

ABSTRACT

Aims and objectives: This study designed and evaluated the use of a specific implementation strategy to deliver a nursing staff led Intentional Rounding intervention to reduce inpatient falls.

Background: Patient falls are a common cause of harm during hospital treatment. Intentional Rounding has been proposed as a potential strategy for prevention, but has not received much objective evaluation. Previous work has suggested that logical interventions to improve patient care require an integrated implementation strategy, utilising teamwork training and systems improvement training, to instigate positive change and improvement.

Methods: Customised Intentional Rounding was implemented and evaluated as part of a staff led quality improvement intervention to reduce falls on a neuroscience ward. Intentional Rounding was instigated using a pre-specified implementation strategy, which comprised of; (a) engagement and communication activities, (b) teamwork and systems improvement training, (c) support and coaching, and (d) iterative Plan-Do-Check-Act cycles. Process (compliance with hourly visiting to patients by staff) and outcome (incidence of falls) measures were recorded pre- and post-intervention. Falls measured on the active ward were compared with incidence of falls in 50 wards across the rest of the same Trust.

Results: There was a 50% reduction in patient falls on the active ward, versus a minimal increase across the rest of the Trust (3.48%). Customised Intentional Rounding, designed by staff specifically for the context, appeared to be effective in reducing patient falls.

Conclusions: Improvement programmes based on integrating teamwork training and staff-led systems redesign together with a pre-planned implementation strategy, can deliver effective change and improvement.

Relevance to clinical practice: This study demonstrates, through the implementation of a specific strategy, an effective improvement intervention to reduce patient falls. It provides insight into the effective design and practical implementation of integrated improvement programmes to reduce risk to patients at the frontline.

Keywords: Quality improvement; patient safety; intentional rounding; patient falls; staff-led improvement; human factors

What does this paper contribute to the wider global clinical community?

- This study shows that through a specific implementation strategy based on integrated training, staff led improvement, coaching and support and iterative design, effective change and improvements to patient care can be delivered at the frontline.
- Intentional Rounding has had mixed evidence to date. Within this study, analysis of the existing systems helped inform the design of Intentional Rounding. Frontline nursing staff were supported by the research team to create a system of Intentional Rounding, which was designed iteratively to suit the context in which it was being implemented. These factors, alongside senior nursing support, appeared key in successful implementation of the intervention.

INTRODUCTION

It has been accepted that the origins of unsafe healthcare are likely to be bound up with complex system level issues requiring in-depth analysis of practice (Carayon et al., 2006). Approaches to achieving ultra-safe, resilient healthcare, of enormous interest in the medical literature, are therefore unlikely to prove straightforward. The complexity of the issue has led to debate, not only in relation to the effectiveness of quality improvement (QI) interventions, but on a more basic level, as to whether improvement interventions can be transferred from one setting to another (Bion et al., 2013). To increase the likelihood of a successful intervention, a rational implementation strategy adapted to the environment in which the intervention is applied, is considered to be as important as the components of the intervention itself (Dixon-Woods, et al., 2011).

In 2011 the National Patient Safety Authority estimated there were on average 282,000 inpatient falls reported each year. Inpatient falls are adverse events, which can result in significant harm to the patient. The Patient Safety Thermometer recently published statistics which indicated that approximately 19,579 patients had experienced harm from an inpatient fall between December 2013 and December 2014. Inpatient falls also have consequences for the organisation in which they occur, including increased resource, increased length of stay and greater rates of discharge to longer-term care facilities (Miake-Lye et al., 2013). There are a number of approaches and programmes which have been developed to address the issue of inpatient falls (e.g. Intentional Rounding, risk assessments, patient education, visual risk alerts), however; many are lacking in rigorous scientific evaluation (DiBardino et al., 2012). As part of a wider programme of improvement in the surgical process in a neuroscience unit (Safer Delivery of Surgical Services; S3

programme), our research group were invited by the ward nursing management to support them in efforts to reduce the frequency of inpatient falls. Neuroscience patients are at particularly high risk of serious injury from falls as their diseases, surgery and/or subsequent medical treatment can all affect balance and stability, and the risk of serious consequences in a fall after recent brain or spinal surgery are self-evident. Senior nursing staff were interested in developing a QI solution based on Intentional Rounding (IR), which was planned to be rolled out across the Trust around the time of intervention.

BACKGROUND

Intentional Rounding has recently gained significant public and political support and has been introduced in hospitals across the UK with the aim of improving patient outcomes and satisfaction (Braide, 2013). It is a system of structured routine checking on patients at regular intervals, with duration determined by the needs level of the patients on the ward (Lowe & Hodgson, 2012). IR is typically conducted by nursing staff (Hutchings et al., 2013) and generally involves the standardised checking and recording of specified elements of the patients care, such as toilet assistance, comfort levels, skin/pressure care, patient positioning and proximity of personal items (Braide, 2013; Dix et al., 2012; Hutchings et al., 2013). It typically includes some form of documentation of the round (Dewing & O'Meara, 2013).

Research on IR has largely been conducted in the USA, with many reporting positive effects on patient satisfaction, call bell usage, pressure ulcer rates and falls (Meade et al., 2010; Olrich et al., 2012; Tea et al., 2008). The quality of the some of these positive studies has, however; been criticised and it has been suggested that many findings may have been over reported or misinterpreted (Snelling, 2013). The transferability of USA findings to the NHS

context has also been questioned (Forde-Johnston, 2013). Whilst initial UK-based pilot studies showed promising results, the evidence for the effectiveness of IR as a QI intervention remains uncertain (Braide, 2013; Dewing & O'Meara, 2013; Dix et al., 2012; Lowe & Hodgson, 2012). No studies to date have looked at the involvement of front line staff in the design and implementation of IR or any other falls prevention programme (Miake-Lye et al., 2013), although the success and sustainability of these programmes largely relies on the compliance and engagement of staff involved in conducting them on a daily basis. Analysis of the IR literature led us to conclude that success was directly proportional to the degree of compliance achieved in real life practice with the procedures proposed. The introduction of IR to reduce falls therefore gave us an opportunity to test the effectiveness of our integrated quality intervention approach in maximising compliance with a specific clinical protocol with a well-defined objective.

At the base level, the literature shows that two major themes dominate methods to improve safety: improvement of staff safety culture through multidisciplinary teamwork training programmes (McCulloch et al., 2011) and industrial Quality Improvement (QI) techniques to rationalise systems of work (Nicolay et al., 2012). At the next dimension above these technical approaches, recent literature has emphasised the importance of staff involvement in improvement work in healthcare settings (Schmittdiel et al., 2010). This stream of research suggests that improvement interventions are most likely to be successful and sustained where staff lead the improvement efforts. This theme is also prominent in some strands of the literature analysing Lean improvement approaches (Spear & Bowen, 1999). Previous studies have examined a variety of single and multi-component interventions in operating theatres and on wards, with some resulting in process and clinical

outcome improvement (McCulloch et al., 2015; Morgan et al., 2015; Morgan et al., 2014; Morgan et al., 2014; Robertson et al., 2015). Such research influenced by Lean quality improvement has emphasised staff leadership of projects. We have therefore developed a standardised implementation strategy which covers these principles: staff led, iterative improvement cycles, with a teamwork training component.

METHODS

This study reports a nursing staff-led improvement project based on Intentional Rounding methods to reduce in-patient falls. Staff were supported by Human Factors/Ergonomics researchers, Lean management professionals and clinical researchers with experience in patient safety as part of the Safer Delivery of Surgical Services Programme (S3). A working group of three senior nurses and a care support worker identified patient falls as an issue warranting intervention inclusion in this programme. This decision allowed us to evaluate the effectiveness of our integrated improvement strategy, comprising (1) teamwork training (2) systems improvement training and (3) support for a staff-led intervention, in implementing a well-defined intervention with a clear measurable goal.

Setting

The study was carried out on a 75-bed neuroscience (neurosurgical and neurology patients) ward of a tertiary referral centre within a university teaching hospital/trauma centre.

Design

The study was undertaken between October 2012 and September 2013 as a pre-post intervention evaluation study, using the rest of the Trust (four hospital sites) as a control. Three phases were utilised; pre-intervention (2 months), intervention (8 months) and post-intervention (2 months). Prior to the pre-intervention phase staff participated in a focus group to identify issues which they believed warranted intervention, where patient falls was subsequently identified as an important area for intervention. A working group of key frontline nursing staff was formed, supported by members of the research team, to design and implement an improvement intervention. This group examined falls incident reports to determine the most frequent contributing factors. The most common factor identified was a patient needing to use the toilet or to access something in their room. It seemed likely that falls could be prevented if staff visits were frequent enough to ensure assistance when required for these purposes. Discussions with frontline staff confirmed that current systems did not provide them with any method of easily monitoring how frequently patients were visited. Intentional Rounding was therefore chosen as an appropriate intervention.

Intervention

The Intentional Rounding intervention consisted of regular visits to each patient by a designated nurse, during which the nurse checked on specific patient needs relevant to the risk of falls, such as toileting. Intentional Rounding was designed to suit the working needs and context of the neuroscience ward. For example, to address the issues of easily monitoring of whether a patient had been visited, a “log sheet” (see appendix) was placed on the patient’s door, which staff were to stamp upon seeing the patient. This increased

the visibility of patient visit intervals, but crucially did so without increasing the workload of frontline staff, who were already spending significant portions of their working day completing paperwork related to other elements of patient care. A training video with examples of what IR should look like was developed by senior nursing staff. This video was used in training drop in sessions, where nurses attended a brief 10 minute training session during their breaks. IR was implemented via iterative Plan-Do-Check-Act (PDCA) cycles (Table 1), with continuous collection of staff experience and feedback during cycles to capture experience and guide improvement. A standardised survey was used for cycles 1-3 (see appendix), but drop in training sessions were also used to gather feedback. Completion of the logging sheet was used for evaluation of IR compliance in each PDCA cycle.

Table 1. PDCA cycles

Role of research team

Prior to implementing the intervention, staff were given the opportunity to attend two days of training which covered training in QI techniques, teamwork and ideas adopted from the Lean approach and from standard ergonomic approaches by members of the research team (Morgan et al., 2013). Expert support and advice from members of the research team was available to the teams during the set-up and implementation of the intervention. Research team members also assisted with the design and implementation of evaluation measures, but all key decisions were made by members of the clinical team.

Evaluation

Incidence of falls

The incidence of patient falls was recorded during pre- and post-intervention phases using the online incident reporting system in use in the Trust. This data was collected in the same way from the active ward and from the rest of the Trust (n=50 inpatient wards), which served as a control group. Only adult inpatient wards were included for comparison. Wards that had experienced changes in coding or incident reporting during the study (n=3) were excluded as this data was considered unreliable.

Observations

Direct ward sampling observations were conducted pre-intervention (n=10 patients) and post-intervention (n=10 patients) to estimate how frequently and for how long patients were visited by staff. Observation sessions lasted either 90 minutes (for 4 patients pre- and 4 patients post-intervention) or 120 minutes (for 6 patients pre- and 6 patients post-intervention). Patients observed pre-intervention were chosen at random and the observations were conducted by a member of the research team. Data collected during the observations included: (1) role of staff visiting; (2) length of visit; and (3) tasks completed on each visit. Patients observed post-intervention were matched as closely as possible for location, diagnosis and estimated falls risk as to those observed in the pre-intervention phase. During post-intervention observations the researchers also recorded (1) whether IR was completed (as per the training video); (2) if an IR log sheet was present; and (3) whether the round was documented on this sheet or not. Although staff were aware that

observations were on-going, they were not aware of which specific patient rooms were being observed or at what times observations were conducted.

Analysis

All statistical analyses were conducted using Microsoft Excel or IBM SPSS (version 20).

Independent t-tests were used to determine if any significant differences existed between pre- and post-intervention in 1) the frequency of nurse/health care assistant (member of healthcare team working under guidance of qualified health professional) visits to patients and 2) incidence of patient falls. Pre- and post-intervention differences are reported as 95% confidence intervals.

Ethics

The study was approved by the Oxford A Ethics Committee [REC:09/H0604/39]. Individual patients were not required to provide consent. Staff involved in observations did provide consent.

RESULTS

Study characteristics

The breakdown of patients admitted to the neuroscience ward by age and gender during pre- and post-intervention phases of the study can be seen in Table 2. The patient sample

was similar in both phases. The number of patients admitted to the entire hospital was 46,654 in the pre-intervention phase and 50,779 in the post-intervention phase.

Table. 2 Patient demographics (neuroscience ward)

Pre- and post- ward round observations

Staff visits to patients

Patients observed were visited more frequently after the introduction of IR (Figure 1), than they were before ($p=0.013$). Mean visits per hour were 1.47 were before and 3.32 after intervention.

Figure 1. Nurse/CSW visits during 90/120 minute observation sessions conducted pre- and post-intervention

Completion of rounding

Post-intervention ward observations recorded that IR was completed 100% of the time (Figure 2). During these periods the IR log sheets were present on the patient door for 90% of the patients observed. IR was documented 50% of the time (Figure 2).

Figure 2. Completion and documentation of rounding post-intervention

Incidence of falls

Comparison of pre- and post- intervention data revealed a 50% decrease in the total incidence of falls on the active ward (Table 3), from 44 in the pre-intervention period to 22 in the post-intervention period ($p=0.006$). Data from the rest of the Trust demonstrated a non-significant increase of 3.48% in total incidence of falls when comparing the same two periods ($p=0.758$). A weekly breakdown of falls across both phases can be seen in Figures 3 and 4.

Table 3. Total falls pre-intervention

Figure 3. Weekly incidence of falls on the active ward

Figure 4. Weekly incidence of falls on the control wards

DISCUSSION

This study demonstrated an effective implementation of Intentional Rounding by frontline staff, with a 50% decrease in falls, whilst no change in falls was observed across the rest of the Trust. The approach to implementation used was one developed during our previous work and comprised brief staff training in teamwork and systems improvement, followed by support from an expert team in developing a staff-led improvement intervention. The resultant intervention was successfully designed by staff using PDCA cycles to suit the context, tasks and needs of the environment in which it was implemented. The compliance

with prescribed procedure achieved was impressive, with an increase in the number of staff visits to at least once an hour and IR conducted 100% of the time during post-intervention observed samples, but the rounds were documented only 50% of the time.

These results accord with previous studies in the UK and US, which have suggested IR as an effective strategy for reducing inpatient falls. They are in line with pilots that indicate IRs potential within the very different UK context, however; there are a number of differences between this study and other existing pilots in the UK. The method used to develop the IR system was designed to enhance success by maximising adherence to the prescribed procedures. The use of a formal QI method incorporating PDCA cycles ensured constant staff feedback throughout the development and implementation of IR, thereby increasing staff engagement and utilising staff knowledge. Feedback and measurement have been shown to be vital elements of QI efforts, and so the PDCA methodology integrates this within the QI method. The use of prior integrated training in teamwork and systems improvement was a core part of the intervention; this has been demonstrated to be more effective in bringing about process improvement than either type of training alone (McCulloch et al., 2015). Qualitative research based on interviews with staff involved in this research has shown that this beneficial effect was due to the fact that this integrated training provides an understanding of the need for safer practices and equips staff with some of the skills required to implement them (Flynn et al., 2015). Previous research indicates that staff engagement is key for the success of QI initiatives (Schmitt diel et al., 2010) and it is likely that this was a critical factor in the success of this particular IR intervention. In this study, a working group of frontline staff led the improvement intervention. Drop in days were also provided and staff collected feedback via surveys

throughout the intervention to ensure the engagement of other frontline staff and to ensure it was tailored to environment in which the staff were working. Whilst both the participation and engagement of staff and the experimental approach were likely contributory factors in the success of the intervention, it is difficult to determine the relative importance of these two features. However, previous research in falls has suggested that these are two key elements in developing a successful falls prevention programme (Miakel-Lye et al., 2013).

This programme was clearly successful, but analysis of its elements reveals its complexity and it is not possible to say how much each contributed to the overall success. Prior staff training in both teamwork for safety and in QI has been shown to improve team performance more than either alone in other studies (McCulloch et al., 2015). Adaptation of IR to the context using both experimentation and staff participation is in accordance with the evidence showing benefits for customisation and staff engagement (Shaw et al., 2005). Training and education in the specifics of the programme via video modelling of IR; drop in sessions with senior nursing staff and researchers; and nursing leadership may all have been important. Some of the success could also be related to the fact that this project was part of a wider improvement programme (S3) and that this encouraged improvement activity by growing a culture of staff getting involved in initiatives to improve their systems of care, similar to other improvement initiatives (Dixon-Woods et al., 2011). Rather than taking a reductionist approach to the elements identified, it may be pragmatically more useful to assume that all are valuable and should be retained if possible in the overall strategy for future projects.

Despite the fact that the rounding was completed during all observations, and that for 90% of these there was a documentation log present, the round was only documented in 50% of cases. This result may not be reliable, as the post-observation sample was small, but it is consistent with previous reports (Harrington et al., 2013) and with the staff feedback that individual patient documentation logs would have been preferred to the ward area logs used in the final version. This remaining imperfection suggests that further QI work and associated research is warranted in this area, to understand why recording is more difficult to achieve than actual rounding and to trial solutions.

This research has obvious benefits for the patients. In addition, it is fair to assume that a reduction in falls will also decrease hospital costs, reduce length of stay and additional resource and possibly reduce morbidity and mortality (Bates et al., 1995; Schwendimann, 1998). Although a decrease of 50% in patient falls is a considerable achievement; it is interesting to consider why the remaining falls still occurred. The neuroscience ward was a high-risk environment, with many patients are neurologically and cognitively impaired. Despite regular rounding, such patients may not highlight additional needs or may try to move about even when not fully capable to do so. In some cases patients may value independence so highly that they would rather complete various tasks of their care independently than ask nursing staff for assistance. There is likely to be an irreducible minimum rate of patient falls associated with factors like these, but most successful safety improvement interventions take more than one approach to solving the problem, basing strategies on analysis of baseline data and development of a process map or risk assessment profile. We may therefore expect that adding other interventions based on this type of analysis may be helpful in reducing falls further. The design of patients' beds, furniture and

rooms can be a major hazard (Hignett & Lu, 2010) and are one obvious target to consider. Additionally, the move away from Nightingale wards has meant that there is now often no clear line of sight between the patient and their nurse. These points suggests that environmental design, which we would consider part of the “technology” dimension of safety and risk (McCulloch & Catchpole, 2011), should be taken into consideration in interventions targeted at the prevention of falls.

The use of the rest of the Trust as a control in this study was a significant strength. Although the control data consisted of falls for the entire adult inpatient cohort, rather than a single ward matched with the active ward, the use of the Trust wide data had the advantage of allowing us to identify trends across the hospital. Through this we were able to determine that a reduction in falls was not due to any Trust implemented initiative, policy or secular trend and therefore seemed more convincingly attributable to the increased rounding.

One limitation of our study is that the samples of patients of observed pre- and post-intervention were relatively small and may not be entirely representative. However *all* patients were to be rounded on hourly according to protocol and therefore the observation of rounding at 100% should not have been affected by a variance in patient needs. A Hawthorne effect (Landsberger, 1958) may have had an impact on staff behaviour during the ward observations. However, this was part of a wider study programme, which involved multiple observations across the ward. The staff had already become accustomed to researcher observations on the ward and were not informed of the time or location of observations. Another weakness of our study was that we did not collect patient satisfaction as a measure, for lack of resources. Future studies should incorporate measures

of patient well-being/satisfaction. A final limitation of the study is the fact that post-intervention data only accounts for two months after the study and therefore there is limited evidence as to whether there was sustainability. Anecdotal observations indicate that the intentional rounding continued beyond the study end date, but unfortunately research permissions do not permit further data evaluation.

CONCLUSION

This study has shown that IR can be effective in reducing falls. It was effective in this case because it was applied as intended, with a very high degree of adherence to the prescribed procedures. We attribute this to the implementation strategy we adopted, of staff engagement and leadership supported by prior integrated training in teamwork and systems improvement and expert technical support. Further work is required both to build on our findings about IR and to evaluate the general applicability of our implementation strategy.

RELEVANCE TO CLINICAL PRACTICE

This study is of relevance to clinical practice as it demonstrates, through the use of a specific implementation strategy, the effective use of Intentional Rounding to reduce inpatient falls, which has had mixed evidence to date. This is significant as it provides important insight into effective design and implementation strategies to reduce risks to patients at the frontline.

REFERENCES

- Bates DW, Pruess K, Souney P & Platt R (1995) Serious falls in hospitalized patients: correlates and resource utilization. *The American Journal of Medicine*, 99(2), 137–43.
- Bion J, Richardson A, Hibbert P, Beer J, Abrusci T, McCutcheon M, Cassidy J, Eddleston J, Gunning K, Bellingan G, Patten M & Harrison, D (2013) “Matching Michigan”: a 2-year stepped interventional programme to minimise central venous catheter-blood stream infections in intensive care units in England. *BMJ Quality & Safety*, 22(2), 110–23. doi:10.1136/bmjqs-2012-001325
- Braide, M (2013) The effect of intentional rounding on essential care. *Nursing Times*, 109(20), 16–18.
- Carayon P, Schoofs Hundt A, Karsh BT, Gurses AP, Alvarado CJ, Smith M & Flatley Brennan P (2006) Work system design for patient safety: the SEIPS model. *Quality & Safety in Health Care*, 15(1), 50–8. doi:10.1136/qshc.2005.015842
- Dewing J & O’Meara BL (2013) Introducing intentional rounding: a pilot project. *Nursing Standard*, 28(6), 37–44. doi:10.7748/ns2013.10.28.6.37.e7652
- DiBardino D, Cohen ER & Didwania A (2012) Meta-analysis: multidisciplinary fall prevention strategies in the acute care inpatient population. *Journal of Hospital Medicine: An Official Publication of the Society of Hospital Medicine*, 7(6), 497–503. doi:10.1002/jhm.1917
- Dix G, Phillips J & Braide M (2012) Engaging staff with intentional rounding. *Nursing Times*, 108(3), 14–16.
- Dixon-Woods M, Bosk CL, Aveling EL, Goeschel CA & Pronovost PJ (2011) Explaining Michigan: developing an ex post theory of a quality improvement program. *The Milbank Quarterly*, 89(2), 167–205. doi:10.1111/j.1468-0009.2011.00625.x
- Flynn LC, McCulloch PG, Morgan LJ, Robertson ER, New SJ, Stedman FE & Martin GP (2015) The Safer Delivery of Surgical Services Program (S3): Explaining Its Differential Effectiveness and Exploring Implications for Improving Quality in Complex Systems. *Annals of Surgery*. doi:10.1097/SLA.0000000000001583
- Forde-Johnston C (2013) Intentional rounding: a review of the literature. *Nursing Standard*, 28(32).
- Harrington A, Bradley S, Jeffers L, Linedale E, Kelman S & Killington G (2013) The implementation of intentional rounding using participatory action research. *International Journal of Nursing Practice*, 19(5), 523–9. doi:10.1111/ijn.12101
- Hignett S & Lu J. (2010). Space to care and treat safely in acute hospitals: recommendations from 1866 to 2008. *Applied Ergonomics*, 41(5), 666–73. doi:10.1016/j.apergo.2009.12.010
- Hutchings M, Ward P & Bloodworth K. (2013). “Caring around the clock”: a new approach to

- intentional rounding. *Nursing Management*, 20(5), 24–30.
- Landsberger HA (1958). Hawthorne revisited: Management and the worker, its critics, and developments in the human relations industry.
- Lowe L & Hodgson G (2012) Hourly rounding in a high dependency unit. *Nursing Standard*, 27(8), 35–40. doi:10.7748/ns2012.10.27.8.35.c9362
- McCulloch P & Catchpole K (2011) A three-dimensional model of error and safety in surgical health care microsystems. Rationale, development and initial testing. *BMC Surgery*, 11(1), 23. doi:10.1186/1471-2482-11-23
- McCulloch P, Morgan L, New S, Catchpole K, Robertson E, Hadi M, Pickering S, Collins G & Griffin D (2015) Combining Systems and Teamwork Approaches to Enhance the Effectiveness of Safety Improvement Interventions in Surgery: The Safer Delivery of Surgical Services (S3) Program. *Annals of Surgery*. doi:10.1097/SLA.0000000000001589
- McCulloch P, Rathbone J & Catchpole K (2011) Interventions to improve teamwork and communications among healthcare staff. *The British Journal of Surgery*, 98(4), 469–79. doi:10.1002/bjs.7434
- Meade CM, Kennedy J & Kaplan J (2010) The effects of emergency department staff rounding on patient safety and satisfaction. *The Journal of Emergency Medicine*, 38(5), 666–674. doi:10.1016/j.jemermed.2008.03.042
- Miake-Lye IM, Hempel S, Ganz DA & Shekelle PG (2013) Inpatient fall prevention programs as a patient safety strategy: a systematic review. *Annals of Internal Medicine*, 158(5), 390–6. doi:10.7326/0003-4819-158-5-201303051-00005
- Morgan L, Hadi M, Pickering S, Robertson E, Griffin D, Collins G, Rivero Arias O, Catchpole K, McCulloch P & New S (2015) The effect of teamwork training on team performance and clinical outcome in elective orthopaedic surgery: a controlled interrupted time series study. *BMJ Open*, 5(4), e006216. doi:10.1136/bmjopen-2014-006216
- Morgan L, New S, Robertson E, Collins, G, Rivero Arias O, Catchpole K, Pickering S, Hadi M, Griffin D & McCulloch P (2014) Effectiveness of facilitated introduction of a standard operating procedure into routine processes in the operating theatre: a controlled interrupted time series. *BMJ Quality & Safety*, bmjqs-2014-003158-. doi:10.1136/bmjqs-2014-003158
- Morgan L, Pickering S, New S, McCulloch P, Kwon R & Robertson E (2013) Developing a human factors curriculum for frontline staff training in the NHS. *Contemporary Ergonomics and Human Factors* 2013, 313–314.
- Morgan L, Pickering SP, Hadi M, Robertson E, New S, Griffin D, Collins G, Rivero Arias O, Catchpole K & McCulloch P (2014) A combined teamwork training and work standardisation intervention in operating theatres: controlled interrupted time series study. *BMJ Quality & Safety*, bmjqs-2014-003204-. doi:10.1136/bmjqs-2014-003204
- Nicolay CR, Purkayastha S, Greenhalgh A, Benn J, Chaturvedi S, Phillips N & Darzi A (2012) Systematic review of the application of quality improvement methodologies from the manufacturing industry to surgical healthcare. *The British Journal of Surgery*, 99(3), 324–35. doi:10.1002/bjs.7803

- Olrich T, Kalman M & Nigolian C (2012) Hourly rounding: a replication study. *Medsurg Nursing : Official Journal of the Academy of Medical-Surgical Nurses*, 21(1), 23–6, 36.
- Robertson E, Morgan L, New S, Pickering S, Hadi M, Collins G, Rivero Arias O, Griffin D & McCulloch P (2015) Quality Improvement in Surgery Combining Lean Improvement Methods with Teamwork Training: A Controlled Before-After Study. *PloS One*, 10(9), e0138490. doi:10.1371/journal.pone.0138490
- Schmitttdiel JA, Grumbach K & Selby JV (2010) System-based participatory research in health care: an approach for sustainable translational research and quality improvement. *Annals of Family Medicine*, 8(3), 256–9. doi:10.1370/afm.1117
- Schwendimann R (1998) Frequency and circumstances of falls in acute care hospitals: a pilot study. *Pflege*, 11(6), 335–41.
- Shaw B, Cheater F, Baker R, Gillies C, Hearnshaw H, Flottorp S & Robertson N (2005) Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes. *The Cochrane Database of Systematic Reviews*, (3), CD005470. doi:10.1002/14651858.CD005470
- Snelling PC (2013) Ethical and professional concerns in research utilisation: intentional rounding in the United Kingdom. *Nursing Ethics*, 20(7), 1–14. doi:10.1177/0969733013478306
- Spear S & Bowen H (1999) Decoding the DNA of the Toyota production system. *Harvard Business Review*.
- Tea C, Ellison M & Feghali F (2008) Proactive patient rounding to increase customer service and satisfaction on an orthopaedic unit. *Orthopaedic Nursing*, 27(4), 233–240. doi:10.1097/01.NOR.0000330305.45361.45

Table 1. PDCA cycles

Intervention	
Cycle 1	<p>Changes:</p> <ul style="list-style-type: none"> - IR introduced and trialed on a 26-bed area of the ward - IR training video & drop in days for staff to learn about IR - IR log sheet for each patient with stamps for staff to stamp their rounds <p>Staff feedback (n=5):</p> <ul style="list-style-type: none"> - Increased workload (80%) - Unsure if helpful (56% said it was helpful) - IR unachievable (75% said no/unsure) - Unsure whether IR increased patient satisfaction or safety (56%; 56%)
Cycle 2	<p>Changes:</p> <ul style="list-style-type: none"> - IR log sheet as per Cycle 1 - Extended training and opportunities for staff to come ask about IR - Prompt cards introduced (clear set of tasks for rounding) - Trialed on same area of ward <p>Staff feedback (n=7):</p> <ul style="list-style-type: none"> - No effect on workload (71%) - Helpful and achievable (92%; 83%) - Believed IR increased patient satisfaction and safety (92%; 92%)
Cycle 3	<p>Changes:</p> <ul style="list-style-type: none"> - Training drop in days for new log sheet - IR log sheet per ward area rather than per patient (except for High Care area) - Alternating rounding hours for nurses and care support workers (CSWs) - Trialed on the entire 75-bed ward <p>Staff feedback (n=7):</p> <ul style="list-style-type: none"> - No effect on workload (67%) - Helpful and achievable (78%; 78%) - Believed IR increased patient satisfaction and safety (67%; 89%)

Cycle 4	<p>Changes:</p> <ul style="list-style-type: none"> - Staff given the choice of two options: <ul style="list-style-type: none"> ○ IR sheet per patient ○ IR sheet per ward area - Tried on the entire 75-bed ward - Staff choose option the per patient sheet <p>Final improvement: IR sheet per patient was used; where staff marked when patient was seen. Rounding was alternated between roles each hour (nurse/CSW). The training video was to be used for new staff as required.</p>
---------	---

Table. 2 Patient demographics (neuroscience ward)

	Pre-intervention	Post-intervention
<i>Patients admitted</i>	691	737
<i>Female</i>	330	347
<i>Male</i>	361	390
<i>Mean age</i>	53.4	54.35
<i>Median age</i>	55	55
<i>Range</i>	16-93	16-94

Table 3. Total falls pre-intervention

	Pre-intervention	Post-intervention	% difference
<i>Active ward</i>	44	22	-50%
<i>Control wards (n=50)</i>	287	297	3.48%

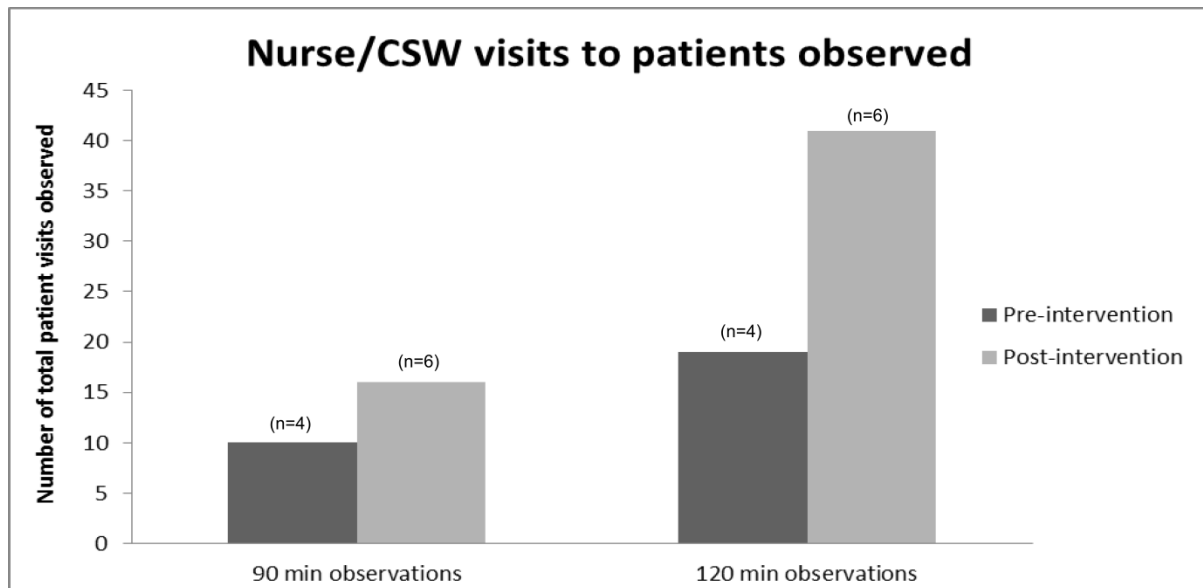


Figure 1. Nurse/CSW visits during 90/120 minute observation sessions conducted pre- and post-intervention

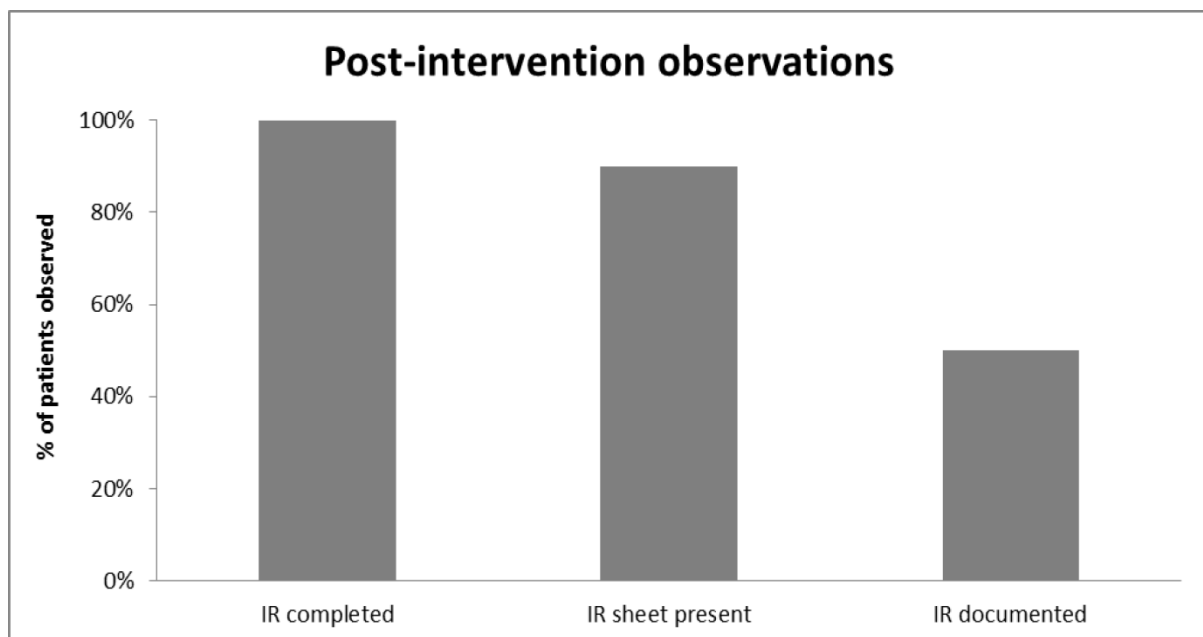


Figure 2. Completion and documentation of rounding post-intervention

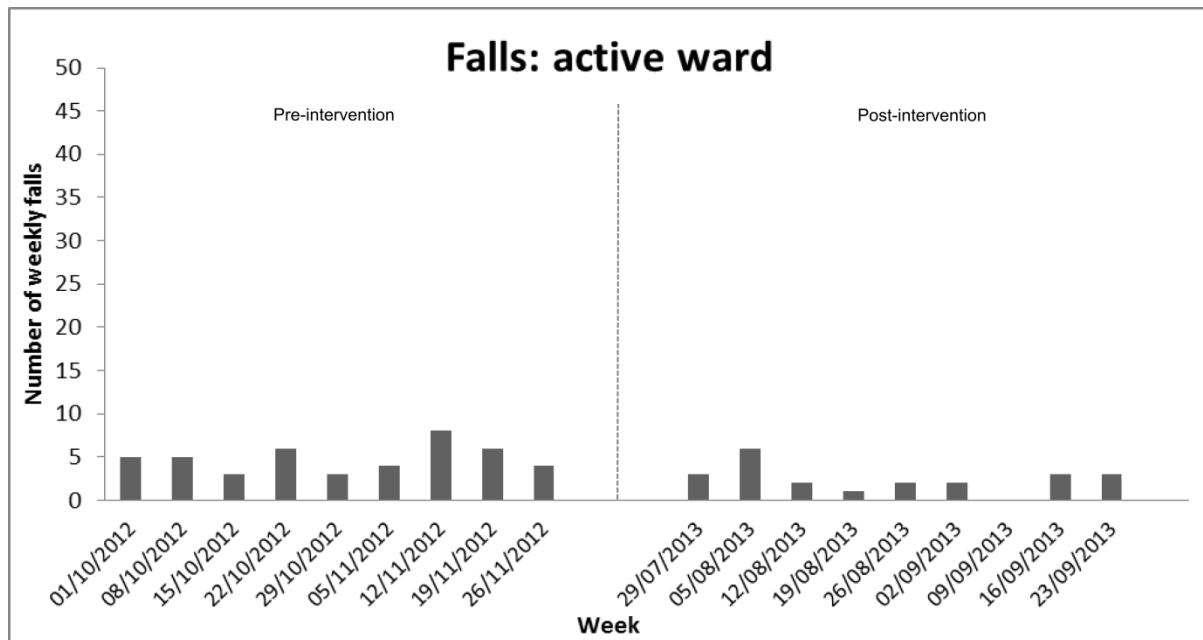


Figure 3. Weekly incidence of falls on the active ward

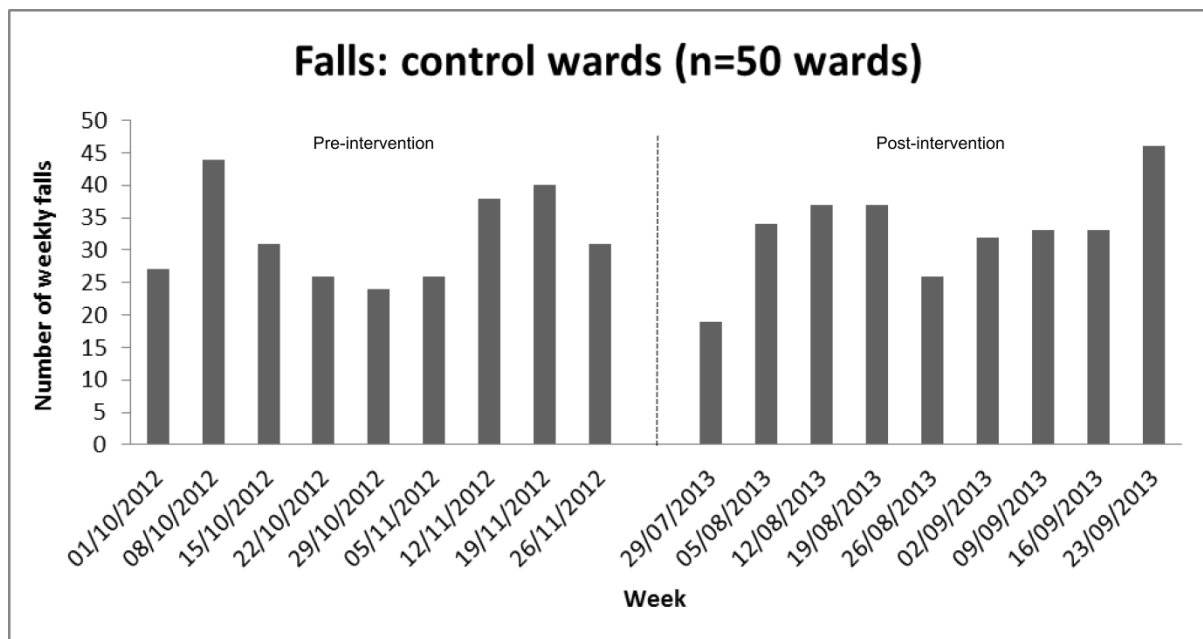


Figure 4. Weekly incidence of falls on the control wards