age ≥75 has been established an independent risk factor [3-6]. Other important risk factors include immobilization, hospitalisation, malignancy, previous VTE, and co-morbidities such as heart failure, stroke, COPD and diabetes mellitus[7-14].

Approximately 50% of VTE is associated with hospital admission and VTE risk assessment of hospitalised patients is strongly recommended by evidence based guidelines[15]. It could be argued that care home residents have VTE risk profiles similar to those of medical inpatients[16 17], although the impact of VTE risk factors in the UK care home population is unknown[16]. Nursing home stay is an independent risk factor for VTE[8], moreover, US data suggest an eight fold risk of VTE associated with residence in a long term care facility [18].

The epidemiology of VTE in care homes remains unclear and accurate data are needed on rates of VTE in care homes. We conducted a prospective cohort observational study to determine for the first time the incidence of VTE in UK care homes.

Methods

Study design

Observational cohort study. Study staff extracted clinical data from case notes of participants care home and GP records over 12 months for all events of interest. Mortality data were complemented with cause of death data from the HSCIC, the national provider of

population data relating to health and social care. The main outcome of interest was the rate of VTE events per 100 person years.

Setting and participant selection

Care home as used in this study, in accordance with the UK definition[19], included care homes with nursing and care homes without nursing. A sample of care homes was recruited in Birmingham and Oxford, stratified by type, size and ownership to increase generalisability. Care homes with less than 10 beds were excluded. Each resident from participating care homes was assessed for study inclusion. Inclusion criteria were: care home resident, able to provide consent (either by consenting personally or via consultee declaration i.e. asking a family member to advise whether a person who lacks mental capacity would want to participate). Temporary residents and residents with a life expectancy of less than six months were excluded. GPs were asked to provide access to participants' medical records.

Data collection

Clinical researchers reviewed the care home and GP medical records for each participant at baseline and at 12 months follow up, or when the particpants died or moved away. Baseline data comprised: demographic data, medical history, comorbidities and current medications. The Rivermead Mobility Index (RMI) [20] was administered by care home staff. Follow up data comprised: hospital admissions (including A/E attendances), deaths and GP consultations.

Outcomes

Endpoint definition The study endpoint was defined as development of VTE during time in the study. VTE events were categorised into three levels of diagnostic certainty: definite VTE (clinical evidence of VTE; including radiological or post mortem diagnosis, evidence of treatment, PE listed as main cause of death on death certificate); probable VTE (high clinical suspicion or indication of VTE but no radiological diagnosis) and possible VTE (no clinical suspicion of VTE recorded in patient's notes; however VTE could not be ruled out, e.g. pleuritic chest pain, haemoptysis).

Endpoint adjudication Firstly, two research nurses with VTE training reviewed the complete case report form for each patient and adjudicated on each death, hospital admission and GP consultation where there was any suggestion there were VTE symptoms. Events that were not VTE related were adjudicated as probably not VTE or definitely not VTE, and cases with insufficient information for a sensible decision were adjudicated as 'VTE unknown'. The Principal Investigator (DF) adjudicated where there was a difference of opinion. All events adjudicated as definite VTE, probable VTE and possible VTE were then referred to a second stage of adjudication: an independent adjudication panel comprising of two haematologists and a GP; two members assessed anonymised information to adjudicate on events and any difference of opinion was judged by the third member.

Statistical analysis

Person time at risk commenced from date of enrolment until 12 months, lost to follow up or death. Incidence of VTE was calculated per 100 person years of observation (PY) with corresponding 95% confidence interval, using the Poisson exact method. The incidence of VTE was calculated based on definite, probable and possible VTE events. Participants'

baseline VTE risk was calculated for both the DH risk assessment tool[24] and QThrombosis score[25]. We assessed the individual risk of VTE for selected factors using Poisson regression, reporting relative risks, associated 95% confidence intervals and p values. Statistical analysis was performed using SAS v9.4.

Results

Sites

45 care homes in Birmingham and Oxford participated: participating care homes varied according to type, size, and ownership, and were representative of UK care homes (Table 1). 83/86 GPs granted access to participants' medical records.

Figure 1 reports the numbers of individuals at each stage of the study. All residents in participating care homes were assessed for eligibility (n=1876); 95% (1783/1876) were eligible. Reasons for exclusion: life expectancy < 6 months (n=35); temporary residents (n=58). 67 patients were excluded as they lacked capacity to consent and no suitable consultee was identified. 59% (1011/1783) of eligible residents invited to participate were consented and enrolled to the study between August 2013 and June 2014; 466/1011 (46%) of these lacked capacity.

Baseline data were obtained for 1011. Follow up analysis consisted of 989 participants (22 patients were excluded from follow up analysis due to restricted access to GP records). 698/989 were followed up for 12 months; 45 moved away; and 246 died, whilst in the study. The total follow up period was 847.5 person years with median (IQR) follow up period 365 (300- 365) days.

Participants

The mean age (SD) was 85.1 (8.6) years, 58.1% (587/1011) were aged ≥85 years; mean BMI (SD) was 24.4 (6.1), with 14.1% (142/1011) having BMI≥30 and 11.8% (119/1011) having a BMI<18.5 (Table 2). The majority, 96.8% (979/1011) were of white ethnicity and 71.4% (722/1011) were female; 52.7% (530/1011) had dementia. 22.2% (224/1011) were completely bedridden (RMI score = 0)and a further 36.5% (369/1011) had significantly reduced mobility (RMI score 1-6).

The main reason for requiring care home admission was mental health conditions (41.4%, 491/1011), with 89.2% (374/391) of this being due to dementia. Participants had been in the present care home for mean time of 2.8 years (SD=8.2) with median time of 1.5 years. 68.3% (691/1011) resided in care homes with nursing and 31.7% (320/1011) in care homes without nursing; overall 31.7% (320/1011) had a do-not-resuscitate order in place.

Baseline VTE risk

When the Department of Health VTE risk assessment tool [24] for hospitalised patients was applied to baseline data 58.7% (593/1011) were classed as high risk and eligible for consideration of either mechanical or pharmacologic prophylaxis in the hospital setting (Table 3). The QThrombosis risk tool [25] a risk prediction model designed for primary care, indicated participants had an increased one year risk of VTE with 96% (971/1011) having an absolute risk of ≥ 0.3, three times the general risk.

VTE prevention strategies at baseline

0.7% (7/1011) were on heparin - all prompted by a recent VTE or hospitalisation, and another 5.5% (56/1011) were on oral anticoagulants - mainly for atrial fibrillation. 5% (51/1011) were using compression stockings. There was no evidence in any participant's records of VTE risk assessment.

Identification of VTE events during follow up period

Data for 989 participants in the follow up analyses were reviewed by the internal adjudication team. There were 991 events: 246 deaths, 574 hospital admissions (relating to 345 patients) and 171 GP consults involving symptoms suggestive of VTE. Out of these, the internal adjudication process identified 132 potential VTE events; there was insufficient information to make a judgement on 6 events. Finally independent adjudication confirmed 21 VTE events (6 definite, 1 probable, 14 possible).

Incidence of VTE

Table 4a shows the number of VTE events according to diagnostic certainty and associated incidence rates, Table 4b shows supplementary data according to type of VTE.

The incidence of definite VTE was 0.71 per 100 PY (95%CI: 0.26 to 1.54), definite and probable VTE was 0.83 per 100 PY (CI 0.33 to 1.70), definite, probable and possible was 2.48 per 100 PY (95%CI: 1.53 to 3.79). The incidence of definite and probable VTE varied according to type of care home (care home with nursing: 0.70 per 100 PY, care home without nursing: 1.10 per 100 PY). The majority of the definite and probable VTE events were DVTs (71.4% [5/7]), and PE accounted for 16.6% [1/6] of definite VTE compared to 57.1% [8/14] of possible VTE. The incidence of VTE related deaths was 0.12 per 100 PY for definite VTE as well as definite and probable VTE, and 0.35 per 100 PY definite, probable

and possible VTE. The rate of hospital admissions due to VTE was 0.34% [2/574] for definite VTE, 0.52% [3/574] for definite and probable VTE and 1.21% [7/574] for definite, probable and possible VTE.

Table 5 compares the event rates across age groups, gender, mobility, type of care home, length of residency,previous VTE event and presence of one or more significant medical co-morbidities. In summary, the data suggest that the risk of a recurrence is increased with having a previous VTE (RR=3.17 (1.16 to 8.66), p=0.02) and with having one or more significant medical co-morbidities (RR=4.87 (1.64 to 14.49), p=0.004). Although the risk of VTE is likely to be increased with being female, aged 85 and over, resident in a nursing home, resident in care home for less than 1 year, the confidence intervals are wide and include the possibility of reduced risk.

Discussion

This is the first prospective study to determine the incidence of VTE in care homes and evaluate incidence of VTE in UK care homes. There was incidence of 0.83 per 100 PY for definite and probable VTE, significantly higher (seven times) than the community incidence of 0.117 per 100 PY [18], rising to 2.48 per 100 PY when including possible VTE. The incidence of definite and probable VTE is also twice as high as the rate of VTE in people aged ≥70 (0.44 per 100 PY) [27]. The study population was classed as high risk according to conventional available VTE risk assessment tools, however there was no demonstrable use of VTE risk asessment.

Strengths and limitations

The current study has several strengths; the clear definitions for VTE according to diagnostic certainty and independent adjudication of study endpoints minimised bias in the ascertainment of VTE events. Data collection comprised complete notes review of both care home and GP records; GP records in UK contain the complete medical history including all hospitalisations, investigations, results and medications, therefore providing a robust data source for identification of VTE events. Further, HSCIC cause of death data provided reliable data for adjudication on deaths. Our sample is drawn from a mix of care homes across Birmingham and Oxford, and reflects a considerable proportion of care home residents without mental capacity. Nevertheless the small number of definite and probable VTE events meant that there was insufficient data to develop a reliable clinical prediction model for estimating the probability of the occurrence of VTE in a care home population.

Comparison with previous studies

The incidence rate of definite and probable VTE in our study is lower than that found in previous studies, however if possible VTE is included the rate is much higher [21-23 28]. Gomes et al found an incidence of 1.30 events per 100PY[21], Gatt et al found an incidence of 1.4 to 1.6 per 100PY [22], and Leibson et al found an incidence of 1.2 to 1.5 per 100 PY [29]. These studies however relied on nursing home administrative data and diagnostic codes and were therefore subject to diagnostic uncertainty and misclassification. Further Gomes et al and Leibson et al were unable to disentangle VTE events that occurred during nursing home residence from those that occurred before admission, as conditions were recorded as active at time of assessment. This is important as Reardon found that one in 25 patients admitted to care homes had a current diagnosis of VTE[28]. On the other hand, our study only included VTE events that occurred during participants time in the study. We also excluded patients

with life expectancy of less than 6 months, and this group may have had a higher likelihood of developing a VTE.

A more recent study found a higher incidence of 3.68 per 100 PY[28]. This again may be due to methodological differences, although the authors attributed this to possible consequence of differences in the pool of nursing homes studied, and improved diagnostics for asymptomatic VTE such as the portable Doppler ultrasound. Portable Doppler was not available to care home residents in the current study. Nevertheless incidence rates found in this and previous studies are likely underestimate the real incidence of VTE in the care home population as death due to PE is underdiagnosed whilst post-mortem proven fatal PE rate in hospital inpatients is 2.5% [30]. Additonally, a post-mortem study of 234 nursing home residents found undiagnosed VTE to be the cause of death in 8%, whilst 40% of PE events were not suspected prior to death[31]. In the current study, only one out of the 246 deaths had objectively confirmed PE as the cause of death, giving a fatal PE rate of 0.4%. Moreover the studies are subject to under-recognition of VTE as symptoms may be nonspecific and masked by co-morbidity in older patients[32-36]. Also VTE is often silent [37-39] and a previous study found prevalence of 13.5% DVT by ultrasonography screening of institutionalised elderly subjects [40].

Implications for research and practice

Despite robust standards for ascertainment of VTE events, the incidence in care home residents in this study is high compared to incidence in the community overall as well as incidence in elderly people. The substantial VTE rate in care home residents needs consideration by clinicians responsible for their care; this has implications on national

healthcare in terms of the UK's ageing population, particularly as none of the residents in our study had been risk assessed for VTE.

Current guidelines have no provision for care home residents; further evidence is needed to inform guideline development. Zarowitz et al have developed a VTE risk stratification tool for care homes[41], though this has not been validated. Many of the characteristics of care home residents are also associated with adverse events from pharmacological thromboprophylaxis. Whilst it is difficult to argue for formal risk assessment in care homes at this stage there is a need to explore the benefit of VTE prophylaxis in this population.

Conclusion

Findings indicate the incidence rate of definite and probable VTE in care homes is seven times higher than in the community; rising to twenty-one times higher and up to five times as high as in the elderly if possible VTE is included. Care home residents have been overlooked as a high risk group for VTE, further investigation is required for risk stratification and prophylactic benefit in this population.

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Ethical approval

Ethical approval for the study was granted by the National Research Ethics Service (NRES) committee West Midlands – Black Country (ref. 13/WM/0118). Informed consent was obtained for all study participants.

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Competing interests

Mrs Apenteng has nothing to disclose. Professor Hobbs has nothing to disclose. Mrs. Roalfe has nothing to disclose. Mr Usman has nothing to disclose. Professor Heneghan has received expenses from the WHO and holds grant funding from the the NIHR, the NIHR School of Primary Care Research, The Wellcome Trust and the WHO. He is also a member of the advisory group of the WHO International Clinical Trials Registry Platform and also organizes the EvidenceLive conference with the BMJ. Professor Fitzmaurice has nothing to disclose.

Authors' contributions

PNA contributed to the design of the study, acquisition, analysis and interpretation of data for the study, and drafted the manuscript. DF, FDRH and CH made contributed to the conception and design of the study, analysis and interpretation and revised the work critically for intellectual content. DF is also the Principal Investigator and guarantor for the study. AR and UM made substantial contributions to the analysis and interpretation of data for the work and revised it critically for intellectual content. All authors approved the final version of the manuscript, and are accountable for all aspects of the work.

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