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**Evaluating the Impact of a Falls Prevention
Community of Practice in a Residential
Aged Care Organisation**

Jacqueline Francis-Coad

Grad Dip PT, M ClinPhty (Gerontology), Grad Cert Uni Teaching

School of Physiotherapy

A thesis submitted to fulfil the
requirements for the degree of
Doctor of Philosophy

The University of Notre Dame Australia

2016

Author's Declaration

This thesis is composed of my original work and contains no material previously published or written by another person except where due reference has been made in the text. I have clearly stated the contribution by others to jointly authored works that I have included in my thesis.

I have clearly stated the contribution of others to my thesis as a whole, including statistical design, survey design, data analysis, design of the intervention, professional editorial advice and any other original research work used in my thesis. The content of my thesis is the result of work I have carried out since the commencement of my research higher degree candidature and does not include a substantial part of work that has been submitted to qualify for the award of any other degree, diploma in any university or other tertiary institution. I have clearly stated which parts of my thesis, if any, have been submitted for another award.

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Jacqueline Francis-Coad

September 2016

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Abstract

Falls in the residential aged care (RAC) sector are a global concern with humanitarian and economic consequences. Reducing falls using a multifactorial approach involving multidisciplinary staff is recommended, but it is not clear how RAC organisations in Australia can achieve this in a resource constrained environment. One potential solution is to develop a sustainable means of addressing falls prevention from within an organisation, creating a forum for staff to share ideas, expertise and achieve goals in a community of practice (CoP). The purpose of this research was to evaluate the impact of a falls prevention CoP on falls outcomes in a RAC setting.

A mixed methods design framed by a realist approach was undertaken, to better understand how CoP interventions were influenced by current conditions (contexts) in triggering (mechanisms) the observed outcomes. Diverse data sources including surveys, electronic CoP discussion transcripts, semi-structured interviews and organisational falls data were used to triangulate findings. The CoP was mapped across three phases. Phase 1 described how the CoP was developed, then evaluated its establishment and operation across 13 geographically diverse RAC sites. In Phase 2 the CoP identified gaps in falls prevention practice using evidence-based audit and feedback, determining the areas for priority intervention. Phase 3 comprehensively evaluated the impact of CoP activity at three levels; member, site and organisation.

Overall the CoP had a positive impact; members gained new peer connections and falls prevention knowledge, the proportion of residents supplemented with vitamin D improved significantly and a falls prevention policy and risk assessment tool were developed and implemented across the organisation. Management recognition and support were key mechanisms in achieving successful outcomes. Falls rates pre CoP were 10.1/1000 occupied bed days (OBD) compared with 10.9 /1000 OBD post CoP operation [coefficient 0.7, 95% CI (-33.5, 34.9) $p = .967$]. This was potentially confounded by an increased use of beds for short stay transition care services and identified differences in defining falls between sites. A downward trend in the rate of injurious falls resulting in fractures was observed (pre CoP 0.2/1000 OBD compared

with 0.1/1000 OBD post CoP; [coefficient -0.3, 95% CI (-1.1, 0.4) $p = .423$]. As the prioritised CoP interventions required design and development, implementation only occurred towards the end of the research period meaning the intervention effect on falls outcomes may require longer term follow up. The CoP remains operational and is ideally positioned to continue to lead evidence-based falls prevention practice change as determined by its membership.

Publications, Presentations and Awards

Published Works by the Author Incorporated into this Thesis

- Francis-Coad J.**, Haines T., Etherton-Ber C., Nobre D., & Hill A-M. (in press). Evaluating the impact of operating a falls prevention community of practice on falls in a residential aged care setting. *Journal of Clinical Gerontology and Geriatrics*
- Francis-Coad, J.**, Etherton-Ber, C., Naseri, C., & Hill, A-M. (2017). The effect of complex falls prevention interventions on falls in residential aged care settings: A systematic review protocol. *JBIS Database of Systematic Reviews and Implementation Reports*, 15(2), 236-244. doi: 10.11124/JBISRIR-2016-002938
- Francis-Coad, J.**, Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A-M. (2016). Can a web-based community of practice be established and operated to lead falls prevention activity in residential care? *Geriatric Nursing*, Advance on line publication, <http://dx.doi.org/10.1016/j.gerinurse.2016.09.001>
- Hang, J., **Francis-Coad, J.**, Burro, B., & Hill, A-M. (2016). Assessing knowledge, motivation and perceptions about falls prevention among care staff in a residential aged care setting. *Geriatric Nursing*, 37, 464-469. doi:10.1016/j.gerinurse.2016.06.019
- Francis-Coad, J.**, Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A.-M. (2016). Using a community of practice to evaluate falls prevention activity in a residential aged care organisation: A clinical audit. *Australian Health Review*, 41(1), 13-18. doi:10.1071/AH15189
- Francis-Coad, J.**, Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A-M. (2015). Investigating the impact of a falls prevention community of practice in a residential aged-care setting: A mixed methods study protocol. *Journal of Advanced Nursing*, 71(12), 2977-2986. doi:10.1111/jan.12725

Manuscripts Submitted by the Author for Publication Under Peer Review

Francis-Coad, J., Etherton-Beer, C., Bulsara, C., Blackburn, N., Chivers, P., & Hill, A-M. What worked translating evidence into practice: A realist evaluation of the impact of a falls prevention community of practice. (*Ref. No.: BHSR-D-16-00388*)

Other Published Works by the Author during Candidacy Not Forming Part of the Thesis

Hill, A-M., McPhail, S.M., **Francis-Coad, J.**, Waldron, N., Etherton-Beer, C., Flicker, L., Ingram, K., & Haines, T.P. (2016). 'My independent streak may get in the way': How older adults respond to falls prevention education in hospital'. *BMJ Open*, 6(7), E012363. doi:10.1136/bmjopen-2016-012363

Hill, A-M., McPhail, S.M., **Francis-Coad, J.**, Waldron, N., Etherton-Beer, C., Flicker, L., Ingram, K., & Haines, T.P. (2015). Educators' perspectives about how older hospital patients can engage in a falls prevention programme: A qualitative process evaluation. *BMJ Open*, 5(12), E009780. doi: 10.1136/bmjopen-2015-009780

Moran, L., **Francis-Coad, J.**, Patman, S., & Hill, A-M. (2015). Using a personalized DVD to prescribe an exercise program to older people post-hip fracture enhances adherence to the exercises – A feasibility study. *Geriatric Nursing*, 36(4), 273-280. doi:10.1016/j.gerinurse.2015.02.025

Francis-Coad, J., & Hill, A-M. (2014). Discovering what experiences physical therapy students identify as learning facilitators in practical laboratories. *Journal of Physical Therapy Education*, 28(3): 42-49.

Oral Conference Presentations by Author

International Conferences

Francis-Coad, J., Haines, T., Etherton-Beer, C., Nobre, D., & Hill, A-M. *Evaluating the impact of operating a falls prevention community of practice on falls in a residential aged care setting*. Presented at the 7th Biennial Australian and New Zealand Falls Prevention Conference, Melbourne, Australia, 27-29 November 2016

Francis-Coad, J., Etherton-Beer, C., & Hill, A-M. *Using a community of practice (CoP) to measure falls prevention activity in a residential aged care setting – mind the gap.* Presented at the 44th Annual Conference of the British Society of Gerontology, Newcastle, UK 1-3 July 2015

Francis-Coad, J., Etherton-Beer, C., & Hill, A-M. *Investigating the impact of a falls prevention community of practice (CoP) in a residential aged care setting.* Presented at the 6th Biennial Australian and New Zealand Falls Prevention Conference, Sydney, Australia, 16-18 November 2014

National Conferences

Francis-Coad, J., Etherton-Beer, C., Bulsara, C., Nobre, D., & Hill, A-M. *To determine the feasibility of implementing and operating a virtual falls prevention community of practice across multiple residential care sites.* Australian Physiotherapy Association National Conference 2015, Gold Coast, QLD, 3-6 October 2015. Abstract retrieved from:
<http://physiotherapy.asn.au/conference>

Hill, A-M., McPhail, S.M., **Francis-Coad, J.,** Waldron, N., Etherton-Beer, C., Flicker, L., Ingram, K., & Haines, T.P. *Educating older patients to engage in falls prevention strategies while in hospital: Mutual understanding is required.* Australian Physiotherapy Association National Conference 2015, Gold Coast, QLD, 3-6 October 2015. Abstract retrieved from:
<http://physiotherapy.asn.au/conference>

Francis-Coad, J., Etherton-Beer, C., & Hill, A-M. *Can a community of practice (CoP) measure falls prevention activity and identify gaps in practice?* GrassRoots falls festival: A Multidisciplinary Falls Management Conference, Perth, Australia 19-20 February 2015

Conference Posters

Francis-Coad, J., Etherton-Beer, C., Bulsara, C., Blackburn, N., Chivers, P., & Hill, A-M. *What worked translating evidence into practice: A mixed methods evaluation of the impact of a falls prevention community of practice.* Poster presented at the 7th Biennial Australian and New Zealand Falls Prevention Conference, Melbourne, Australia, 27-29 November 2016

Hang, J., **Francis-Coad, J.,** Burro, B., & Hill, A-M. *What care staff think about falls prevention: A pilot survey.* Poster presented at the 48th Annual National Conference of the Australasian Association of Gerontology, Alice Springs, Australia, 4 - 6 November 2015

Awards

Francis-Coad, J. (2016). Winner WA Health FutureHealth Research Travel Fellowship (**\$5000**) – To undertake a collaborative research project with Swansea University, Wales evaluating residents’ knowledge, motivation and perceptions about falls and falls prevention in residential and care home settings (October 2016).

Francis-Coad, J. (2014). Nominee for the Journal of Physical Therapy Education’s **Stanford Award** for the research paper containing the most influential educational ideas.

Francis-Coad, J. (2013). Awarded PhD stipend (**\$90,000**) as part of the Collaborative Research Networks (CRN) program. The University of Notre Dame Australia has been awarded \$5.96 million over the period 2013-2017 from the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education to build collaborative research activity.

Research Supervision

Hang, J. (2014-2015). Evaluation of Care staff knowledge, motivation and perceptions about falls prevention in a residential aged care setting. Supervisors: Anne-Marie Hill, **Jacqueline Francis-Coad** and Bianca Burro. Awarded first class honours.

Statement of Contribution by Others

Contributions to Jointly Authored Works

Signed statements of consent for inclusion of jointly authored works in this thesis were obtained from all co-authors (see Appendix A).

Francis-Coad, J., Etherton-Beer, C., Naseri, C., & Hill, A-M. (2017). The effect of complex falls prevention interventions on falls in residential aged care settings: A systematic review protocol. *JBI Database of Systematic Reviews and Implementation Reports*, 15(2), 236-244. doi: 10.11124/JBISRIR-2016-002938

JFC, AMH and CEB, were principal contributors to conceptualisation of the systematic review design and protocol manuscript. The drafting of the manuscript was led by JFC, with all authors contributing to critical revision of the manuscript.

Francis-Coad, J., Etherton-Beer, C., Bulsara, C., Nobre, D., & Hill, A-M. (2015). Investigating the impact of a falls prevention community of practice in a residential aged-care setting: A mixed methods study protocol. *Journal of Advanced Nursing*, 71(12), 2977-2986. doi:10.1111/jan.12725

JFC, AMH and CEB, were principal contributors to conceptualisation of the study design and protocol manuscript. AMH is the chief investigator of the funding awarded for this research activity. JFC and AMH were responsible for the design of the survey. CB provided guidance in qualitative methodology and DN in planning study data collection. The drafting of the manuscript was led by JFC, with contribution from AMH and all authors contributed to critical revision and approved the final manuscript for submission.

Francis-Coad, J., Etherton-Beer, C., Bulsara, C., Nobre, D., & Hill, A-M. (2016). Can a web-based community of practice be established and operated to lead falls prevention activity in residential care? *Geriatric Nursing*, Advance on line publication. <http://dx.doi.org/10.1016/j.gerinurse.2016.09.001>

JFC, AMH and CEB, were principally responsible for Study 1 conception and design. CB provided guidance in qualitative methodology and DN in planning study data collection. The interpretation of data, analysis and drafting of the manuscript was led by JFC with contributions from AMH, with all authors contributing to critical revision.

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A.-M. (2016).

Using a community of practice to evaluate falls prevention activity in a residential aged care organisation: A clinical audit. *Australian Health Review*, 41(1), 13-18. doi:10.1071/AH15189

JFC, AMH and CEB conceptualised and contributed to all aspects of Study 2. DN co-ordinated data collection and CB provided guidance in qualitative methodology. The drafting of the manuscript was led by JFC with contributions from AMH and all authors contributed to critical revision.

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Blackburn, N., Chivers, P., & Hill, A-M. What worked translating evidence into practice: A realist evaluation of the impact of a falls prevention community of practice. (Ref. No.: BHSR-D-16-00388. Under peer review at journal)

JFC, AMH and CEB conceptualised and contributed to all aspects of Study 3. JFC and AMH were responsible for the design of the surveys. JFC wrote the first draft of the manuscript, CB contributed to qualitative methods, PC to statistical support and NB to data collection. All authors contributed to manuscript appraisal, revision and editing.

Francis-Coad J., Haines T., Etherton-Ber C., Nobre D., & Hill A-M. (in press).

Evaluating the impact of operating a falls prevention community of practice on falls in a residential aged care setting. *Journal of Clinical Gerontology and Geriatrics*

JFC, AMH and CEB conceptualised and contributed to all aspects of Study 4. DN co-ordinated data collection. The interpretation of data and analysis was undertaken by AMH, TH and JFC, with all authors contributing to critical revision of the manuscript.

Hang, J., **Francis-Coad, J.**, Burro, B., Nobre, D., & Hill, A-M. (2016). Assessing knowledge, motivation and perceptions about falls prevention among care staff in a residential aged care setting. *Geriatric Nursing*, 37, 464-469. doi:10.1016/j.gerinurse.2016.06.019

JFC and AMH conceptualised and JH, AMH, JFC and BB contributed to all aspects of this manuscript. AMH was principal supervisor, with JFC and BB as co-supervisors for JH's Honours project and dissertation. AMH, JFC, JH and BB were responsible for design of the survey, DN assisted with planning data collection. JH wrote the first draft and all authors contributed to manuscript appraisal, revision and editing.

Contributions to the Thesis as a Whole

Associate Professor Anne-Marie Hill was the principal supervisor who conceptualised the research and was the principal investigator on the successful grant application to the Collaborative Research Network awarded to The University of Notre Dame Australia (Fremantle). Associate Professor Anne-Marie Hill provided major guidance and assistance with the drafting and editing of all manuscripts and the thesis, scrutinising iterative drafts of the chapters and the final document.

Professor Christopher Etherton-Beer was the associate supervisor who brought his extensive expertise on conducting research in RAC settings. He also provided guidance and assistance with the design, structure, data analysis and editing of all manuscripts and the thesis.

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“Stand on the shoulders of giants”

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List of Abbreviations

A&F	Audit and Feedback
BLUP	Best Linear Unbiased Predictor
CEO	Chief Executive Officer
CI	Confidence Interval
CMO	Context-Mechanism-Outcome
CCMO	Conjectured Context-Mechanism-Outcome
COM-B	Capability, Opportunity, Motivation – Behaviour change
CoP	Community of Practice
I²	I squared statistic
ICT	Information and Communication Technology
OBD	Occupied Bed Days
OR	Odds Ratio
RAC	Residential Aged Care
RCT	Randomised Controlled Trial
RR	Risk Ratio
SNA	Social Network Analysis

Chapter 1:

Thesis Introduction and Outline

1.1 Introduction

Falls are a significant concern across the residential aged care (RAC) sector with half its older population falling annually (Burland, Martens, Brownell, Doupe, & Fuchs, 2013; Haralambous et al., 2010; Kerse, Butler, Robinson, & Todd, 2004; Nyman & Victor, 2011; Ray et al., 2005). Preventing falls by older people in RAC may enable them to maintain their independence, enhance their wellbeing and sustain their quality of life. This research partnered staff and residents of a RAC organisation with a university research team. The collaboration aligned with the Australian Government's national initiative of preventing falls among older people (Lord, Sherrington, Cameron, & Close, 2011; National Public Health Partnership, 2004) and international recommendations for embedding research in RAC settings (Verbeek, Zwakhalen, Schols & Hamers 2013).

For an older person the consequences of falling can result in an increased risk of mortality, physical injury, functional decline, depression and anxiety (Morley, 2007; Oliver et al., 2007; Rubenstein, 2006). For older people (residents) who live in RAC facilities the sequela of falling can be devastating with a loss of independence and reduction in their quality of life (Barker, Nitz, Low Choy, & Haines, 2012; Bonner, MacCulloch, Gardner, & Chase, 2007; Oliver et al., 2007). The characteristics of this population are complex and place them in a high falls risk category, as they present with combinations of multiple co-morbidities, age-related systems decline and cognitive impairment. Addressing this complexity is a challenge for care providers and researchers when implementing and evaluating falls prevention interventions (Craig et al., 2008).

Recommendations for effective evidence-based falls prevention interventions in RAC settings include the supplementation of vitamin D and medication review by a pharmacist (Cameron et al., 2012; Flicker et al., 2005; Nazir et al., 2013, Zermansky et

al., 2006). Multifactorial interventions delivered by a multidisciplinary team incorporating staff education, resident exercise programs and environmental modification show inconclusive outcomes in reducing falls rates indicating a problem exists (Cameron et al., 2012; Quigley et al., 2010). Despite this, adopting a multifactorial approach to falls prevention is still considered as industry best practice in the absence of further specific evidence (Australian Commission on Safety and Quality in Healthcare, 2009). The RAC population is known to have high levels of activities of daily living disability (83%) and cognitive impairment (68%) (Onder et al., 2012) suggesting that in terms of falls prevention, this population may have difficulty adopting falls prevention strategies independently. Therefore staff and health care systems providing care to this population may need to play a significant proxy role in providing falls prevention interventions for those at risk.

At a site or organisational level the occurrence of falls can also lead to complaints and in some cases litigation, thus careful guidance in the adoption of evidence-based falls prevention interventions is necessary (Oliver et al., 2007). This in turn requires access to evidence-based falls prevention knowledge, followed by systematic inquiry, synthesis and adaptation. This tailoring of evidence-based falls prevention knowledge underpins its translation into relevant practice (Graham et al., 2006; Haines & Waldron, 2011; Tetroe, Graham, & Scott, 2011). However undertaking this translation process in its entirety requires collaboration, research expertise and clinical and managerial skills, all of which may not be present within the RAC workforce expected to undertake this process (Haines & Waldron, 2011). This is confirmed by studies describing the RAC workforce as one of diminishing expertise due to lower levels of recruitment, retention of professional staff and limited workplace learning opportunities (Grealish, Bail, & Ranse, 2010; O'Connell, Ostaszkiwicz, Sukkar, & Plymat, 2008). Therefore finding ways that partner research expertise regarding falls prevention, with authentic expertise in RAC may be an effective way to approach the translation of research evidence into practice. This "translation to action change" process has been proposed to improve resident care outcomes (Fixsen, Scott, Blase, Naoom, & Wagar, 2011; Tolson, Lowndes, Booth, Schofield, & Wales, 2011).

An innovation that is yet to be applied to the problem of falls prevention in the RAC sector that may address these issues is the formation of a community of practice

(CoP). A CoP is a group of like-minded people with a mutual interest in a topic who get together to share their expertise, and then innovate and facilitate change in pursuit of a common goal (Conklin et al., 2011; Li et al., 2009; Ranmuthugala, Cunningham, et al., 2011; Wenger, 1998), in this case falls prevention. CoPs have emerged across the healthcare sector as a potential means of improving knowledge, learning, clinical practice and patient care, however, there is a lack of empirical evidence to support these claims (Li et al., 2009; Ranmuthugala, Plumb, et al., 2011; Tolson et al., 2011). Whilst a variety of descriptive guidelines for establishing and operating CoPs are documented in the literature, there has been limited robust research regarding their impact and whether they achieved improved outcomes for patients. Therefore more studies measuring CoP outcomes and impact are required (Li et al., 2009; Ranmuthugala, Plumb, et al., 2011).

The purpose of this research was to evaluate the impact of a falls prevention CoP on falls outcomes in a RAC setting. The research was, to our knowledge, unique. Firstly it evaluated whether a CoP, as an intervention at organisational level, could address falls prevention within a RAC setting. Secondly, it conducted a comprehensive evaluation of CoP impact at three levels: individual member level, site level and organisation level. A mixed methods design (Creswell & Plano Clark, 2007; Onwuegbuzie & Leech, 2005) framed by a realist approach (Hewitt, Sims & Harris, 2012; Pawson & Tilley, 1997; Schierhout et al., 2013) was undertaken to gain a better understanding of how CoP interventions were influenced by current conditions (contexts) in triggering (mechanisms) the observed outcomes. These “context-mechanism-outcome” (CMO) configurations served as a framework for identifying what worked, for whom, how and under what conditions.

1.2 Organisation of Chapters

Chapter 2

Chapter 2 reports a systematic review and meta-analysis of studies that investigated the effect of complex falls prevention interventions delivered at two or three levels in a RAC population on falls outcomes.

This chapter is based on two manuscripts; a published systematic review protocol and a systematic review and meta-analysis prepared for submission to a peer reviewed journal.

Francis-Coad, J., Etherton-Ber, C., Naseri, C., & Hill, A-M. (2017). The effect of complex falls prevention interventions on falls in residential aged care settings: A systematic review protocol. *JBI Database of Systematic Reviews and Implementation Reports*, 15(2), 236-244. doi: 10.11124/JBISRIR-2016-002938

Francis-Coad, J., Etherton-Ber, C., Burton, E., & Hill, A-M. The effect of complex falls prevention interventions on falls in residential aged care settings: A systematic review.

Chapter 3

Chapter 3 describes the methodology selected to address the research aims in the form of a study protocol. The mixed methods design of the research program is described in detail.

This chapter is based on a published manuscript:

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A-M. (2015). Investigating the impact of a falls prevention community of practice in a residential aged-care setting: A mixed methods study protocol. *Journal of Advanced Nursing*, 71(12), 2977-2986. doi:10.1111/jan.12725

Chapter 4

Chapter 4 describes and evaluates the establishment and operation of a falls prevention CoP across 13 geographically diverse sites of the RAC organisation.

This chapter is based on a published manuscript:

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A-M. (2016). Can a web-based community of practice be established and operated to lead falls prevention activity in residential care? *Geriatric Nursing*, Advance on line publication, <http://dx.doi.org/10.1016/j.gerinurse.2016.09.001>

Chapter 5

Chapter 5 describes the preparation and conduction of a falls prevention activity audit led by the CoP members across the 13 participating RAC sites. This audit benchmarked the organisation's current falls prevention practices against evidence-based guidelines, with the CoP identifying gaps in practice to be addressed at resident, site and organisational levels.

This chapter is based on a published manuscript:

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A-M. (2016).

Using a community of practice to evaluate falls prevention activity in a residential aged care organisation: A clinical audit. *Australian Health Review*, 41(1), 13-18. doi:10.1071/AH15189

Chapter 6

Chapter 6 describes the evaluation of CoP activities using a realist approach. Results are presented that explain how the CoP facilitated the translation of falls prevention evidence into practice, for whom, and under what conditions.

This chapter is based on a manuscript submitted for publication:

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Blackburn, N., Chivers, P., & Hill, A-M. What worked translating evidence into practice: A realist evaluation of the impact of a falls prevention community of practice. (*Ref. No: BHSR-D-16-00388*. Under peer review at journal)

A further co-authored published manuscript from a supervised student, awarded first class honours, contributes to this chapter:

Hang, J., Francis-Coad, J., Burro, B., Nobre, D., & Hill, A-M. (2016). Assessing knowledge, motivation and perceptions about falls prevention among care staff in a residential aged care setting. *Geriatric Nursing*, 37, 464-469. doi:10.1016/j.gerinurse.2016.06.019

Chapter 7

Chapter 7 describes the evaluation of the impact of operating a falls prevention CoP on falls outcomes across the RAC organisation.

This chapter is based on a manuscript accepted for publication:

Francis-Coad J., Haines T., Etherton-Ber C., Nobre D., & Hill A-M. (in press).

Evaluating the impact of operating a falls prevention community of practice on falls in a residential aged care setting. *Journal of Clinical Gerontology and Geriatrics*

Chapter 8

Chapter 8 synthesises the findings from this research and discusses these findings in relation to the research aims. The research findings are positioned in context of relevant studies. Strengths and limitations of the research and implications for practice and future research are also presented.

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Chapter 2:

The Effect of Complex Falls Prevention Interventions on Falls in Residential Aged Care Settings: A Systematic Review and Meta-Analysis

Preface

There is limited synthesised evidence for organisation wide approaches to delivering falls prevention interventions at multiple levels in RAC settings.

This chapter describes a systematic review and meta-analysis and is based on two manuscripts, the first of which is a published protocol:

Francis-Coad, J., Etherton-Beer, C., Naseri, C., & Hill, A-M. The effect of complex falls prevention interventions on falls in residential aged care settings: A systematic review protocol. *JBI Database of Systematic Reviews and Implementation Reports*, 15(2), 236-244. doi: 10.11124/JBISRIR-2016-002938 [see Appendix B])

Francis-Coad, J., Etherton-Beer, C., Burton, E., & Hill, A-M. The effect of complex falls prevention interventions on falls in residential aged care settings: a systematic review and meta-analysis. (Prepared for submission to a peer reviewed journal)

The author's version of the manuscripts is presented with modifications to suit the style and format of this thesis.

2.1 Abstract

Background

To synthesise the best available evidence for the effectiveness of complex falls prevention interventions delivered at two or more of the following levels: resident, site or organisation, on falls rates in the RAC population.

Methods

A systematic search of seven databases was undertaken including hand searches of reference lists of relevant articles. Papers published between January 1 1990 and May 31 2016 in the English language were considered for inclusion. Study designs included were randomised controlled trials, pseudo-RCTs, repeated measures and quasi-experimental studies with a pre/post design. In total 1930 articles were identified for consideration with 24 retrieved for full text review and 12 included. Two independent reviewers conducted critical appraisals using the Joanna Briggs Institute (JBI) Meta-Analysis of Statistics Assessment and Review (MAStARI) tools. The effectiveness of complex falls prevention interventions delivered at more than two levels compared to usual care was assessed using standard meta-analysis methods.

Results

Complex falls prevention interventions delivered at multiple levels in RAC populations did not show a significant effect in reducing falls rates [RR = -1.29; 95% CI (-3.01, 0.43)], or the proportion of residents who fell [OR = 0.76; 95% CI (0.42, 1.38)]. However, a sensitivity analysis suggested complex falls prevention interventions delivered with additional resources at multiple levels had a significant positive effect in reducing falls rates [RR = -2.26; 95% CI (-3.72, -0.80)].

Conclusion

Complex interventions delivered at multiple levels in the RAC population may reduce falls rates when additional staffing, expertise or resources are provided. Organisations may need to determine how resources can be allocated to best address falls prevention management. Future research should continue to investigate which combinations of multifactorial interventions are effective.

2.2 Introduction

Falls in the RAC sector are a major concern worldwide with rates reported to range between 3-13 falls per 1000 bed days (Cameron et al., 2012; Morley, Rolland, Tolson, & Vellas, 2012; Oliver et al., 2007; Rapp, Becker, Cameron, König, & Büchele, 2012; Rubenstein, 2006). One in two older people (residents) admitted to RAC have a fall within 12 months and 25%-30% of those sustain a physical injury (Burland, Martens, Brownell, Doupe, & Fuchs, 2013; Oliver et al., 2007). Significant physical injuries, such as hip fracture, have an estimated incidence rate of between 3% and 5% annually (Rapp, Becker, Lamb, Icks, & Klenk, 2008; Rigler et al., 2011; Vlaeyen et al., 2015). These types of injuries frequently lead to a loss of independence. Data from nursing homes in Victoria, Australia gathered from July 1 2000 to Dec 31 2012 reported that of 1296 deaths from external causes (including falls, suicide and choking) 1,155 (89.1%) resulted from falls (Ibrahim, Murphy, Bugeja, & Ranson, 2015). The psychological impact of falling can also result in loss of confidence and reduced quality of life, with researchers reporting that even with rehabilitation interventions, many older people who have fallen never regain their former level of confidence or independence (Oliver et al., 2007; Oliver & Masud, 2004; Rubenstein, 2006).

At health care systems level the financial burden of falls is a current and future concern (Haines et al., 2013; Heinrich, Rapp, Rissmann, Becker, & König, 2010), in part due to projected population ageing, with estimates indicating by 2064 there will be 9.6 million people aged 65 and above and 1.9 million aged 85 and above (Australian Institute of Health and Welfare, 2012). Falls data from New South Wales during 2006-2007 showed that although older people residing in aged care facilities represented only 5.5% of the total population of older people in that state, they contributed 15% of the total costs of fall injuries in that state (Watson, Clapperton, & Mitchell, 2011). The estimated cost of falls per person in RAC settings in Australia (2008 base year) was reported as \$AUD 1887 (Haines et al., 2013). Thus preventing falls in the RAC sector is part of an Australian Government national initiative (Lord, Sherrington, Cameron, & Close, 2011; National Public Health Partnership, 2004).

Falls prevention in any setting is challenging as it involves a number of interacting components making both intervention and evaluation complex (Anderson, Issel, & McDaniel, 2002; Craig et al., 2008). The cause of most falls is complex

involving combinations of risk factors present in an individual older person, such as reduced strength and balance, presenting at a specific moment in the context of an external environment that can also present risks, such as a slippery floor (Cameron et al., 2012; Morley et al., 2012). Older people residing in aged care facilities are recognised as a population with high falls risk due to many individuals having a history of falls, activities of daily living disability, cognitive and visual impairments, multiple medications, pain, urinary incontinence and reduced strength and balance (Cameron et al., 2012; Deandrea et al., 2013; Morley et al., 2012; Rubenstein, 2006). A European study of 57 long term care homes with over 4000 residents observed cognitive impairment in 68% of residents and activities of daily living disability in 81.3% (Onder et al., 2012), suggesting that older people in residential care are particularly vulnerable and often lack the capability to reduce their risk of falling without prompting or assistance. The environment can also impact resident safety; with the highest incidence of falls occurring in residents bedrooms (Nitz et al., 2012; Rapp et al., 2012) or bathrooms (Rapp et al., 2012). Other factors within the RAC setting, such as staff and organisational philosophy and culture, can also influence resident safety (Dyer et al., 2004; Etherton-Beer, Venturato, & Horner, 2013).

Researchers working in this field have trialled a range of different intervention approaches to address falls among this older population from single strategies, including exercise and medication review, to multifactorial approaches delivered by a multidisciplinary staff (Cameron et al., 2012; Nazir et al., 2013; Speechley, 2011). Two recent meta analyses examining falls prevention programs in RAC populations showed different findings; the Cochrane systematic review (Cameron et al., 2012) concluded that providing vitamin D supplementation for residents with low vitamin D levels reduced the rate of falls by 37%, 95% CI [0.46-0.86] but not an individual's risk of falling whilst Vlaeyen et al. (2015) reported that multifactorial fall prevention interventions decreased falls by 33%, 95% CI [0.55-0.82] and the number of people with recurrent falls by 21% (95% CI 0.65-0.97). However whilst these systematic reviews focused on single, multiple or multifactorial intervention approaches their inclusion criteria differed; the former included some mixed population studies (Cameron et al., 2012) whilst the latter included only nursing home populations and randomised or cluster randomised controlled designs (Vlaeyen et al., 2015).

Randomised designs are a challenge in RAC populations for several reasons; including recruitment, adherence to interventions and sustained participation (Nyman & Victor, 2011). High levels of cognitive impairment make consent to participation an issue, thus in RAC settings approximately 49% of residents are recruited and by 12 months 16% are lost, largely due to mortality. Adherence to multifactorial falls prevention intervention components ranged from 11%-93% across studies reviewed by Nyman and Victor (2011) and by 12 months only a third of those in residential care were likely to be still adhering to interventions. This suggests that results from RCTs in RAC populations must also be interpreted with caution and other designs that are flexible and inclusive may also provide useful evidence (Nyman & Victor, 2011; Oliver et al., 2007).

Since residents are frail and generally require assistance with activities of daily living, implementing falls prevention evidence-based practice into a RAC setting predominantly requires staff to master the content of such a program and apply it to the care of their residents (Berta et al., 2010; Craig et al., 2008). Whilst the capacity to deliver organisation wide approaches to address complex issues, such as effective falls prevention, is strongly influenced by an organisation's leadership and culture to support change (Berta et al., 2010; Etherton-Beer et al., 2013). This requires connections between managers, staff and researchers to develop effective policy through interdisciplinary problem solving and discussion that in turn enables staff behavioural change (Colón-Emeric et al., 2006; Colón-Emeric et al., 2013; Michie, van Stralen, & West, 2011). Consequently some researchers have suggested that organisations need to make changes at multiple levels using a systematic approach to enable evidence to be translated into practice (Australian Commission on Safety and Quality in Healthcare, 2009; Berta et al., 2010; Craig et al., 2008; Panel on Prevention of Falls in Older Persons, American Geriatrics Society & British Geriatric Society, 2011; Wensing, Wollersheim, & Grol, 2006). These interventions that are delivered across multiple levels have been characterised as complex (Craig et al., 2008). For falls prevention interventions delivered in RAC settings these levels can be categorised as: resident, site and organisation and if at least two or all of these levels are targeted then the intervention can be considered complex. Resident level describes intervention delivery involving resident participation, such as the resident undertaking an exercise program or having a medication review. Site level delivery describes interventions that target RAC staff, such as giving staff falls prevention education or undertaking safety maintenance on patient equipment. Organisation level describes interventions involving RAC management

participation in bringing about practice change, such as revising professional staff roles and reviewing policy or processes around falls prevention. A limited number of studies have evaluated complex multiple level interventions that included elements that addressed aspects of organisational change including, reassignment of staff roles and adoption of best practice at a site level (Kerse, Butler, Robinson, & Todd, 2004; Nitz et al., 2012; Rask et al., 2007). Such studies include; a participatory action research design that trained a falls resource nurse to lead the implementation of evidence-based strategies resulting in a reduction in the proportion of fallers in RAC facilities (Nitz et al., 2012) whilst a falls management program targeting cultural change and quality improvement had no effect on falls (Rask et al., 2007). Another study, led by a falls coordinator in similar RAC settings, used tailored falls risk management delivering best practice interventions found that falls rates increased (Kerse et al., 2004). These variations in findings lead to uncertainty about the effectiveness of complex multi-level approaches.

It has also been suggested that RAC facilities may require additional resources to facilitate translation of falls prevention evidence into practice (Kennedy et al., 2012; Kerse, 2010). This will be increasingly challenging due to the financial constraints of the RAC industry, which has recently been reported in the bulletin Australian Ageing Agenda (Mathewson, 2016).

To our knowledge there were no recent systematic reviews either published or underway that synthesised the evidence for effectiveness of complex falls prevention interventions delivered at multiple levels in the RAC population. The absence of synthesised evidence for organisation wide approaches to falls prevention in the RAC setting justifies this current review. Given that clinicians and falls researchers are now undertaking and evaluating complex multiple level interventions there is a need to combine these data systematically. The aim of this review was to synthesise the best available evidence for the effectiveness of complex falls prevention interventions, implemented at two or more of the following levels: resident, site or organisation, on falls in the RAC population.

2.3 Methods

This systematic review and meta-analysis was conducted according to an *a priori* protocol (under second review for publication at the JBI Database of Systematic Reviews and Implementation Reports) (see Appendix B).

2.3.1 *Participants*

Studies were included if they met all of the following criteria: participants were aged 65 years of age or older or the mean age of the group was over 65 years and they resided in long-term care accommodation providing 24-hour supervision and/or care assistance.

Studies were excluded if they were conducted in a setting that was community-based, assisted living in retirement communities, retirement homes, continuing care retirement centres, a palliative care site, transition care or in a hospital. It has been found by other falls researchers that the participant characteristics and the environment differ between these settings and hence require different falls prevention interventions (Cameron et al., 2012).

2.3.2 *Interventions*

Studies were included if they evaluated complex falls prevention interventions. Complex falls prevention interventions were defined as those delivered across at least two or all of the following levels: resident, RAC site and RAC organisation. These levels were classified based on the adapted works of Wensing et al. (2006) and Quigley et al. (2010) and are described in Table 2.1.

Table 2.1 Classification of Falls Prevention Interventions by Level of Delivery.

Delivery level	Intervention	
Resident	Falls risk factor assessment	
	Post-fall assessment	
	Medication modification	
	Orthostasis management	
	Prescribed exercises e.g. balance, strength, gait training	
	Prescribed assistive devices e.g. walking aid	
	Hip protectors	
	Continence management	
	Falls prevention education	
	Vitamin D supplementation	
	Restraint minimisation	
	Site	Environmental audits or modifications
		Staff education or training
Safety equipment provision e.g. low-low beds		
Equipment maintenance		
Referrals to other health professionals e.g. Optometrist		
Organisation	Revision of professional roles ^a	
	Implementation of multidisciplinary falls prevention teams or committees	
	Support for staff membership of quality improvement collaboratives or communities of practice	
	Implementation of falls prevention policy, process checklists or tools	
	Implementation of knowledge management systems e.g. ICT supporting resident care	

Note. ICT = Information and communication technology, ^aChanges to a health professional's tasks or responsibilities

Resident level described intervention delivery involving resident participation or compliance similar to Quigley et al. (2010). Site level delivery described interventions at a proxy level engaging RAC staff in undertaking falls prevention education or practice change to effect resident outcomes. We considered interventions such as modifying the environment layout and safety maintenance on patient equipment to be decided at site level, involving RAC staff rather than organisation level as described by Quigley et al. (2010). At organisational level we considered Wensing et al.'s (2006) focused review describing the organisational changes directed at staff practices to improve patient care a better fit for our review criteria, as they reflected management participation. Therefore,

organisation level described interventions involving RAC management participation in bringing about practice change. Interventions delivered at any of the levels included multiple or multifactorial falls prevention interventions delivered by single discipline, multidisciplinary staff teams or quality improvement collaboratives. An example of an intervention delivered at three levels could be that residents may receive vitamin D supplementation and hip protectors, the site may provide falls prevention education for staff and the organisation may revise its professional staff roles to lead falls prevention change.

2.3.3 Comparators

Studies that compared interventions delivered at two or three levels (resident, site and/or organisation) with a control group were included. In addition, studies that offered no comparison, a passive comparison (such as no treatment, standard care), or an active comparison (such as variation of the intervention) were considered.

2.3.4 Outcome Measures

Studies were included if an outcome measure related to falls prevalence was used and outcomes were measured before and after the intervention period. Outcome measures related to falls prevalence included the number of falls, the rate of falls (expressed as the number of falls per 1000 occupied bed days) and the risk of falling (expressed as the number of participants who fell); the number of injurious falls, the rates of injurious falls (expressed as the number of falls with injury per 1000 occupied bed days). Studies that measured falls rates as secondary outcome measures were also included if they provided data from which the falls rate or injurious falls rate could be calculated.

The study designs considered were both experimental and quasi-experimental designs, including randomised controlled trials, controlled clinical trials, experimental studies where randomisation had been used, comparative studies without randomisation, cohort and pre post designs. Studies were only included if they contained repeated measures or compared an intervention against standard treatment, no treatment or another intervention.

Studies published in the English language from January 1 1990 to May 31 2016 were considered for inclusion. The phenomena of interest, which is the incidence of falls in the RAC population, began to be addressed in published studies from around 1990. Falls prevention strategies which involved concepts to engage healthcare organisations and employees in improving outcomes were also conceived after 1990 (Lave & Wenger, 1991), hence the selection of the search date parameter.

2.3.5 Data Sources and Search Strategy

This review used a three-step search strategy. An initial limited search of MEDLINE (Pubmed) and CINAHL Plus with full text (EBSCO) using initial key words falls, falls prevention, residential aged care and nursing homes was undertaken. Text words contained in the title and abstract of these identified studies together with index terms describing these studies were used to construct the second search step, undertaken in seven databases: The Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library, latest issue), The JBI Database of Systematic Reviews and Implementation Reports, Medline, CINAHL, EMBASE, AMED and Psych INFO. The search for unpublished studies included an electronic search of: trials registers Current Controlled Trials (<http://www.controlled-trials.com>) and the National Institute of Health Clinical Database (<http://clinicaltrials.gov>), Universal Index of Doctoral Dissertations in Progress, Mednar, Grey Literature Report and Google. The third search step reviewed reference lists of all identified studies for relevant additional studies not previously captured (see Appendix C).

2.3.6 Study Selection

Studies identified from the database searches were examined to ensure that they met the inclusion criteria using the title and abstract descriptions. Eligibility assessment using full text retrieval was then undertaken to determine if inclusion criteria were met. Any studies excluded were recorded with reasons (see Appendix D).

2.3.7 Quality Assessment

Papers selected for critical appraisal were assessed by two independent reviewers for methodological quality prior to inclusion in the review, using standardised critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of

Statistics Assessment and Review Instrument (JBI-MAStARI) as shown in Appendix B. Data were extracted and quality assessed by one reviewer and checked by a second reviewer. Disagreement was resolved by discussion between the two independent reviewers. A third independent reviewer was available for arbitration should a consensus not have been reached.

2.3.8 Data Extraction

Quantitative data were extracted from the selected studies by two independent reviewers using the standardised data extraction tool from the JBI-MAStARI (see Appendix B). The data extracted included details about participants and setting, study design and duration, sample size and the level and type of interventions delivered; including whether interventions were delivered at resident, site or organisation level. Falls outcomes extracted included the number of falls, falls rates, the number of older people who fell, the number of injurious falls and injurious falls rates. Data were only extracted on injurious falls if soft tissue injuries and fractures were included. The full data extraction is detailed in Appendix E.

2.3.9 Data Synthesis

Quantitative data from eligible studies were pooled in statistical meta-analyses using Review Manager (Version 5.3, 2014). All results were subject to double data entry. Statistical analysis was undertaken for falls rates, number of fallers and injurious falls rates (see Appendix E). All studies were analysed in terms of primary outcomes where data were available, regardless of their settings or combinations of intervention. Heterogeneity was assessed using a combination of visual inspection of the Forest plot along with consideration of the Chi-squared test and the I^2 statistic (Higgins, Thompson, Deeks, & Altman, 2003). When the I^2 statistic was greater than 50% a random effects model was applied as authors were aware of the uncertainty of the homogeneity of RAC resident populations and interventions delivered. For continuous outcomes the mean difference, standard deviation and standard error were calculated using the inverse variance DerSimonian and Laird method (DerSimonian & Laird, 1986). Mean difference was used in the meta-analysis, however results are presented as risk ratios or odds ratios (their original metric) (Higgins & Green, 2011). The results for dichotomous outcomes (fallers) were analysed using Mantel-Haenszel's random effects model

(Higgins & Green, 2011). Sub group analyses were undertaken based on whether additional staff or resources were allocated or obtained to participate in the intervention. Statistical significance was set at $p \leq .05$ for all analyses (two-sided). Where statistical pooling was not possible the results were presented as a narrative synthesis.

2.4 Results

The three step search strategy identified 1930 studies for consideration, 24 studies were retrieved for full text review, 12 studies were included for critical appraisal and seven were eligible for meta-analysis, as shown in the flow chart adapted from Moher, Liberati, Tetzlaff, and Altman (2009) (see Figure 2.1).

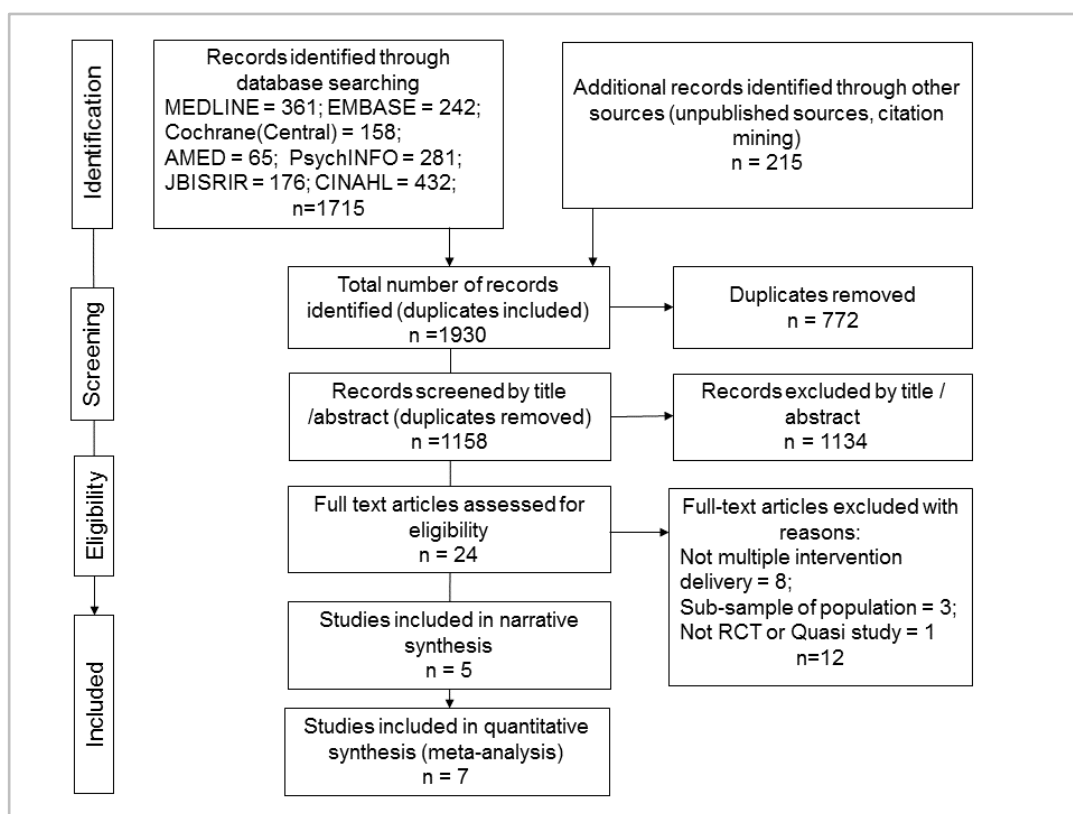


Figure 2.1 Flowchart Showing Selection of Studies Included in the Review.

2.4.1 Study Characteristics

The characteristics of the 12 included studies are described in Table 2.2.

Seven studies were cluster randomised controlled trials (Becker et al., 2003; Dyer et al., 2004; Jensen, Lundin-Olsson, Nyberg, & Gustafson, 2002; Kerse et al., 2004; McMurdo, Millar, & Daly, 2000; Ray et al., 2005; Ray et al., 1997), two were

quasi-experimental pre-post with control group (Burland et al., 2013; Rask et al., 2007) and the remaining three quasi-experimental pre-post design (Colón-Emeric et al., 2006; Hofmann, Bankes, Javed, & Selhat, 2003; Nitz et al., 2012). Five studies were conducted in the USA, two in the UK, and the remainder in Australia, New Zealand, Canada, Germany and Sweden. The number of RAC facilities included in the 12 studies ranged from one to 112 with the mean age of residents being greater than 80 yrs. Studies included were conducted in long term care facilities for older people providing 24 hour supervision and care assistance as assessed. Study follow up times ranged from 34 weeks (Jensen et al., 2002) to 24 months (Nitz et al., 2012). Eight studies included a fall or injurious fall definition (Becker et al., 2003; Jensen et al., 2002; Kerse et al., 2004; McMurdo et al., 2000; Nitz et al., 2012; Rask et al., 2007; Ray et al., 2005; Ray et al., 1997) and seven studies followed recommended methods for gathering falls data (Becker et al., 2003; Burland et al., 2013; Dyer et al., 2004; Jensen et al., 2002; Kerse et al., 2004; McMurdo et al., 2000; Nitz et al., 2012).

2.4.2 Study Interventions

The interventions delivered at two or three levels are presented in Table 2.2. Nine studies (Becker et al., 2003; Burland et al., 2013; Colón-Emeric et al., 2006; Hofmann et al., 2003; Jensen et al., 2002; Kerse et al., 2004; Nitz et al., 2012; Ray et al., 2005; Ray et al., 1997) delivered falls prevention interventions at three levels (resident, site and organisation). Three studies delivered falls prevention interventions at two levels; two delivered resident and site level interventions (Dyer et al., 2004; McMurdo et al., 2000) and one delivered site and organisation level interventions (Rask et al., 2007). Resident level interventions included falls risk assessment, exercise program, medication review and provision of mobility aids or hip protectors. Site level interventions included staff education, environmental modifications (audit, install or repair) and referral to a health professional or service. Organisation level interventions included changes to falls or falls prevention policy

Table 2.2 Characteristics of Included Studies in the Systematic Review.

Criteria	Included studies
	Becker 2003
Title	Effectiveness of a multifaceted intervention on falls in nursing home residents

Criteria	Included studies
Methods	Prospective cluster randomised controlled trial
Setting	6 nursing homes, Germany
Participants	981 residents >60 yrs, Mean Age yrs (<i>SD</i>) 83.5(7.5) intervention group, 84.3(6.9) control group
Intervention	Multifaceted, 12 months
Resident level	Resident education on fall prevention, Exercise (progressive balance and resistance 75 minutes x 2 weekly), Hip protectors. Residents chose any combination of interventions for any selected duration
Site level	Staff education on fall prevention (60 minutes) and monthly feedback on falls outcomes, environmental modification (76 items audited)
Organisational level	Trained nurses from within participating nursing homes. Telephone hotline to experts.
Control	No specific falls prevention program activities
Falls outcome measures	Falls ✓ fallers ✓ injurious falls ✗ (also measured recurrent fallers and hip fractures only)
Key results	Significant reduction in falls rates ($p < .001$), residents that fell ($p = .038$) and residents that fell more than twice ($p = .015$)
Notes	Included a fall definition, additional resources provided during intervention
Burland 2013	
Title	The evaluation of a fall management program in a nursing home population
Methods	Quasi-experimental, pre-post, comparison group design
Setting	12 nursing homes, Canada
Participants	5 intervention nursing homes (196 beds) 7 control (200 beds), 1046 residents
Intervention	Fall management program (site level), 3 years
Resident level	Falls risk assessment, restraint minimisation, prompted voiding, exercise, nutrition and medication reviews, education
Site level	Environmental audits, assistive devices, staff education
Organisational level	New tools and processes including: program guide, assessment tools, checklists, educational resources and a post-fall protocol
Control	Usual care (no formal falls management program in place)
Falls outcome measures	Falls ✓ fallers ✗ injurious falls ✓
Key results	Falls rates trended upwards in the intervention group pre and post measures but did not reach significance, injurious falls remained unchanged and hospitalized falls decreased significantly. Intervention group had significantly less injurious falls in post intervention period ($p = .022$)
Notes	No site fall definition included but fall data extraction defined by data set codes. Intervention delivered using existing resources

Criteria	Included studies
Colón-Emeric 2006	
Title	Translating evidence-based falls prevention into clinical practice in nursing facilities: results and lessons learned from a quality improvement collaborative
Methods	Naturalistic quasi-experimental pre/post design
Setting	36 nursing homes, USA
Participants	36 nursing homes with 353 non-participating nursing homes considered as controls
Intervention	“Change package”, 9 months
Resident level	Falls risk assessment, medication review, supplemented vitamin D and calcium, correction of orthostatic hypotension, hip protectors, post fall assessment
Site level	Staff education, monthly environmental assessment including equipment repair, labelling high risk residents and PT referral.
Organisational level	2 to 3 nursing home staff became QIC members, Tool kit to support change
Control	Usual care (not participating in QIC)
Falls outcome measures	Falls ✓ fallers ✓ injurious falls ✗ (primarily measured changes in clinical practice)
Key results	No significant change in falls rates or proportion of residents who fell. Self-reported falls rates showed a decline from 6.1 to 5.6/1000 resident days ($p = .31$) but falls rates measured by chart abstraction increased slightly ($p = .17$). There was no significant association between the proportion of fallers and level of site participation. Compliance with screening, labelling, risk assessment and medication review showed only moderate improvement (evidenced by chart abstraction). Significant increase in vitamin D prescription ($p = .03$) and decrease in sedative hypnotics prescribed ($p = .04$). No change in benzodiazepine, neuroleptic or calcium use.
Notes	Participating facilities used a variety of fall definitions but none were reported. Some self report and chart abstraction from MDS, no raw falls data
Dyer 2004	
Title	Falls prevention in residential care homes: a randomised controlled trial
Methods	Cluster randomised trial
Setting	20 residential care homes, England
Participants	196 residents, Mean Age yrs (<i>SD</i>) 87.4(6.9) intervention group, 87.2(6.9) control group
Intervention	Multifactorial program for three months, follow up 12 months
Resident level	Risk factor and medical assessment, progressive group exercise program 3 x 40 minutes per week for 3 months (83 participants), or individual program for frailer/cognitively impaired residents, medication review

Criteria	Included studies
Site level	Environmental modifications, staff education, referral to optician and podiatrist
Organisational level	X
Control	No intervention, visit by researcher every 3 weeks to collect data only
Falls outcome measures	Falls ✓ fallers ✓ injurious falls X (also measured recurrent fallers and fractures only)
Key results	Modest reduction in falls rates in intervention group but not statistically significant (p = .27), no significant difference in the proportion of residents who fell (p = .94)
Notes	No fall definition included, additional resources provided during intervention
Hofmann 2003	
Title	Decreasing the incidence of falls in the nursing home in a cost-conscious environment: a pilot study
Methods	Prospective time-services study
Setting	1 nursing home, USA
Participants	120 residents
Intervention	Combined interventions
Resident level	Restorative activity program (entertainment based), hip protectors, provision and repair of mobility aids, medication review
Site level	Staff education, environmental modifications, repair of mobility aids
Organisational level	Multidisciplinary falls committee formed. Shift changes to increase staffing at times of high fall occurrence (no additional staff members), OT to provide post fall assessment, Post fall conferences.
Falls outcome measures	Falls ✓ fallers X injurious falls ✓ (measured hip fractures only)
Key results	A significant reduction in number of falls was reported (p<.001) and falls resulting in fracture trended downwards but the difference was not significant. Post intervention falls on evening and night shifts reduced significantly (p<.001)
Notes	No fall definition. Retrospective comparison, information on resident compliance with the intervention was not available
Jensen 2002	
Title	Fall and injury prevention in older people living in residential care facilities a cluster randomized trial
Methods	Cluster randomised trial
Setting	9 residential care facilities, Sweden
Participants	402 residents >65 yrs, Mean Age yrs (range) 83(65-97) intervention group, 84(65-100) control group
Intervention	11 week multidisciplinary program, follow up 34 weeks

Criteria	Included studies
Resident level	Individualised exercise program 2-3 x per week, assistive device prescription, medication review, hip protectors
Site level	Staff falls prevention education, environmental modifications, assistive device repairs
Organisational level	Implementation of falls team meeting and post fall conference
Control	Received usual care only
Falls outcome measures	Falls ✓ fallers ✓ injurious falls ✓ (also measured recurrent fallers)
Key results	Total number of falls and number of residents who fell reported as significantly decreased (no p values were reported)
Notes	Included a fall and injurious fall definition. Additional resources provided (8 physiotherapy staff employed during intervention (200 hrs/wk) and 3 during follow up period (10 hrs/wk)
Kerse 2004	
Title	Fall prevention in residential care: A cluster, randomized, controlled trial
Methods	Cluster randomized controlled trial
Setting	14 residential care homes in New Zealand
Participants	617 residents, Mean Age yrs (<i>SD</i>) 83.2(10.6)
Intervention	Falls risk management program, 12 months
Resident level	Falls risk assessment with individualised care plan strategies targeting identified risk factors
Site level	Reminder logos for risk level and strategy adoption, environmental assessment, referral to relevant health professionals
Organisational level	Falls co-ordinator appointed, falls risk assessment tool and falls/injury prevention manual implemented
Control	Usual care, monthly visit by researcher to audit fall surveillance
Falls outcome measures	Falls ✓ fallers ✓ injurious falls ✓ (also measured recurrent fallers)
Key results	Falls rates increased significantly in the intervention program homes compared with control group homes and the proportion of residents who fell also increased significantly ($p < .018$) following adjustment for clustering, baseline fall rate, site dependency level. There was no statistically significant difference in injurious fall rates between the two groups
Notes	Included a fall and injurious fall definition, utilised existing resources to deliver the intervention
McMurdo 2000	
Title	A randomized controlled trial of fall prevention strategies in old peoples' homes
Methods	Cluster randomised controlled trial
Setting	9 nursing homes, UK

Criteria	Included studies
Participants	133 residents, Mean Age yrs (<i>SD</i>) 84(7)
Intervention	Multifactorial, 12 months follow up
Resident level	Falls risk assessment including medication review and visual acuity test, supervised exercises (not tailored individually): seated balance exercises, strength and flexibility 30 minutes x 2 weekly for 6 months
Site level	Environmental modification (lighting levels), optometry referral
Organisational level	X
Control	Received reminiscence therapy (targeting social interaction) twice weekly for six months
Falls outcome measures	Falls ✓ fallers ✓ injurious falls ^a ✓ (also measured recurrent fallers)
Key results	No significant differences in falls rates ($p = .165$) or proportion of residents who fell ($p = .088$)
Notes	Included a fall definition, high drop out rate compromised power to detect an effect, excluded residents with higher levels of cognitive impairment (MMSE <12), utilised existing resources
Nitz 2012	
Title	Outcomes from the implementation of a site-specific evidence-based falls prevention intervention program in residential aged care
Methods	Prospective cohort study pre/post design
Setting	9 residential aged care facilities, Australia
Participants	670 residents (650 staff)
Intervention	External project team facilitated an action research approach to deliver multifactorial interventions that varied dependent on the needs of the participating facilities, 24 months (included a 6 month preintervention phase)
Resident level	Prioritised strategies identified at audit e.g. hip protectors
Site level	Falls prevention activity audit, low-low beds and other prioritised strategies identified at audit including environmental modification, staff education
Organisational level	A falls resource nurse was trained to lead the project at their site, falls prevention action research group formed and met fortnightly at each site
Falls outcome measures	Falls ✓ fallers ✓ injurious falls X (also measured recurrent fallers)
Key results	Reduction in the proportion of fallers ($p = .044$) and single fallers ($p = .04$), no effect on number of falls due to confounding by residents who fell multiple times, variation in positive outcomes from interventions by site
Notes	Included fall definition, additional resources staffing 0.2FTE and equipment budget funded during intervention

Criteria	Included studies
Rask 2007	
Title	Implementation and evaluation of a nursing home fall management program
Methods	Quality improvement project
Setting	19 nursing homes, USA within single organisation
Participants	All residents of 19 participating nursing homes (convenience sample), 23 non-intervention nursing homes considered controls
Intervention	Falls management program (quality improvement and culture change)
Resident level	X
Site level	Intensive staff education including problem solving and safety culture training
Organisational level	Advanced practice nurse consultation, falls nurse co-ordinator and interdisciplinary falls team elected at participating facilities, extensive falls prevention tools (manuals, video, forms and brochures)
Falls outcome measures	Falls ✓ fallers X injurious falls ^a ✓ (primarily measured process of care documentation including restraint use)
Key results	No significant difference in falls rates in intervention homes (p = .59), fall related care process documentation improved significantly and restraint use decreased (p<.001), serious fall injuries only were reported with no significant difference (p = .79)
Notes	Fall and injurious fall defined, additional external resources utilised (Advanced practice nurse or expert consult)
Ray 1997	
Title	A randomised controlled trial of a consultation service to reduce falls in nursing homes
Methods	Cluster randomised controlled trial
Setting	14 nursing homes, USA
Participants	482 residents, Mean Age 83 yrs
Intervention	External falls consultation service (multidisciplinary assessment) with 12 month follow up
Resident level	Comprehensive individual falls risk assessment including medication review, gait and transfer safety training
Site level	Environmental modification
Organisational level	Falls co-ordinator appointed at participating sites
Control	Usual care
Falls outcome measures	Falls X fallers X injurious falls ^b ✓ (also measured recurrent fallers)
Key results	A non-significant trend towards a reduction in the rate of serious injurious falls (p = .220) was observed between groups

Criteria	Included studies
Notes	Included a fall definition, only falls injuries leading to hospital admission, ED or physician visit were included, additional resources (external staff) employed in intervention delivery, included high falls risk residents who had fallen only.
Ray 2005	
Title	Prevention of fall-related injuries in long-term care randomized
Methods	Cluster randomised controlled trial
Setting	112 aged care facilities, USA
Participants	10,558 residents >65 yrs (not bedridden) mean age 84 yrs
Intervention	Intensive 2 day safety training program with 12 month follow up
Resident level	Medication review, transfers and ambulation
Site level	Environmental modification, equipment review (wheelchairs and walking aids), staff training
Organisational level	Falls team co-ordinated by a nurse appointed at participating sites, training resources implemented (manual, video, assessment tools), telephone calls to falls team co-ordinator (mean of 24 calls per site)
Control	Usual care
Falls outcome measures	Falls X fallers X injurious falls ^b ✓ (also measured recurrent fallers)
Key results	There was a trend towards an increase in serious fall related injuries but the difference was not significant (p = .84)
Notes	Included serious injurious fall definition

Note. QIC = Quality improvement collaborative, MDS = Minimum data set, **✓** = Presence of outcome measurement, **X** = Absence of outcome measurement

^a serious fall injuries only were reported, ^b only falls injuries leading to hospital admission, ED or physician visit were included

2.4.3 Critical Appraisal

Assessment for risk of bias was completed for seven RCTs as shown in Table 2.3. Two studies scored six out of 10 (McMurdo et al., 2000; Ray et al., 2005), four studies scored seven out of 10 and one study scored nine out of 10 (Kerse et al., 2004). True random assignment to treatment groups was performed in five (71.4%) of the included studies, four (57.1%) studies concealed allocation to treatment from the allocator and six (85.7%) studies described and included outcomes of people that withdrew in their analysis. In all seven studies (100%) the control and treatment groups were similar at entry, received identical treatment apart from the named intervention and measured outcomes in the same way for both groups. Measurement of outcomes was deemed reliable in six (85.7%) studies with five (71.4%) using appropriate statistical

analysis. Blinding of assessors to treatment groups was reported in three (42.9%) studies with none (0%) blinding participants to treatment allocation.

Table 2.3 Results of Critical Appraisal of Included Randomised Controlled Trials.

Study	Q1 ^a	Q2 ^b	Q3 ^c	Q4 ^d	Q5 ^e	Q6 ^f	Q7 ^g	Q8 ^h	Q9 ⁱ	Q10 ^j
Becker 2003	Y	U	U	Y	N	Y	Y	Y	Y	Y
Dyer 2004	Y	N	Y	Y	N	Y	Y	Y	Y	U
Jensen 2002	U	N	Y	Y	N	Y	Y	Y	Y	Y
Kerse 2004	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
McMurdo 2000	U	U	U	Y	Y	Y	Y	Y	Y	N
Ray 1997	Y	U	Y	Y	U	Y	Y	Y	N	Y
Ray 2005	Y	N	U	N/A	Y	Y	Y	Y	Y	Y

Note. Y = Yes, N = No, N/A = Not applicable, U = Unclear.

^a Was the assignment to treatment groups truly random?

^b Were participants blinded to treatment allocation?

^c Was allocation to treatment groups concealed from the allocator?

^d Were the outcomes of people who withdrew described and included in the analysis?

^e Were those assessing outcomes blind to the treatment allocation?

^f Were the control and treatment groups comparable at entry?

^g Were groups treated identically other than for named interventions?

^h Were outcomes measured in same way for all groups?

ⁱ Were outcomes measured in a reliable way?

^j Was appropriate statistical analysis used?

The five quasi experimental designs were assessed for risk of bias as shown in Table 2.4. Assessment for risk of bias for quasi-experimental designs showed variation in the overall quality. Two studies scored seven (Burland et al., 2013) and eight (Nitz et al., 2012) out of nine respectively, one scored five out of nine (Rask et al., 2007), one scored three out of nine (Hofmann et al., 2003) and the other two out of nine (Colón-Emeric et al., 2006). All five studies (100%) clearly stated cause and effect, four (80%) studies provided treatment similarly other than the intervention and follow up was completed or strategies to deal with losses were employed. Three (60%) studies reported participants under comparison were similar and measurement of outcomes was performed in the same way for all participants. In two (40%) studies participants received similar treatments other than the intervention, a control group was included,

multiple measurements of outcomes pre and post exposure were reported, outcomes were measured reliably and appropriate statistical analysis was used.

Table 2.4 Results of Critical Appraisal of Included Quasi-Experimental Studies.

Study	Q1 ^a	Q2 ^b	Q3 ^c	Q4 ^d	Q5 ^e	Q6 ^f	Q7 ^g	Q8 ^h	Q9 ⁱ
Burland 2013	Y	Y	U	Y	N	Y	Y	Y	Y
Colón-Emeric 2006	Y	U	U	U	N	Y	N	N	U
Hofmann 2003	Y	U	Y	N	N	U	Y	N	U
Nitz 2012	Y	Y	Y	N	Y	Y	Y	Y	Y
Rask 2007	Y	Y	U	Y	Y	Y	N	N	N

Note. Y = Yes, N = No, N/A = Not applicable, U = Unclear.

^a Is it clear in the study what is the ‘cause’ and what is the ‘effect’ (i.e. there is no confusion about which variable comes first)?

^b Were the participants included in any comparisons similar?

^c Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?

^d Was there a control group?

^e Was there multiple measurements of the outcome/conditions both pre and post the intervention/exposure?

^f Was follow-up complete, and if not, was follow-up adequately reported and strategies to deal with loss to follow-up employed?

^g Were the outcomes of participants included in any comparisons measured in the same way?

^h Were outcomes measured in a reliable way?

ⁱ Was appropriate statistical analysis used?

2.4.4 Effectiveness of Multiple Level Interventions on Falls Rates

Some studies were not suitable for meta-analysis due to incomplete reporting. Falls rates from five RCTs were pooled for meta-analyses (shown in Figure 2.2). Three studies provided complex intervention at all three levels (Becker et al., 2003; Jensen et al., 2002; Kerse et al., 2004) and two provided interventions delivered at two levels (resident and site) (Dyer et al., 2004; McMurdo et al., 2000). Overall there was no significant between group difference in the rate of falls [RR = -1.29; 95% CI (-3.01, 0.43)]. There was evidence of heterogeneity between the included studies ($I^2 = 64\%$).

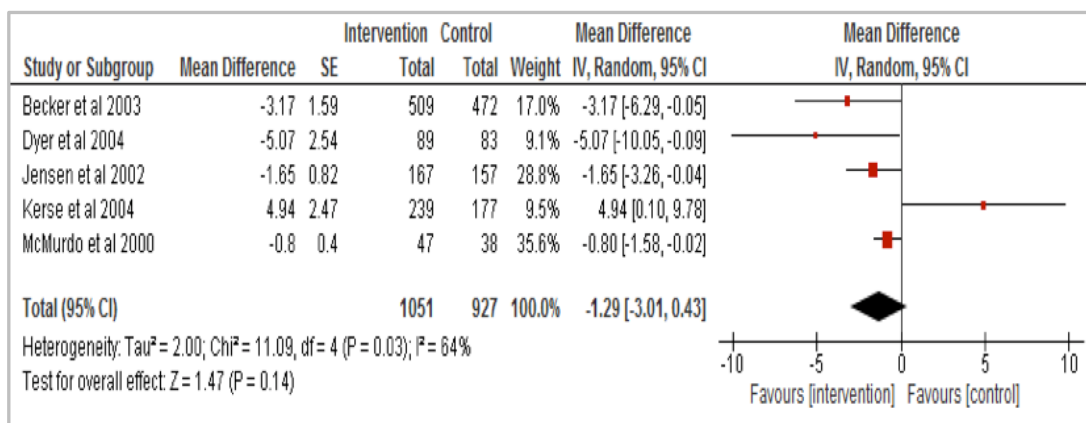


Figure 2.2 Forest Plot of Comparison: Intervention vs Control for Falls Rates.

Sensitivity analysis

For the outcome rate of falls three sensitivity analyses were performed to explore differences in the delivery of the intervention. Three studies (Becker et al., 2003; Dyer et al., 2004; Jensen et al., 2002) which delivered their interventions using notable additional input from external experts and extra resources at three levels were effective in reducing falls rates [RR = -2.26; 95% CI (-3.72, -0.80)] (Figure 2.3).

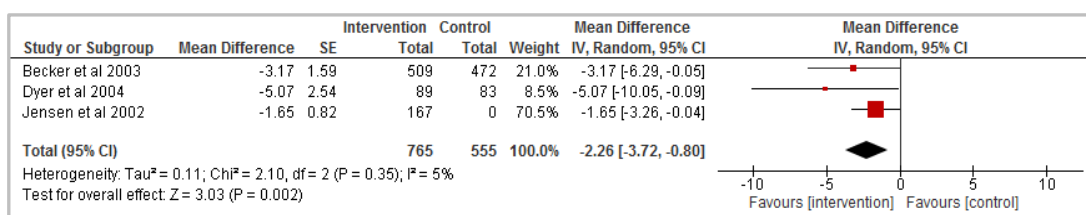


Figure 2.3 Forest Plot of Comparison: Intervention vs Control for Falls Rates in Studies with Additional Resource Support in Intervention Delivery.

The two studies (Kerse et al., 2004; McMurdo et al., 2000) that were removed delivered their multiple level interventions using existing RAC resources with no extra assistance. Removal of these two studies significantly reduced the heterogeneity (I² = 5%). Additionally, separate sensitivity analyses were performed, which pooled the studies that delivered interventions at two levels (see Figure 2.4) and those that delivered interventions at three levels (see Figure 2.5). Neither had a significant effect on falls rates [RR = -2.20, 95% CI (-6.13, 1.73)] and [RR = -0.56, 95% CI (-4.02, 2.90)] respectively and heterogeneity was high in both (I² = 64% and 75% respectively).

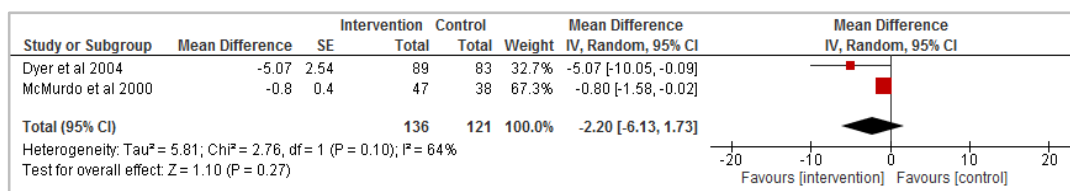


Figure 2.4 Forest Plot of Comparison: Intervention vs Control for Falls Rates in Studies with Interventions Delivered at Two Levels.

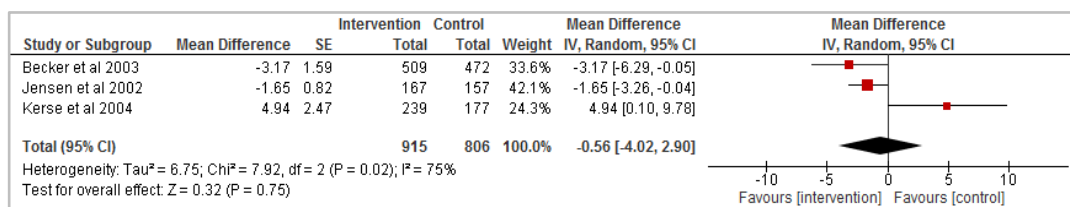


Figure 2.5 Forest Plot of Comparison: Intervention vs Control for Falls Rates in Studies with Interventions Delivered at Three Levels.

Five quasi-experimental studies reported data on falls rates (Burland et al., 2013; Colón-Emeric et al., 2006; Hofmann et al., 2003; Nitz et al., 2012; Rask et al., 2007). Four of the studies (Burland et al., 2013; Colón-Emeric et al., 2006; Nitz et al., 2012; Rask et al., 2007) reported no significant change in falls rates at follow up compared to baseline. One study (Hofmann et al., 2003) reported a significant reduction in the number of falls, however, this study was of low quality and did not report or analyse falls rates according to the global recommendations of the prevention of falls network Europe (Lamb, Jørstad-Stein, Hauer, & Becker, 2005).

Effectiveness of multiple level interventions on fallers

The number of residents who fell (relative to all residents) from five RCTs were pooled for meta-analysis (Becker et al., 2003; Dyer et al., 2004; Jensen et al., 2002; Kerse et al., 2004; McMurdo et al., 2000) (Figure 2.6). Overall there was no significant between group difference in fallers [OR = 0.76, 95% CI (0.42, 1.38)]. There was evidence of high heterogeneity between the included studies (I² = 88%).

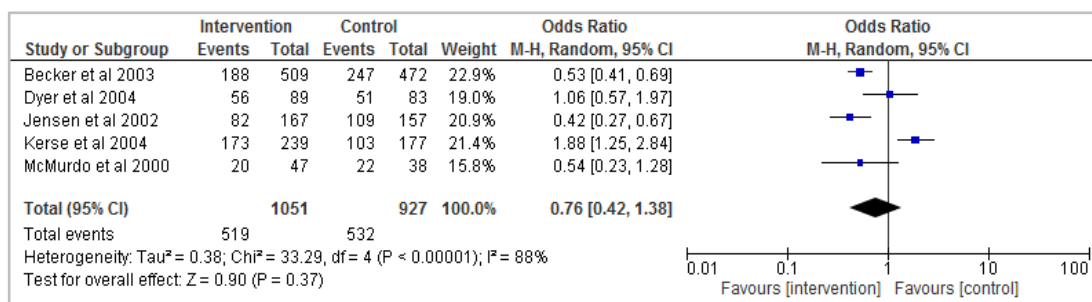


Figure 2.6 Forest Plot of Comparison: Intervention vs Control for the Proportion of Residents Who Fell.

Two quasi-experimental studies reported data on the number of residents who fell (Colón-Emeric et al., 2006; Nitz et al., 2012). One study reported no significant differences in the proportion of residents who fell pre and post intervention (Colón-Emeric et al., 2006). The other study showed a significant reduction in the proportion of fallers (residents who fell once or multiple times) [95% CI (-21.85, -0.28) p = .044] and single fallers (residents who fell only once) [95% CI (-15.03, -0.35) p = .040] (Nitz et al., 2012).

Effectiveness of multiple level interventions on injurious falls rates

Data reporting injurious falls rates from two RCTs were pooled for meta-analyses (see Figure 2.7).

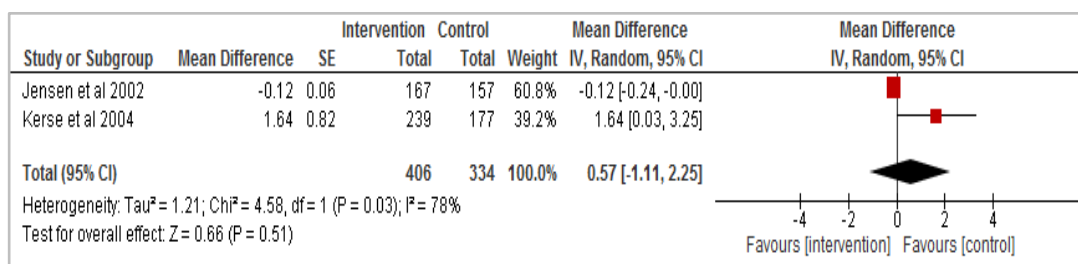


Figure 2.7 Forest Plot of Comparison: Intervention vs Control for Injurious Falls Rates.

These two studies delivered complex interventions at all three levels (Jensen et al., 2002; Kerse et al., 2004). There was no significant between group difference in the rate of injurious falls [RR = 0.57, 95% CI (-1.11, 2.25)] and heterogeneity was high (I² = 78%). A further two studies (Ray et al., 2005; Ray et al., 1997) were pooled separately as they classified injurious falls differently, using the prefix ‘serious’ to include only those injuries from falls that required hospital admission, emergency department or physician visit (see Figure 2.8).

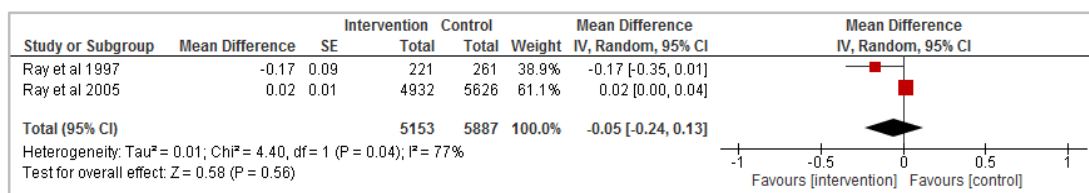


Figure 2.8 Forest Plot of Comparison: Intervention vs Control for Serious Injurious Falls Rates.

These studies both provided interventions delivered at three levels (resident, site and organisation). Again there was no significant between group differences (Figure 2.8) in the rate of serious injurious falls [RR = -0.05, 95% CI (-0.24, 0.13)]. There was also evidence of high heterogeneity in the serious injurious falls rates ($I^2 = 77\%$).

Two quasi-experimental studies reported data on injurious falls (Burland et al., 2013; Hofmann et al., 2003) of which one only reported the number of falls that resulted in fracture (Hofmann et al., 2003). Burland et al. (2013) reported a significant reduction in injurious falls [adjusted RR = 0.79, 95% CI (0.67, 0.96) p = .022]. However this study compared injurious falls rates pre and post intervention between two different groups, meaning results may have been confounded.

2.5 Discussion

Complex interventions using a multiple level approach to prevent falls in RAC settings have been delivered at combinations of resident, site and organisational levels. Synthesised results demonstrated no significant reduction in falls rates or the proportion of residents who fell when intervention delivery targeted combinations of resident, site and organisational levels. High heterogeneity amongst the five included studies was identified and deemed significant. A sensitivity analysis that pooled three studies (Becker et al., 2003; Dyer et al., 2004; Jensen et al., 2002) where interventions were delivered at either two or three levels and supported with additional resources, improved heterogeneity and showed a significant reduction in falls rates. These studies provided additional resources such as extra nursing staff to perform falls risk assessments, personal falls consultation for residents by external staff and extra physiotherapists employed part time during and following the intervention period. This may have enabled better intervention intensity and fidelity without compromise to RAC staff undertaking their usual duties.

Common intervention components provided in these three studies were exercise programs for residents, education for staff and modifications to the environment. Targeting patients (or residents), staff and the environment have previously been identified as domains requiring simultaneous intervention to prevent falls amongst older people in hospital settings (Hill et al., 2015, Haines et al., 2011).

Two meta-analyses (Cusimano, Kwok, & Spadafora, 2008; Vlaeyen et al., 2015) investigating the effectiveness of multifactorial fall prevention programs for older people in RAC showed more favourable results on falls outcomes but did not include the study by Kerse et al. (2004), which we assessed as having low risk of bias, but showed a significant increase in falls outcomes. The meta-analysis of the effectiveness of multifactorial intervention studies by Cameron et al. (2012) included five studies common to ours and showed similar non-significant findings.

The studies included in our review varied widely in terms of the type, intensity and level of the interventions delivered with some differences in setting. For example Becker et al. (2003) provided residents with falls prevention education, hip protectors and balance and resistance exercises twice weekly for 75 minutes, staff received falls education (60 minutes presentation and written material) and monthly feedback on falls outcomes, modifications to the environment that included appropriate lighting chair and bed height and additional safety rails combined with revision of nursing roles to lead falls prevention at their site. In contrast Hofmann et al. (2003) implemented a restorative activity program for residents that was entertainment based, repositioned or removed furnishings within the environment, formed a falls committee and changed staff rostering to cover periods identified as high risk for fall occurrence. Other systematic reviews have also noted that multifactorial interventions vary widely in their components in terms of, the duration, intensity of the intervention and its implementation, which makes interpretation of findings difficult (Cameron et al., 2012; Cusimano et al., 2008; Vlaeyen et al., 2015). Researchers have also suggested that the philosophy of the RAC site, including that of individual staff, may influence whether a falls prevention program is successful (Dyer et al., 2004).

2.5.1 Implications for Practice

Our finding regarding the requirement of additional intervention resources to achieve a significant reduction in falls rates poses a problem in an industry faced with resource constraints. It has previously been suggested that interventions in RAC facilities need to be delivered with existing resources due to the financial constraints of the RAC sector (Kerse, 2010). Peak bodies representing the RAC sector in Australia have recently reported they have serious concerns regarding their ability to provide high quality care because of planned government cuts to RAC funding. Changes to the funding criteria are estimated to cost the sector over \$1.6 billion over the next four years (Keast, 2016). So whilst current evidence supports delivery of multifactorial falls prevention interventions to improve falls outcomes, we concur with other researchers in stating that assisting RAC organisations to find a sustainable means of achieving this is of primary importance (Burland et al., 2013; Kerse, 2010; Nitz et al., 2012; Vlaeyen et al., 2015).

2.5.2 Limitations

Only a small number of studies were eligible for meta-analysis and sensitivity analysis therefore the results must be interpreted with caution. We were not able to account for the heterogeneity of resident case-mix and staffing in these RAC settings in our analyses. Consideration should also be given to intervention fidelity and intensity. These complex interventions delivered at multiple levels incorporated a range of different strategies, making it difficult to attribute the beneficial outcomes to individual components or levels. Variations in the methods of gathering, reporting and analysing falls data were also noted. Thus careful descriptions of intervention components, intensity and fidelity and adherence to falls reporting recommendations are required for better comparisons in the future.

2.6 Conclusion

Implementing multifactorial falls prevention programs across multiple levels is challenging in RAC settings. There are limited resources to provide falls prevention interventions for a frail population with complex needs. The best available evidence indicates that multifactorial interventions delivered at resident site and organisation

levels can be effective in reducing falls rates in the RAC population when additional external expertise and resources are provided in the short term.

2.7 Recommendations for Future Research

A strength of this meta-analysis was the inclusion of studies with high methodological quality but this in turn limited the number available for pooling, hence more high quality studies investigating complex multiple level interventions are required. In addition, there is a need to determine how RAC organisations can participate in falls prevention research to facilitate sustainable delivery of evidence-based falls prevention interventions with existing resources. When large research studies using external resources have been conducted it is not known if the positive outcomes reported are sustained in the longer term, as RAC facilities may return to their usual operation conditions when the additional resources are withdrawn. More translational research is required with longer follow up periods to measure ongoing changes.

The present research examined these findings and sought to design an intervention whereby using the existing resource of multidisciplinary RAC staff with an interest in falls prevention, enabled to interact regularly, would deliver multifactorial falls prevention strategies across multiple levels of the RAC organisation. We hypothesised there would be a group of RAC staff with a common interest in working with others on improving falls prevention. Sharing ideas across the organisation and collaborating on problem solving could also offer learning opportunities to raise staff expertise and deliver favourable outcomes. In searching for models to fit these intervention criteria ‘communities of practice’, defined as a group of people with a common interest meeting frequently to share ideas and collaborate, was synonymous with our proposed intervention criteria. CoPs have been used in healthcare to promote evidence-based practice (Tolson, Booth & Lowndes, 2008) and in the setting of a RAC facility to enhance clinical teaching and learning for staff and student nurses (Grealish, Bail & Ranse, 2010). We also considered the requirement that CoPs need their members to meet frequently on an on-going basis to facilitate change but many organisations have recognised that the frequency of face to face meetings necessary to drive change is costly in terms of wasted staff time on travel to and from a meeting place (Dubé, Bourhis &

Jacob, 2006). A web-based environment could enable the formation of a CoP that would otherwise be restricted by time or geographic location (Dubé et al., 2006; Kimball & Ladd, 2004). Some RAC provider organisations have invested in information and communication technologies to benefit staff such as an intranet platform for email exchange, forums, occupational software and access to information databases. Such organisations therefore have the infrastructure capability to support a web-based CoP. In addition an important feature of a CoP was that it could be a sustainable means of delivering evidence-based falls prevention strategies within the resource constrained RAC environment. The methods for this research will be described in detail in Chapter 3.

2.7.1 Research Aims

The purpose of this research was to evaluate the impact of a falls prevention CoP on falls outcomes in a RAC setting.

The specific research aims were:

- **Study 1** (Chapter 4): to describe the development and evaluate the establishment of a web-based CoP to lead falls prevention activity in a RAC organisation; to explore CoP members' capability, confidence, opportunity and motivation to participate in web-based activity using the organisation's intranet and to identify barriers and facilitators for sustainable web-based CoP member participation.
- **Study 2** (Chapter 5): to evaluate if a CoP could conduct a falls prevention activity clinical audit, to determine if a CoP could identify gaps in falls prevention practice and to identify barriers to the adoption of CoP planned falls prevention activities and facilitated actions.
- **Study 3** (Chapter 6): to evaluate the impact of a falls prevention CoP on translating falls prevention evidence into practice.
- **Study 4** (Chapter 7): to investigate the impact of a falls prevention CoP, acting at multiple levels of a RAC organisation on falls rates and injurious falls (resulting in fracture) rates.

2.7.2 Overview of The Research Structure

An overview of the structure of the research, including how each phase of the research contributes to the chapters of the thesis is presented in Figure 2.9.

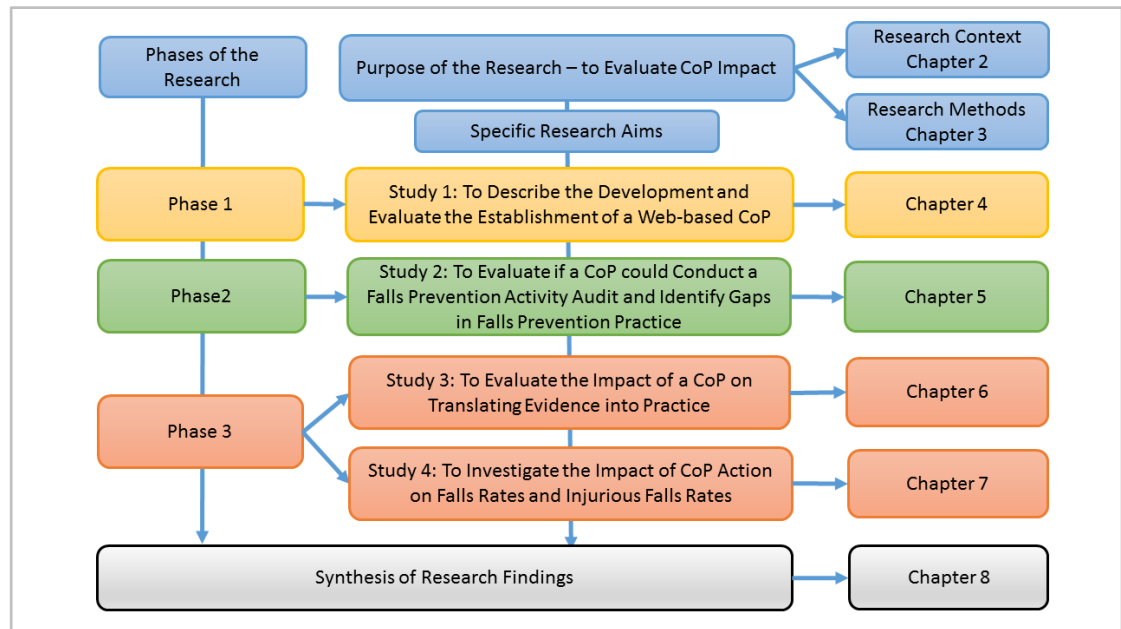


Figure 2.9 Overview of the Research Structure.

2.8 References

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Chapter 3:

**Investigating the Impact of a Falls
Prevention Community of Practice in a
Residential Aged Care Setting:
A Mixed Methods Study Protocol**

Preface

This chapter describes the methods for the research conducted as part of this thesis. Health service research is increasingly utilising both quantitative and qualitative methods in research designs when seeking answers to complex problems, such as preventing falls among older people who live RAC settings.

The chapter is based on a published manuscript (see Appendix F):

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A-M. (2015). Investigating the impact of a falls prevention community of practice in a residential aged-care setting: A mixed methods study protocol. *Journal of Advanced Nursing*, 71(12), 2977-2986. doi:10.1111/jan.12725

The author's version of the manuscript is presented with modifications to suit the style and format of this thesis.

3.1 Abstract

Background

Falls are a substantial concern across the RAC sector with half its older population falling annually. Preventing falls requires tailoring of current evidence for reducing falls and adoption into daily activity, which is challenging for diversely skilled staff caring for a frailer population. Forming a CoP could provide staff with the opportunity to share and develop their expertise in falls prevention and innovate change. The aim of this study is to facilitate implementation and operation of a falls prevention CoP in a RAC organisation and evaluate its effect on falls outcomes.

Methods

A mixed methods design based on a realist approach was conducted across 13 RAC sites (N = 779 beds). Staff will be invited to become CoP members with all sites represented. The CoP will be supported to audit falls prevention activity and identify gaps in practice for intervention. The impact of the CoP will be evaluated at three levels: individual member level, site level and organisational level. A pre/post design using a range of standardised measures supported by audits, surveys, focus groups and interviews will determine its effect on falls prevention practice. Falls outcomes will be compared at five time intervals using negative binomial regression and logistic regression. The research is funded to operate from 2013-2016.

Conclusion

Findings from this research will assist RAC providers to understand how to effectively translate evidence about falls prevention into clinical practice.

3.2 Introduction

Falls are a substantial concern across the residential and long term aged care sector with half its population falling annually (Burland, Martens, Brownell, Doupe, & Fuchs, 2013; Haralambous et al., 2010; Nyman & Victor, 2011). Between 25-30% of falls among older people in RAC result in physical injury (Burland et al., 2013; Oliver et al., 2007) and are associated with an increased risk of mortality functional decline, depression and anxiety (Morley, 2007; Oliver et al., 2007; Rubenstein, 2006). Frail, older people who require nursing home care are at high risk of falls as they present with combinations of; multiple co-morbidities, age-related systems decline and cognitive impairment (Onder et al., 2012; Rubenstein, 2006). Meta-analyses of studies investigating falls prevention in RAC settings have found that the two strongest evidence-based interventions are, the supplementation of vitamin D and medication review by a pharmacist (Bischoff-Ferrari et al., 2004; Cameron et al., 2012; Nazir et al., 2013). Multifactorial interventions incorporating staff education, resident exercise programs and environmental modification show inconclusive outcomes in reducing falls rates indicating a problem exists (Cameron et al., 2012; National Institute for Health and Care Excellence, 2013). Despite this, adopting a multifactorial approach to falls prevention is still considered as industry best practice in the absence of further specific evidence. It is also recognised that effective interventions for this population differ from community interventions (Cameron et al., 2012; Gillespie et al., 2012) because older people in RAC may have difficulty adopting falls prevention strategies independently (Oliver et al., 2007; Oliver & Masud, 2004; Rubenstein, 2006). This suggests that staff and health care systems providing care to this population need to play a significant proxy role in providing falls prevention intervention for those at risk.

Policy, processes and practices reflecting evidence-based falls prevention are required for implementation and adoption within the context of a RAC organisation. This requires systematic inquiry, synthesis and adaptation to tailor relevant falls prevention knowledge for translation into practice (Graham et al., 2006; Haines & Waldron, 2011; Tetroe, Graham, & Scott, 2011). However undertaking this translation process in its entirety requires collaboration, research expertise, clinical and management skills all of which may not be present within the RAC workforce expected to undertake this process (Haines & Waldron, 2011). The use of external falls prevention

experts to implement change independently has been shown to reduce falls rates in the short term but following withdrawal the effect has not been sustained (Capezuti, Taylor, Brown, Strothers, & Ouslander, 2007; Ray et al., 2005). There is a need for designing falls prevention research that can evaluate how to facilitate the sustainable delivery of evidence-based falls prevention interventions using existing resources. Therefore enabling workplace staff to connect with research experts could be a viable means of translating current falls prevention evidence into effective practice (Fixsen, Scott, Blase, Naoom, & Wagar, 2011; Tolson, Irene, Booth, Kelly, & James, 2006; Tolson, Lowndes, Booth, Schofield, & Wales, 2011).

An innovation that is yet to be applied to the problem of falls prevention in the RAC sector is the formation of a CoP. A CoP is a group of like-minded people with a mutual interest in a topic who get together to share and develop their expertise, and then innovate and facilitate change in pursuit of a common goal (Conklin et al., 2011; Li et al., 2009; Ranmuthugala, Plumb, et al., 2011; Wenger, 1998), in this case falls prevention. A CoP applied to a RAC setting could provide an opportunity to connect nurses, allied health staff, managers, residents and researchers in collaboration to action evidence-based best practice (Ranmuthugala, Plumb, et al., 2011; Tolson et al., 2006).

The purpose of this research is to evaluate the impact of the falls prevention CoP on falls outcomes in a RAC setting by measuring:

1. Changes in individual CoP member knowledge, motivation and confidence to champion falls prevention activities.
2. Changes in implementation and adoption of falls prevention strategies at each participating RAC site measured simultaneously with falls rates, injurious falls rates and the proportion of residents falling.
3. Changes in RAC organisational policy or systems supporting falls prevention.

3.3 Methods

3.3.1 Ethical Considerations

Researchers from the university have formed a partnership with the RAC organisation to ensure that research priorities and study design are in keeping with the philosophy of the RAC organisation. Approval has been granted from the RAC

organisation for the research to be conducted as part of their continuous quality improvement priorities. Ethical approval from the university human research ethics committee has been granted for all phases of the research (Reference numbers 013145F, 014084F, 015033F & 014179F). All individual participation was voluntarily sought following the presentation of verbal and written information to participants. Written consent to participate was obtained from all who volunteered, with participants being free to withdraw from the research at any time.

3.3.2 Design

This research will use a convergent, parallel mixed methods design across three phases (Creswell & Plano Clark, 2007) based on a realist approach (Pawson & Tilley, 1997).

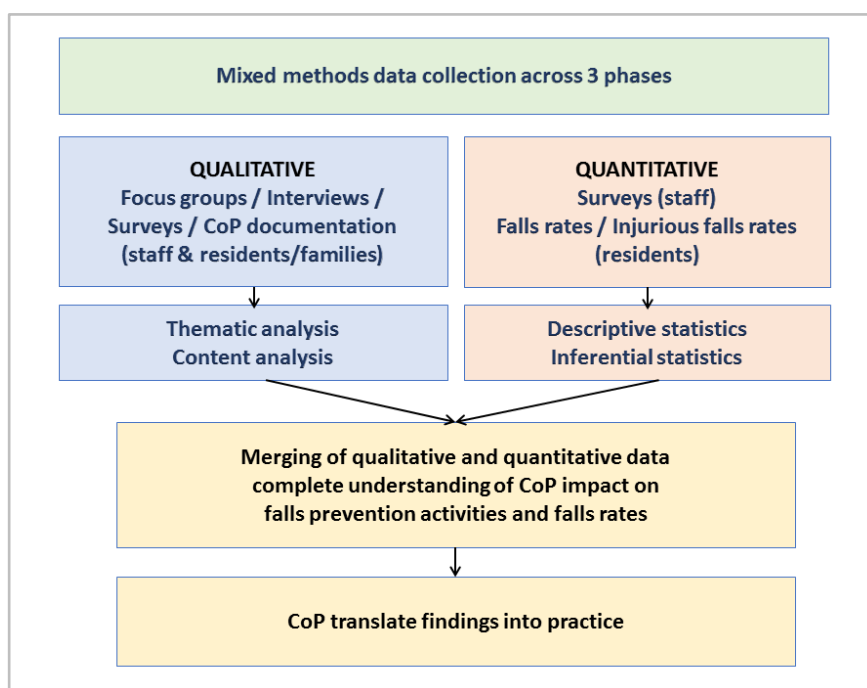


Figure 3.1 Mixed Methods Data Collection Overview
(Guided by Creswell & Plano Clark, 2007).

The realist approach to evaluation has been used previously in health services research where a comprehensive understanding of complex interventions is required (Greenhalgh et al., 2009; Rycroft-Malone, Fontenla, Bick, & Seers, 2010; Williams, Burton, & Rycroft-Malone, 2013). Realist evaluators seek to provide not just a descriptive profile of an intervention's outcomes, but also to identify more comprehensively, ways in which these interventions are influenced by current conditions

(**contexts**) in triggering (**mechanisms**) the observed **outcomes** (Hewitt, Sims, & Harris, 2012; Pawson & Tilley, 1997; Ranmuthugala, Cunningham, et al., 2011; Schierhout et al., 2013). This is based on the realist assumption that interventions will only work in the presence of particular conditions, referred to as generative or conditional causality. Therefore the purpose of a realist evaluation is to identify those conditions to produce robust findings (Greenhalgh et al., 2009; Pawson & Tilley, 1997). The context-mechanism-outcome (CMO) configurations serve as a framework for identifying what works (or not) for whom, how and under what conditions. Early stakeholder participation, in our case the RAC organisation staff and researcher team steering committee, via meetings, emails and telephone contact assisted the development of potential CMO configurations (see Table 3.1). The potential CMOs have been scoped broadly to guide qualitative and quantitative data collection but can be readily adapted to construct emergent CMO configurations from research findings (Ranmuthugala, Cunningham, et al., 2011; Williams et al., 2013).

Table 3.1 Potential Context-Mechanism-Outcome Configurations as Applied to the Falls Prevention CoP.

CMO	Configurations
Contexts	RAC organisational culture RAC site leadership RAC site environmental infrastructure Resident care level (dependence/independence) CoP characteristics Staff Characteristics
Possible mechanisms	CoP actions CoP activities CoP member behaviours
Outcomes proposed	Changes in resident falls rates and injurious falls rates Changes in adoption of falls prevention strategies Changes in staff confidence and motivation to address falls prevention strategies Changes in the environment (that affect resident falls risk) CoP can achieve maturity through member participation and collaboration

Note. RAC = Residential aged care, CoP = Community of practice

3.3.3 Participants, Setting and Recruitment

This research will partner university researchers with staff across a not-for-profit RAC provider organisation with 13 geographically diverse sites in metropolitan Western Australia. The RAC organisation provides care for approximately 780 older people at any one time. There is approximately 1185 full and part time care staff across each of the 13 RAC sites; a care manager leads sites and staff includes nursing (practitioners, clinical specialists, registered, enrolled and assistants) and allied health professionals. A separate corporate office provides centralised support for all sites such as human resources, clinical and quality control departments and ICT. Commitment to this partnership is endorsed by the organisation’s Chief Executive Officer (CEO) and General Managers.

3.3.4 Outcome Measures and Evaluation

The impact of the falls prevention CoP will be evaluated at three levels:

1. At an individual member level we will measure changes in their knowledge, confidence and motivation to lead falls prevention activities and confidence in using ICT for communication.
2. At the site level we will measure changes in implementation and adoption of falls prevention interventions in conjunction with falls rates and injurious fall rates.
3. At the organisational level we will describe changes in policy or systems supporting falls prevention.

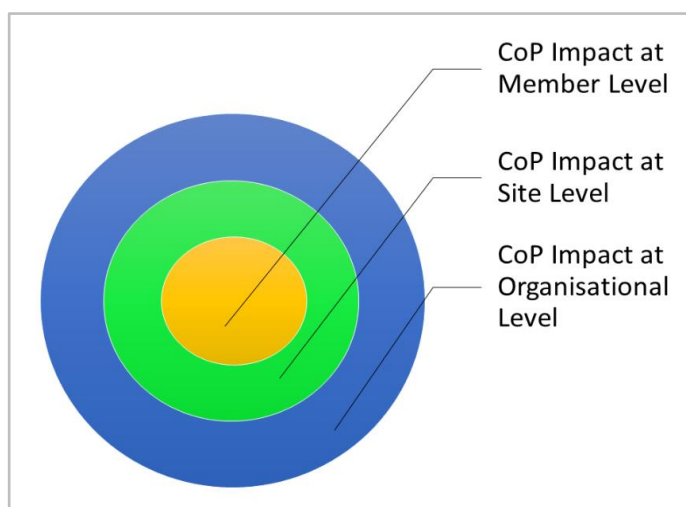


Figure 3.2 Levels of Evaluation of CoP Impact on Falls Prevention and Falls Outcomes (Guided by Ranmuthugala, Cunningham et al., 2011).

3.3.5 Data Collection and Procedure

Phase 1

A steering committee comprising research and service provider representatives from nursing and allied health will be formed to discuss CoP development, operation and study logistics. A CoP is defined as a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Li et al., 2009; Wenger, 1998). This is an attractive concept for health workers as it has been reported that on-going learning is facilitated in the workplace through interaction with peers (Li et al., 2009; Tolson et al., 2011).

The proposed structure of the CoP is shown in Figure 3.3. Three of the 13 sites are used as representative examples in the figure for clarity.

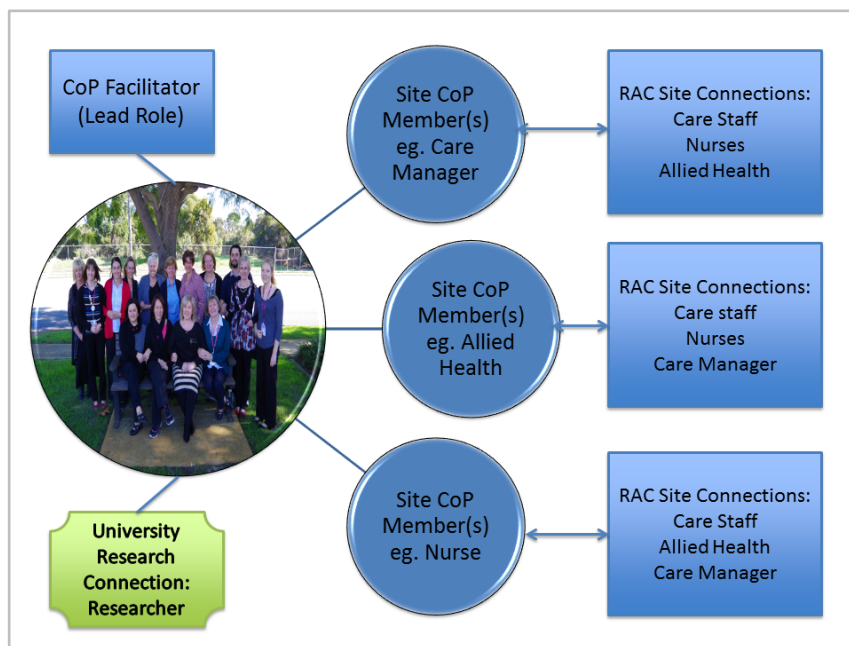


Figure 3.3 The Structure of the RAC Organisation's Falls Prevention CoP.

Conceptually CoPs have the potential to be models for knowledge translation. Lave and Wenger (1991), who are credited with conceptualising CoPs, viewed knowledge as being social in nature. They declared it should be explored within its social context, in a process of 'situated learning', then actioned to generate new shared knowledge. This new shared knowledge can be created through a process of conversion and tailoring by its membership and includes different ways to problem solve and apply skills to work place practices (Li et al., 2009; Tolson et al., 2011). It is envisaged that CoP member social interaction will take place asynchronously during their working

hours via an electronic discussion board forum accessed through their RAC site intranet web page. Open discussions, involving topic related knowledge sharing and problem solving, by asking questions and reading other CoP member posts will be enabled by password protected access to the CoP web page. Newly created knowledge, in this case negotiated falls prevention activities to influence practice change, will be disseminated by the CoP membership at their RAC sites. Actioning falls prevention activities at RAC sites will involve the CoP members disseminating new knowledge to their care manager and multidisciplinary staff groups at shift handovers, staff meetings or intra-organisational media. If new workplace practices actioned by a CoP result in successful outcomes, a CoP could become a value-adding capacity of the organisation (Li et al., 2009; Ranmuthugala, Cunningham et al., 2011, Tolson et al., 2011).

The CoP member(s) at each site irrespective of their discipline will engage with their multidisciplinary colleagues in falls prevention activities, enabling contributions from a range of perspectives facilitating 'situated learning' across the organisation (see Figure 3.3). CoPs require a leadership or facilitator role to steer discussion and keep the focus on the topic of choice (Kimball & Ladd, 2004). A RAC organisational member of staff will be assigned part of their managerial role as the CoP facilitator and study liaison person connecting the RAC organisation with the tertiary research team. All staff expressing an interest in falls prevention currently part of the organisation's workforce will be invited to volunteer as CoP members, with a minimum of one representative from each of the organisation's sites. The organisation's staff and residents (including aspects of the built environment) will be the recipients of the falls prevention activities implemented by the CoP. To overcome geographic separation CoP members will pilot the use of the organisation's intranet to communicate on a regular basis, supported by approximately three face to face meetings annually. All staff nominating as CoP members will complete a baseline questionnaire (see Appendix G) to gather demographic information and to explore their knowledge, confidence and motivation regarding falls prevention practice and confidence in using ICT for communication. Researcher and CoP facilitator documented observations will inform evaluation and modify CoP operation as required across the duration of the study. CoP members will repeat these measures at the end of the study period. Additional documents will be used to describe CoP development and operation including stakeholder steering committee meeting minutes, CoP discussion transcripts, emails and the researcher and CoP facilitator observation journals.

Phase 2

Evaluating current falls prevention activity and comparing it with evidence-based guidelines (Australian Commission on Safety and Quality in Healthcare, 2009; Cameron et al., 2012; National Institute for Health and Care Excellence, 2013) will identify gaps in practice for targeted intervention. The CoP will therefore be supported to conduct a scoping audit across all RAC sites using a validated tool. CoP members will co-ordinate audit completion at their RAC site assisted by site staff, including those with an awareness of policies and practices within each site, such as care managers, nurses and allied health professionals. Discussions with other RAC staff such as nursing and allied health assistants, cleaners, laundry and maintenance staff may also contribute to establishing whether everyday practices reflect current policies. The selected audit tool will address domains such as falls risk assessment, falls and falls injury prevention interventions, the environment, falls and falls injury prevention staff training and information for residents. After analysis of all audits, The CoP will then discuss the prepared report of the audit findings, reflecting current falls prevention activity, to determine the areas for development and intervention. Repeating this audit at the conclusion of this study will enable the comparison of changes in falls prevention activity across the RAC sites following CoP determined interventions.

Findings from the scoping falls prevention audit will be discussed and prioritised for action by the CoP membership taking into account their available resources. Subsequently the CoP membership's facilitation of falls prevention activities at RAC sites and across the organisation will be measured using an appropriate series of methods such as questionnaires, focus groups and interviews reflecting the diversity of practice in providing clinical care.

A quasi-experimental pre/post design will be adopted for determining the quantitative outcomes of interventions addressed by the CoP at each site and across all sites. Appropriate standardised tools will be selected to measure changes in falls outcomes dependent on the area of need defined by the CoP. This will be guided by the findings of the scoping audit and therefore cannot be pre-determined. However possible CoP falls prevention activities are likely to take a multifactorial approach that includes the staff, the residents and the environment. Examples may include: Staff intervention through the development of a mandatory falls prevention education and training package

informed by a survey of care staff. Resident intervention through the administration of vitamin D supplementation via nurse practitioner, doctor and pharmacist liaison and the environment may be modified to minimise hazards and maximise resident safety. All CoP falls prevention activity is likely to involve RAC policy and practice development or modification and resource creation to facilitate the adoption of falls prevention activities.

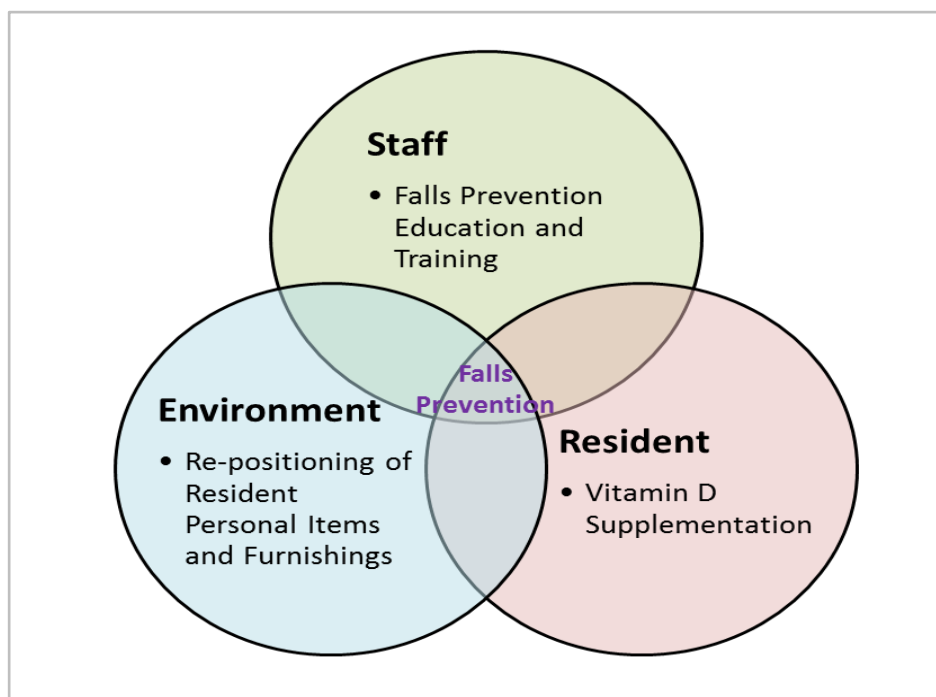


Figure 3.4 An Example of a Possible CoP Intervention in Each Interactive Domain Contributing to Falls Prevention.

Specifying the intervention context, measuring the proposed outcomes and identifying trigger mechanisms will determine what CoP facilitated falls prevention activities worked, for whom, how and under what conditions within the RAC organisation.

The establishment of a community through connections between its members and knowledge flow through the community will be recorded by the organisation's intranet platform. Frequent communication, interaction and knowledge exchange between members are characteristics associated with CoPs. A social network analysis (SNA) will be undertaken to examine the relationships, connections and flow of knowledge within the CoP, as the behaviour of the CoP is likely to be influenced by its structure as well as the characteristics of its members. The exchange between members on the CoP intranet discussion board and CoP facilitator emails will provide frequency counts representing CoP member activity and connectivity. The presence and strength

of these connections may assist in comprehending which features of the CoP relate to improvement in falls prevention activity and tacit knowledge exchange (Gainforth, Latimer-Cheung, Athanasopoulos, Moore, & Ginis, 2014; Ranmuthugala, Cunningham, et al., 2011; Yousefi-Nooraie, Dobbins, & Marin, 2014).

Falls outcomes

A prospective quasi-experimental pre/post design will measure falls rates, falls related hospitalisation rates and the proportion of older people sustaining one or more falls. Falls rates across two years will be compared with rates at baseline and at six monthly intervals. As this is a quasi-experimental design the CoP is considered an intervention at organisational level. In line with international recommendations for a common outcome data set for falls injury prevention trials, the definition of falls by Lamb, Jørstad-Stein, Hauer, and Becker (2005) will be adopted by this study:

“an unexpected event in which an individual comes to rest on the ground, floor or lower level”. Falls data will be collected from the organisation’s electronic clinical record system that records all reported falls by staff at RAC sites. The organisation also records all falls that require a transfer to hospital due to an injury sustained from a fall. The organisation subsequently records all injuries diagnosed as a fracture. These data will also be collected from the organisation’s electronic clinical record system for the duration of the study. Falls rates and injurious falls related (fracture) rates will be reported as falls/1000 resident bed days. Bed days of care (calculated using the site census i.e. number of beds occupied across 30 days) will represent the denominator and number of falls the numerator multiplied by 1000. As residents of the participating aged care sites may remain in the study for varying lengths of time due to death, hospital admission or discharge, the probability of falling will be calculated relative to the duration they were exposed to the risk of falling.

Falls prevention activities and falls outcomes will be measured by CoP members in conjunction with the RAC organisation’s staff. The researcher will provide falls prevention expertise and links to external falls prevention experts as required through participation in the CoP and will be responsible for evaluating the CoP on the three levels previously described.

Phase 3

Organisational falls prevention management such as policies or quality improvement systems will be reviewed as part of the audit process described in Phase 2. Different types of organisational documents will be scrutinised including policy documents, practice manuals and meeting minutes by bench marking against current evidence and clinical guidelines (Australian Commission on Safety and Quality in Healthcare, 2009; Cameron et al., 2012; National Institute for Health and Care Excellence, 2013).

3.3.6 Data Analysis

Quantitative

Data drawn from surveys and audits throughout Phases 1-3 will be allocated a value representing a category such as gender, first language and type of exercise offered. A 5-point Likert scale will be used to measure subjective variables such as attitudes, beliefs, confidence and motivation through extent of agreement to the responses generated. Categorical response items used to measure engagement in falls prevention activities will be analysed using non-parametric methods where required. Both nominal and ordinal data from surveys and audits will be entered into the SPSS statistical software package version 22 IBM SPSS Statistics. Parametric data will be described as means, frequencies and percentages and non-parametric data will be described as medians, interquartile ranges and displayed in tables. Frequency analyses cross comparisons between sites will be undertaken. Relationships between variables will be examined between two or more sets of responses and cross tabulations and contingency tables used where appropriate (Portney & Watkins, 1993; Punch, 2003). Survey results will be presented in reports using bar graphs and tables.

Falls incident data will be collected at five time points in six monthly intervals over two years (see Table 3.2) and analyses completed using recommended methods for falls data (Lamb et al., 2005; Robertson, Campbell, & Herbison, 2005).

Falls outcomes (falls and injurious fall rates per 1000 resident days, proportion of residents falling) will be compared between baseline and at two years after the introduction of the CoP. Mixed-effects, multilevel, linear regression using site as a

random effect and pre vs post intervention periods as a fixed effect will be used to compare the falls outcomes between these periods. Adjustment will be made for age, presence of dementia and aged care funding instrument care rating. P values of less than .05 will be considered significant.

Table 3.2 Proposed Evaluation of CoP Impact to be Measured During The Three Phases of Research.

Timeline	Phase 1. CoP Member Level	Phase 2. RAC Level	Phase 3. Organisational Level
Aug 2013			CoP formation stakeholder meetings
Nov 2013	Member baseline survey CoP feasibility study	Falls outcome data 1 RACF site meetings	ICT liaison meetings/email
May 2014		Falls outcome data 2 CoP Falls prevention activity audit	Management meetings
Nov 2014	Member activity reports	Falls outcome data 3 CoP Falls prevention activities targeting resident/staff/environment	Present Policy/System changes
May 2015		Falls outcome data 4 CoP Falls prevention activities targeting resident/staff/environment	
Nov 2015	Member final survey Semi-structured interviews	Falls outcome data 5 CoP Falls prevention activity audit	Evaluate uptake of recommended Policy/System changes

Note. Falls outcome data 1-5 includes falls rates, injurious falls rates and proportion of residents falling.

The SNA will use software such as UCI-Net; this allows visual examination of each of the relationships in question, in our study these will be CoP member interactions and knowledge flow through frequency counts (Ranmuthugala, Cunningham, et al., 2011; Yousefi-Nooraie et al., 2014). Results will be presented as matrices or graphs.

Qualitative

Interview or focus group digital recordings will be transcribed verbatim. Open-ended qualitative responses from questionnaires, researcher observation journal and all CoP documentation will be scrutinised by the primary researcher (JFC) and second researcher (AMH). Responses seeking further categorical information, such as other types of exercise programs provided, will be subjected to content analysis. Data will be extracted on the number and frequency of categories identified within each document. All other responses will be coded and thematically analysed by two researchers and arbitrated by a third researcher based on the realist framework of context, mechanisms and outcome configurations (Pawson & Tilley, 1997; Williams et al., 2013). The analysis of the qualitative data will be assisted by the data management software package QSR NVivo 10 for windows. A reflective, iterative process to determine common repeated patterns of meaning or themes across responses will be undertaken (Miles, Huberman, & Saldana, 2014) and interpreted within the realist framework (Pawson & Tilley, 1997). CoP communication transcripts and observations from researcher and CoP facilitator study journals will be used to inform the survey and interview data. Questionnaires will be administered as previously described in Phase 1.

Data Integration

The reduced qualitative data will be integrated with the quantitative data across Phases 1-3 to aid explanation and to holistically present the results of the study (Creswell & Plano Clark, 2007).

3.3.7 Validity, Reliability and Rigour

Health service research is increasingly utilising both quantitative and qualitative methods in research designs seeking answers to complex problems, such as preventing falls in older people. This integration of complementary methodologies has many advantages in that it can enhance confirmation or corroboration of varying methodologies via triangulation; elaborate or develop analysis, provide richer detail; and initiate new lines of thinking through attention to convergent and divergent findings (Onwuegbuzie & Leech, 2005; Rossman & Wilson, 1985). Credibility will be demonstrated through the participation of two independent researchers in the thematic analysis of all qualitative data. Any disagreement will be resolved by discussion with a

third researcher. Member checking, a process in which participants are provided with opportunity to verify or change the researcher interpretations of collected data (e.g. interview and CoP discussion transcripts) to ensure they have been truly represented, will be undertaken (Creswell & Plano Clark, 2007; Thomas & Magilvy, 2011). The primary researcher and CoP facilitator will keep a journal to record their observations and reflections regarding CoP member participation and evaluation ensuring the identification of any bias and actions to contain it. Confirmability will be established through the use of verbatim quotations to represent the voices of participants (Polit & Beck, 2013). Dependability will be demonstrated through the provision of an audit trail enabling an external researcher to follow the decisions made and mapped by the study researchers. In our study this will be established by describing the purpose of the study, detailing the context, mechanism and outcome configurations of the complex intervention, describing how the data will be collected and analysed, presenting the evaluation findings in a coherent and logical style and reporting both processes and outcomes (Thomas & Magilvy, 2011). The primary researcher will be positioned on the fringe of the CoP providing support as required and connecting the CoP members to falls prevention research evidence and other research experts.

3.4 Discussion

The problem of intervening to prevent falls in a RAC organisation is complex. The recipient population is older, frailer and more cognitively impaired compared with community dwelling older people. The staff are diverse in skill-level and experience and may lack the expertise to translate falls prevention strategies into clinical practice. Individual organisational sites are geographically diverse so there is potential for them to operate as silos and not benefit from each other's workplace knowledge and expertise when dealing with similar complex problems. The culture within RAC organisations may also be lacking in terms of optimal communication, leadership and teamwork as perceived by their own staff (Etherton-Ber, Venturato, & Horner, 2013). The representation of RAC staff members as part of a falls prevention CoP has the potential to enable communication, leadership, idea sharing and collaboration. In harnessing a community of individuals, as opposed to reliance on a single individual, the CoP may have a better chance to become the change agent for falls prevention activity through diverse perspectives and collaboration. The use of a CoP with links to a research team

with relevant expertise may enable the translation of falls prevention evidence into clinical practice through tailoring for the local context. Measuring the impact of a CoP will also augment the current CoP literature. Study strengths include the use of the realist approach to enable the research findings to be robustly evaluated and determine what worked or didn't work in the context of a RAC organisation.

3.4.1 Limitations

Limitations include: the quasi-experimental pre/post design but this will be strengthened by the mixed method data collection from a number of sources. Falls data are known to be underreported in hospital systems when only using incident reporting systems which could mean that falls rates obtained may not reflect the total falls (Hill et al., 2010). However we will also be measuring injurious fall related (fracture) rates for falls that are mandatory to report at RAC sites.

3.5 Conclusion

To our knowledge there is no previous literature that clearly identifies and measures how the actions by members of a CoP could affect falls prevention and falls rates in a RAC organisation and how participation affects its membership. If successful, the actions implemented by a CoP have the potential to improve outcomes for residents in terms of independence and quality of life and empower organisational staff through improved policy and practice. The CoP could then become a value-adding aspect of the organisation.

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Chapter 4:

Can a Web-Based Community of Practice be Established and Operated to Lead Falls Prevention Activity in Residential Care?

Preface

This chapter describes Phase 1 (Study 1) of the research that investigated the establishment of the falls prevention CoP within the collaborating RAC organisation.

The chapter is based on a published manuscript:

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Nobre, D., & Hill, A-M. (2016). Can a web-based community of practice be established and operated to lead falls prevention activity in residential care? *Geriatric Nursing*, Advance on line publication, <http://dx.doi.org/10.1016/j.gerinurse.2016.09.001>

The author's version of the manuscript is presented with modifications to suit the style and format of this thesis.

4.1 Abstract

Background

The aims of this study were to determine the feasibility of establishing and operating a web-based CoP to lead falls prevention in a RAC setting.

Methods

A mixed method evaluation was conducted in two phases using survey and transcripts from interactive electronic sources. Nurses and allied health staff (n = 20) with an interest in falls prevention representing 13 sites of a RAC organisation participated.

Results

In Phase 1 the CoP was developed, and the establishment of its structure and composition was evaluated using determinants of success reported in the literature. In Phase 2 all participants interacted using the web, but frequency of engagement by any participant was low. Participatory barriers, including competing demands from other tasks and low levels of knowledge about ICT applications, were identified by CoP members.

Conclusion

A web-based CoP can be established and operated across multiple RAC sites if RAC management support dedicated time for web-based participation and staff are given web-based training.

4.2 Introduction

Falls are a major problem in RAC settings with falls rates between 3-13 per 1000 bed days (Morley, Rolland, Tolson, & Vellas, 2012; Rapp, Becker, Cameron, König, & Büchele, 2012) and 25-30% resulting in serious injuries, such as femoral fractures (Burland, Martens, Brownell, Doupe, & Fuchs, 2013; Oliver et al., 2007). Preventing resident falls in RAC organisations is complex as the population is old and frail and heavily reliant on clinical staff to provide personal assistance to maintain resident safety (Carroll, Dykes, & Hurley, 2010; Oliver et al., 2007). Staff members therefore need to have the knowledge and skills to deliver evidence-based falls prevention interventions to assist with resident safety (Robinson, 2010). However it is uncertain if staff in RAC organisations possess these abilities as levels of training, skills and experience are varied (King et al., 2013). In addition there are fewer professional staff on duty simultaneously, meaning they often work in isolation. Thus peer support and professional development opportunities through tacit learning are limited (Grealish, Bail, & Ranse, 2010; O'Connell, Ostaszkievicz, Sukkar, & Plymat 2008; Robinson, 2010), particularly when individual RAC sites making up an organisation are geographically diverse. Thus finding pragmatic ways of getting staff together to share knowledge and ideas and lead falls prevention in RAC organisations requires an innovative solution (Barnett et al., 2014; Robinson, 2010; Tolson, Irene, Booth, Kelly, & James, 2006).

One model with the potential characteristics to address such a problem is a CoP; these have been emerging in the health sector as a resource for bringing together expertise, problem solving and actioning new policy and practice (Barnett et al., 2014; Ranmuthugala, Cunningham, et al., 2011; Tolson, Lowndes, Booth, Schofield, & Wales, 2011). A CoP is described as a group of people who share a concern regarding a common topic and interact on a frequent basis to deepen their knowledge and skills in the area of concern (Ranmuthugala, Plumb, et al., 2011; Wenger, 1998). As RAC sites are often geographically diverse, staff time poor and funding limited, a CoP might be prohibited from meeting frequently enough face to face to have any impact on falls prevention practice (Dubé, Bourhis, & Jacob, 2006). However CoPs are also able to operate virtually, therefore a web-based CoP may enable staff to meet frequently, share ideas and lead falls prevention practice change without the costly need to leave their workplace. As many RAC organisations have invested in ICT to enhance their operation

a web-based CoP is potentially feasible. A CoP also requires leadership, in the form of its facilitator role, to promote and steer interaction and activity among its members (Kimball & Ladd, 2004). Multidisciplinary staff undertaking managerial duties within RAC settings have the potential to fulfil such a role. Providing the infrastructure to support web-based CoP activity, having the capacity to interact frequently and identifying a committed facilitator are reported determinants of success for CoPs (Barnett et al., 2014; Ranmuthugala, Cunningham, et al., 2011). However there is limited research that has explored the feasibility of establishing and operating a web-based falls prevention CoP across a RAC organisation.

People are the fundamental component of a CoP, with the CoP model providing the opportunity to learn about falls prevention through web-based social interaction (Dubé et al., 2006; Wenger, 1998). However this would require members of a web-based CoP to engage with ICT to interact and learn from each other. Staff who work in Australian RAC settings have a median age of 48 years (King et al., 2013) and consequently may not have had the same exposure to ICT compared with their younger peers (Eley, Fallon, Soar, Buikstra, & Hegney, 2008; Ikioda, Kendall, Brooks, De Liddo, & Shum, 2013). Therefore they may feel challenged in engaging with ICT, or be less familiar with a digital environment (Eley et al., 2008; Mather & Cummings, 2014) and may be required to adopt new behaviours to engage with ICT. Changing the behaviour of an individual or group involves changing their capability, opportunity and/or motivation (COM) to engage in the new behaviour (B); this has been conceptualized as the COM-B model (Michie, Atkins, & West, 2014; Michie, van Stralen, & West, 2011). For example, capabilities to operate a web-based CoP would require staff to have a knowledge and understanding of ICT and be versed in its use. Opportunity may depend on access to computer hardware or software and time to engage with ICT, whilst motivation may depend on the individual's passion for problem solving, learning and collaborating on the topic of falls prevention. It is not known if staff in a RAC setting have the capability, opportunity or motivation to establish and operate a web-based falls prevention CoP.

Therefore, the aims of the study were to: firstly, describe the development and evaluate the establishment of a web-based CoP to lead falls prevention activity in a RAC organisation; secondly, to explore CoP members' capability, confidence, opportunity and motivation to participate in web-based activity using the organisation's intranet;

thirdly to identify barriers and facilitators for sustainable web-based CoP member participation.

4.3 Methods

4.3.1 Study Design

A descriptive-explanatory mixed method feasibility study was conducted in two phases (Creswell & Plano Clark, 2007). During Phase 1 the CoP was developed using RAC organisational and researcher input. In Phase 2 the CoP was operationalised and members identified barriers and facilitators to sustainable participation. The study used a survey-based approach supported by prospective researcher observation journaling, stakeholder meeting minutes, emails and CoP electronic document transcripts. An overview of the study design is shown in Figure 4.1.

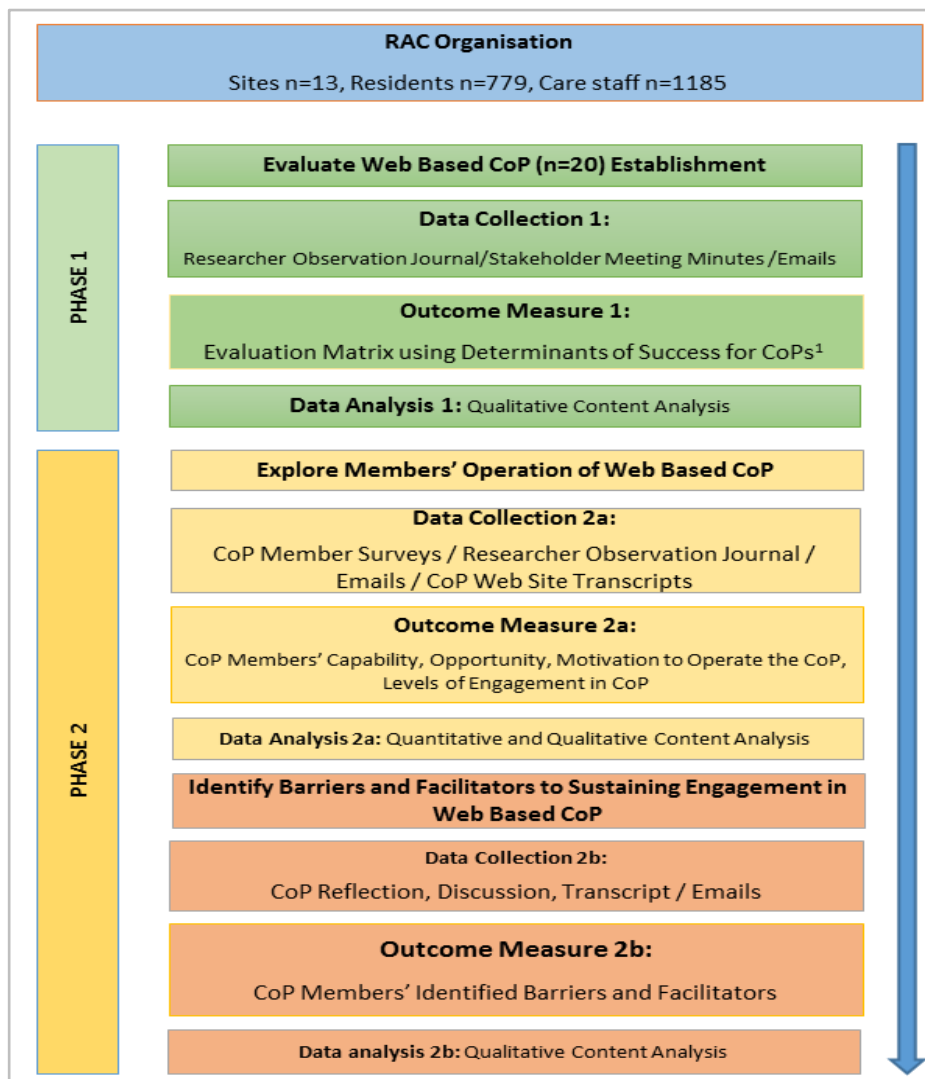


Figure 4.1 Design of Study 1.

4.3.2 Recruitment, Participants and Setting

Study 1 formed the first phase of the present research. This research used a realist approach to evaluation, which enables a comprehensive understanding of complex interventions (Pawson & Tilley, 1997). As part of this approach, it was planned that actions of the CoP, as well as falls and injurious falls rates data, would be measured and analysed.

The CoP partnered university researchers with 20 multidisciplinary staff, volunteering as members, each of the 13 geographically diverse sites belonging to a single RAC organisation. The RAC organisation provided care in a home-like environment for approximately 780 older people at any one time. The mean age of the resident population was approximately 84 years. There was approximately 1185 full and part time care staff across each of the 13 RAC sites. Care assistants supervised by enrolled nurses, registered nurses, clinical nurse specialists and nurse practitioners provided most of the direct resident care. A care manager led each site and all sites had some allied health professional input.

4.3.3 Data Collection and Procedure

Phase 1

At the commencement of Phase 1 of the study commitment to establish a web-based CoP was endorsed by the organisation's CEO and general managers. Operation of the CoP was planned to be predominantly web-based to enable frequent web-based interaction, supplemented by three to four face to face meetings annually. A stakeholder steering committee was formed to commence the logistical development of the CoP. The steering committee, which comprised research and service provider representatives from nursing and allied health, based the development of the CoP on Wenger's three stages of CoP development (Wenger, 1998):

1. Potential: those with a common goal and passion to learn volunteered to be CoP members.
2. Coalescing: CoP members met and CoP purpose was negotiated.
3. Active: CoP members committed to sharing and collaborating on common goals and championing best practice at their sites.

It was envisaged that each site would be represented in the CoP membership. The organisation elected their allied health consultant to the role of CoP facilitator because the scope of this liaison managerial position was perceived to be conducive to the CoP model. The researchers provided training for the CoP facilitator, following established CoP facilitator guidelines (Kimball & Ladd, 2004). All CoP members were invited to an initial face-to-face training session prior to the trial of the web-based CoP.

Data from three sources were collected during Phase 1 of the study:

1. Researcher journal observations
2. Stakeholder steering committee meeting minutes
3. Email communications between stakeholders

Phase 2

In Phase 2 of the study an invitation and a hyperlink to participate in a baseline survey was emailed to CoP members. The questionnaire, containing both open and closed (Likert scale) responses, was constructed with reference to the COM-B model of behaviour change (Michie et al., 2014). Three independent clinical educators reviewed the questionnaire prior to piloting by four RAC staff members to determine content and face validity. The internal consistency of the questionnaire was determined using Cronbach's alpha where an alpha value >0.7 is deemed acceptable (Bland & Altman, 1997). The CoP members' demographics, capability, confidence, opportunity and motivation in using ICT for interacting with other members were reported.

The web-based CoP was then operationalised and the ability of the CoP to function sustainably using the intranet was evaluated. The CoP members' interaction was facilitated using the RAC organisation's intranet over a six week trial period. Intranet was selected over Internet as all staff groups had authorised access. Operation was enabled using Microsoft Windows SharePoint Services (Version 3.0. Redmond, WA: Microsoft Corporation). A secure intranet webpage was designed for the falls prevention CoP as a repository for sharing information and asynchronous discussion. The trial activities were based around Wenger's (1998) 'active' stage of CoP development commencing with an introductory activity of posting a brief social profile followed by an asynchronous discussion on a falls prevention related topic. Asynchronous posting allows a virtual discussion to take place at different points in time

by reading and responding to prior participant posts. A goal of posting an asynchronous weekly comment during CoP members' usual working hours was planned by the researchers. Links to quality falls prevention evidence were placed on the webpage for review and discussion. The primary researcher was available to answer any queries along with access to the organisation's ICT staff. Following the close of the operational trial CoP members were asked to reflect and comment on their participation and identify barriers or facilitators for engaging in sustainable web-based CoP activity. This final evaluation was completed over two weeks.

Data from four sources were collected during Phase 2 of the study:

1. Survey of CoP members
2. Researcher journal observations
3. Intranet discussion transcripts
4. Email communications

4.3.4 Ethical Considerations

Ethical approvals were obtained from the human research ethics committee of the University of Notre Dame Australia (Ref. no. 013145F) and the RAC organisation. All CoP members were provided with both a verbal explanation and information sheet and all provided written consent to participate.

4.3.5 Data Analysis

Phase 1

Qualitative data from stakeholder meeting minutes, researcher journal observations and stakeholder emails were collected and transcribed. Two independent researchers read through all transcripts several times to become familiar with and make sense of the data (Polit & Beck, 2013). Transcripts were analysed using deductive content analysis, which uses previous knowledge around the research topic, when a theory is being tested (Elo & Kyngäs, 2008). The process of the CoP establishment was mapped against determinants of success for establishing CoPs in healthcare (Ranmuthugala, Cunningham, et al., 2011) using a category matrix (Elo & Kyngäs, 2008) to address the first study aim.

Phase 2

In Phase 2 quantitative questionnaire responses addressing CoP members' capability, confidence, and opportunity to interact using the organisation's intranet platform were extracted into SPSS version 22 software package (IBM SPSS Inc., Chicago IL, USA) and summarised using descriptive statistics. Qualitative data from the questionnaire were analysed using an inductive content analysis approach as little was known regarding CoP member motivation to interact in a web-based environment (Elo & Kyngäs, 2008). Responses were organised using open coding, category creation and abstraction. Multiple categories were generated from the headings copied on to coding sheets, further grouping and collapsing followed to reduce the number of categories. The abstraction process involved applying content-specific words to each category. Subcategories with similarities were then described using a generic category and finally a main category (Elo & Kyngäs, 2008) to address the second study aim.

Data from researcher journal observations, intranet discussion board transcripts and CoP member emails were collected and transcribed. After two researchers had read all transcripts thoroughly data were subjected to deductive content analysis. In Phase 2a frequency counts of individual CoP member postings were extracted from the intranet discussion board transcripts. In Phase 2b a category matrix was designed (Elo & Kyngäs, 2008) to address the third study aim of identifying barriers and facilitators for CoP members to engage in sustainable web-based participation.

4.4 Results

Phase 1

A total of 20 staff self-nominated for CoP membership representing all 13 RAC sites. The baseline profile of the CoP was 17 (85%) females and three (15%) males aged between 40-59 years of age. Eleven (55%) had completed a bachelor degree and 10 (50%) had more than six years' experience in their current job role. The membership included nurses, managers, physiotherapists and occupational therapists with eight (40%) having a clinical background in nursing.

The CoP was established over a period of six months. The evaluation of the establishment of the web-based CoP demonstrated that it met with determinants of

success for CoPs in healthcare identified from the literature, as shown in Table 4.1. These included: organisational staff with an interest in falls prevention volunteered as members, they met face to face initially to negotiate their goals and committed to leading falls prevention best practice at their sites.

Table 4.1 Evaluation of The Establishment of a Web-Based Falls Prevention CoP.

Determinants of success for CoP's in healthcare	Identifying a committed facilitator	Having a shared purpose	Commitment and enthusiasm	Endorsement of CoP from organisational management	Capacity for regular CoP member communication	Developing relationships with an initial face to face meeting	Infrastructure to support CoP activity
Evaluation evidence	Steering committee identified facilitator. 72 email exchanges between CoP facilitator and researcher drove logistics for establishment, <i>"It's great to be involved in such a worthwhile project"</i>	Reducing falls rates a priority for staff and organisation, <i>"Falls are our highest recorded clinical incident, we should improve on that"</i> . CoP members identified initial goal of auditing falls prevention activity at each site to identify gaps in practice for targeting.	Seven face to face stakeholder meetings and four presentations enabled CoP set up, <i>"I think we are moving closer to getting started which is exciting! Drafting an action plan and timeline will allow us to plan how to get all (RAC) sites on board,"</i> CoP membership (n = 20) self-nominated across 13 RAC sites	Consent for study obtained from organisation's CEO and General Managers, <i>"have set a date for the official (CoP) launch as CEO is available and it's during the care managers meeting"</i>	CoP members have computer access to intranet site, <i>"some of us share a computer as we work on different days but there's also a hot desk available"</i>	CoP members met at initial face to face training session and social lunch. Two additional face to face meetings scheduled in addition to web-based interactions, <i>"It's feasible to link face to face CoP meetings alongside current organisation meetings to save on cost"</i>	RAC organisation invested in intranet with plans for future upgrades. ICT support available, <i>"Test web page should be up and running by launch"</i>

Note. CEO = Chief executive officer, CoP = Community of practice, ICT = Information and communication technology, RAC = Residential aged care

Phase 2

All 20 (100%) CoP members responded to the survey. The internal consistency for the questionnaire used to survey CoP members was acceptable ($\alpha = 0.83$). Twenty (100%) CoP members reported the most frequent electronic media they used for communication was email and only six (30%) had previously used a blog format. Self-rating of CoP members' capability, confidence and opportunity to participate in web-based activity using the intranet is shown in Table 4.2.

Table 4.2 CoP Member Capability and Opportunity to Participate in Web-Based Activity.

Item	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Capability					
I use the intranet as part of my every day work practice	12 (60%)	4 (20%)	0	3 (15%)	1 (5%)
I am confident to use the intranet to communicate with other staff members	10 (50%)	9 (45%)	1 (5%)	0	0
I feel confident to use a blog for communicating with other CoP members	2 (10%)	8 (40%)	6 (30%)	3 (15%)	1 (5%)
Opportunity					
I have easy access to the intranet at my work site.	15 (75%)	5 (25%)	0	0	0
I have time to use the intranet at my work site for CoP participation.	9 (45%)	7 (35%)	4 (20%)	0	0

The motivations of CoP members to participate in web-based CoP activity were determined as personal, peer and resident driven and centred on the anticipated benefit of improving falls prevention management at their workplace, as shown in Figure 4.2.

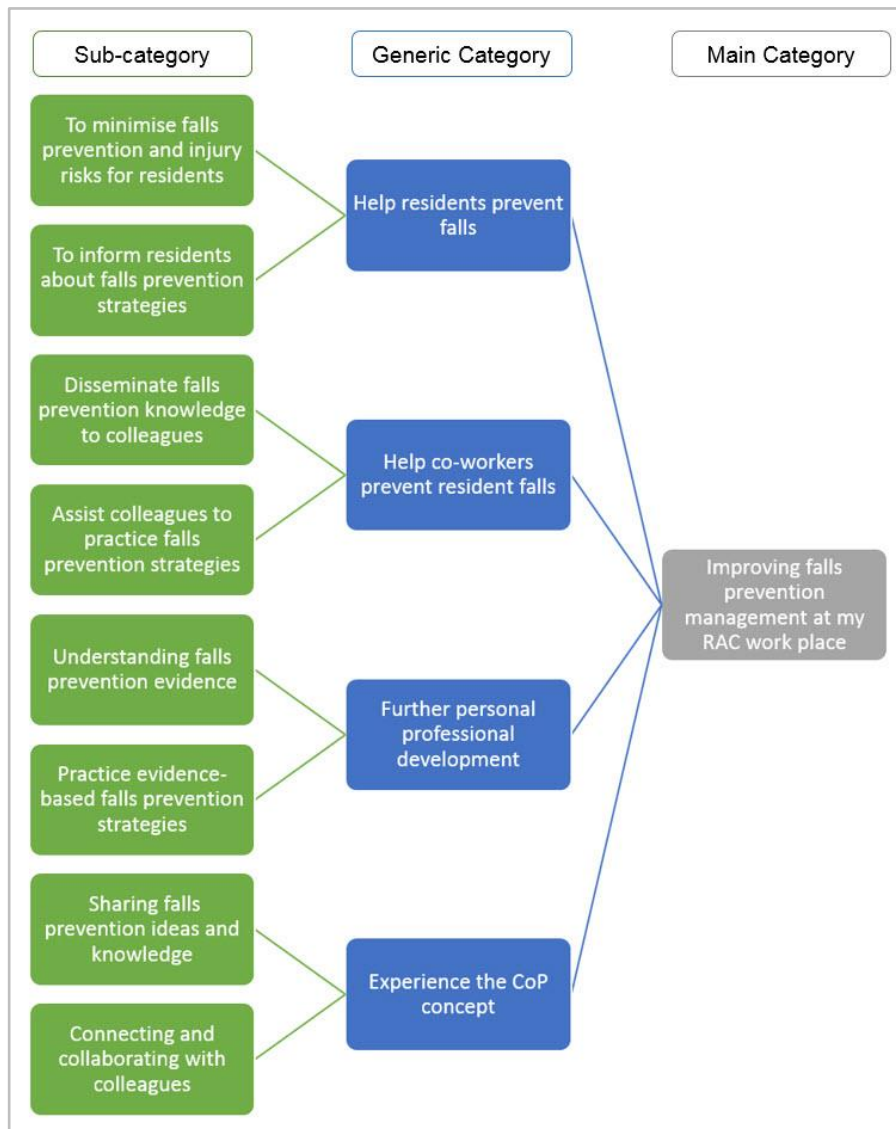


Figure 4.2 CoP Members’ Motivations for Web-Based Participation.

Personal expressions of CoP members’ motivation to participate in a web-based CoP supporting the generic categories included: To help residents prevent falls, P12 *“to manage falls prevention more effectively on site and reduce resident falls and injuries”*, to help co-workers in preventing resident falls, P8 *“to help our staff implement and embed improvements”*, to further personal professional development,

P7 *“improve falls prevention knowledge and practice in ourselves”*, to experience the CoP concept, P7 *“to link with like-minded colleagues on common goals”*.

Two (10%) CoP members who had not posted during the operational trial were followed up and offered assistance. It was identified they had been unable to attend the initial training session and were uncertain of how to participate in a web-based discussion. An interactive training session was provided on site for both CoP members to enable future participation. A training document describing the web-based participation process was also produced to assist members. This was made freely available on the RAC intranet.

Seven (35%) CoP members participated in the introductory web activity and posted a social profile. Eighteen (90%) CoP members communicated by posting asynchronously during the trial but none met the goal of posting a weekly comment. The highest frequency of virtual engagement (two posts, two article downloads) by any one CoP member was low. CoP Facilitator: *“Some members are slow to respond to posts on discussion board, then it’s frustrating for others who have posted... you can’t move on”, “RAC culture involves more face to face communication so this web-based discussion could be out of their comfort zone.”*

Following the operational trial eight (40%) CoP members provided their reflections regarding barriers and facilitators for engaging in sustainable web-based participation. Barriers included challenges to building web-based rapport due to unfamiliarity with other members and competing priorities resulting in members forgetting to participate. Facilitators proposed to induce member behaviour change included attaching member photos linked to web-based activity to build familiarity and rapport with email alerts to prompt participation being the most frequent suggestion (n = 3, 15%). The theoretical concepts for facilitating each new behaviour change are explained in Table 4.3 (Michie et al., 2014) with plans for adoption in ongoing CoP operation.

Table 4.3 CoP Member Identified Barriers and Facilitators to Web-Based Participation with Proposed Behaviour Change Techniques.

Barriers	Facilitators	Behaviour Change Technique	Explanation of BCT
Getting to know and recognise other CoP members by text was challenging and slowed building rapport, “you don’t know them and what site they are from”	Add member photographs to posts on discussion board, <i>“Identification photo’s for each member so they know who they are communicating with”</i>	Adding objects to the environment	Add objects to the environment to facilitate performance of the behaviour
Not all CoP members able to attend face to face training, <i>“I have no idea how to blog or what it is. I never use social media”</i>	Easy to follow electronic training document (Welcome Pack) produced, <i>“use screen shot steps on how to access the intranet, navigate our webpage and post on discussion board”</i>	Instruction on how to perform the behaviour / Demonstration of the behaviour	Advise or agree on how to perform the behaviour; provide observable sample of performance of the behaviour, directly or indirectly e.g. via pictures
CoP members asked to take on added responsibilities without recognition, <i>“there’s no extra time for this but it has to fit in, it’s an important topic”</i>	Members receive a certificate of participation or CPD points for incidences of web based CoP activity, <i>“It might be good to have something in recognition we were part of it (the CoP)”</i>	Incentive outcome	Inform that a reward will be delivered if there’s been effort and progress in achieving the behavioural outcome
CoP members have multiple demands on their time, requiring attention away from computer. Resulted in forgetting to go to intranet webpage, “You come in, quickly check emails then you have to get on with your work (clinical) so you put it off”	Members receive email reminder alert when new activity on intranet webpage, drawing attention to access webpage , <i>“It’s there (email inbox) right in front of you on the screen when you log on”</i>	Prompts / Cues /Habit formation	Introduce environmental or social stimulus with the purpose of prompting or cueing the behaviour / Prompt rehearsal and repetition of alternative behaviour

Note. BCT = Behaviour change technique, CPD = Continuous professional development

4.5 Discussion

4.5.1 Establishment and Operation of a CoP in a RAC Setting

Establishing and operating a web-based falls prevention CoP across multiple RAC sites was achievable if sufficient staff time, training and support is allocated, although some barriers to sustainable operation were identified.

Attention to detail was undertaken when establishing the CoP by tailoring guidelines from the literature (Kimball & Ladd, 2004; Tolson et al., 2011; Wenger, 1998; Wenger, McDermott, & Snyder, 2002). Previous CoP studies have shown that lack of attention to detail can deliver poor outcomes (Ranmuthugala, Plumb, et al., 2011) and in the case of web-based health related CoPs there has been very little use of measurement (Barnett, Jones, Bennett, Iverson, & Bonney, 2012). The study measured the establishment of a web-based CoP by designing an evaluation matrix (Elo & Kyngäs, 2008) using the broader determinants of success for healthcare CoPs identified from the literature (Ranmuthugala, Cunningham, et al., 2011). This is an important first step as several problems may arise, such as the creation of factions or silos that hamper knowledge sharing (Braithwaite et al., 2009), if the structure of a CoP does not enable its theoretical underpinnings. Previous systematic reviews have also identified that diversity in CoP structure makes them challenging to replicate and evaluate (Li et al., 2009; Ranmuthugala, Plumb, et al., 2011), therefore using an evaluation matrix may assist in highlighting structural gaps, standardising this process for future comparisons to be made.

4.5.2 CoP Members' Capability, Confidence, Opportunity and Motivation

Taking on any new role, such as being a member of a web-based CoP, involves behaviour change that requires capability, confidence, opportunity and motivation to engage in the new ICT behaviours (Michie et al., 2014). The CoP member survey findings showed members felt motivated to participate in the web-based CoP for their professional development and to help their co-workers and residents in preventing falls. All (100%) were in agreement they had easy access to the intranet with 80% of CoP members reporting they already used it daily and perceived they had time to use it to participate. There was also high agreement (95%) in perceived member confidence to communicate with other members via the intranet. These findings suggested that the

required levels of CoP member capability, confidence, opportunity and motivation were present to enable the new behaviour of web-based participation as reported in studies describing behaviour change (Jackson, Eliasson, Barber, & Weinman, 2014; Michie et al., 2011). However member engagement with the ICT applications of asynchronous discussion and accessing evidence were low. Similarly Eley et al (2008) identified lower than expected levels of engagement with ICT amongst the nursing profession despite the prevalence of computer access. Access to web-based health care staff education in a community setting has been reported as positive due to the flexible, asynchronous format but engaging with the content was influenced by management support, access accountability and whether the web-based education program was integrated as on the job learning (Hanssen, Norheim & Hanson, 2016). These findings indicate that further investigation is required to enable engagement in ICT applications with the potential to benefit healthcare outcomes.

4.5.3 Barriers and Facilitators to Web-Based CoP Operation

The final phase of this study identified barriers and facilitators to CoP member web-based participation. Although members initially reported they had time to participate in web-based activity (80%), CoP reflection identified a key barrier was competing demands from other clinical tasks away from the computer. This culminated in them forgetting to engage in CoP web-based activity, as experienced by other online CoPs in healthcare (Barnett et al., 2012; Ikioda et al., 2013). Having an onscreen prompt of activity on the webpage via email alerts was suggested as a facilitator to improve participation.

Using unfamiliar ICT applications, such as navigating the route to the discussion board web page and posting was challenging for some CoP members, particularly those who were older. Having technology that was easy to use in a supportive environment (Hanssen et al., 2016) was paramount to the successful operation of a web-based CoP as reported by Barnett et al. (2012). Over 60% of our CoP was aged between 40-59 years of age and reported less experience of ICT applications such as asynchronous learning pedagogy. This suggests a technology usability gap exists and more training and time may be required to enable ICT participation, as suggested by Eley et al. (2008) to enable nurses to engage with ICT. A plan to facilitate CoP member participation by providing a procedural pictorial training document that can be

accessed by all, as recommended by Kimball and Ladd (2004), to assist members in using these ICT applications was undertaken.

Web-based interaction between CoP members requires them to build rapport and trust, which was challenging, as they didn't know many participants from other sites they were engaged with in discussion. Previous CoP studies have shown that building trust is an important pre-requisite for sharing ideas and information (Kimball & Ladd, 2004; Ranmuthugala, Cunningham, et al., 2011). Members suggested having photo identification attached to posts to enable them to recognise each other and feel safe to express their opinions, as this was a new way of building rapport and trust. Providing a familiar and safe web-based environment was identified by other studies for encouraging sharing amongst its CoP members (Barnett et al., 2012; Ikioda et al., 2013).

4.5.4 Limitations

This study was conducted within a single organisation and was of short duration, however feasibility was established and operation of the web-based CoP is ongoing to enable further long term evaluation. There was some reliance on member self-report in accessing items on the webpage however future RAC software upgrades will enable tracking of member web-based activity. The position of the researcher as a part of the CoP may have resulted in some bias, however this also enabled the necessary in depth understanding of CoP operation required for analysis (Polit & Beck, 2013).

4.6 Conclusion

A web-based falls prevention CoP was established across multiple sites of a RAC organisation and was evaluated structurally as meeting determinants of success for CoPs in healthcare. These included having a shared purpose, committed members, capacity for regular communication, infrastructure to enable activity and leadership support. Evaluation of web-based CoP operation identified members had easy access to ICT at their RAC sites and were motivated to engage. However lower than expected capabilities using ICT applications and limited (time) opportunity for web-based participation were identified as barriers. The operation of a CoP could be facilitated if members are given web-based training and RAC management support dedicated time for web-based participation. This could enable CoP members to interact frequently enough to deliver beneficial healthcare outcomes.

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Chapter 5:

Using a Community of Practice to Evaluate Falls Prevention Activity in a Residential Aged Care Organisation: A Clinical Audit

Preface

This chapter describes Phase 2 (Study 2) of the research that investigated the ability of the newly established CoP to undertake its first falls prevention action. The CoP conducted an audit on falls prevention activity across the RAC organisation.

This chapter is based on a published manuscript (see Appendix H):

Francis-Coad, J., Etherton-Beer, C., Bulsara, C., Nobre, D., & Hill, A-M. (2016).

Using a community of practice to evaluate falls prevention activity in a residential aged care organisation: A clinical audit. *Australian Health Review*, 41(1), 13-18. doi:10.1071/AH15189

The author's version of the manuscript is presented with modifications to suit the style and format of this thesis.

5.1 Abstract

Background

CoPs have been established in healthcare using workplace staff to address clinical problems but little is known about their ability to audit and influence practice change.

This study evaluates if a CoP could conduct an evidence-based falls prevention activity audit and identify gaps in falls prevention practice requiring action.

Methods

Cross-sectional falls prevention activity audits were undertaken in 13 RAC sites of a not-for-profit organisation providing care to approximately 780 residents. The audit was led by an operationalised CoP. Membership of the CoP was self-nominated representing all RAC sites and comprised of multidisciplinary staff with a shared interest in falls prevention. The CoP members were assisted in conduction of the audit by site clinical staff.

Results

All 13 (100%) sites completed the audit. The CoP conduct of the audit met identified criteria for an effective clinical audit. Priorities for improvement were identified as increasing the number of residents receiving vitamin D supplementation (mean 41.5% *SD* 23.7) and development of mandatory falls prevention education for staff and a falls prevention policy, as neither was in place at any site. CoP actions undertaken included a letter to visiting doctors requesting support for vitamin D prescription, surveys of care staff and residents to inform falls education design, defining falls and writing a falls prevention policy.

Conclusion

A CoP was able to effectively conduct an evidence-based falls prevention activity audit and identify gaps in practice. CoP members were well positioned, as site staff, to overcome barriers and facilitate action in falls prevention practice.

5.2 Introduction

Older frail people who live in residential care are at very high risk of falls with falls rates across the RAC sector ranging from 3-13 falls per 1000 bed days of care (Oliver et al., 2007; Rapp, Becker, Cameron, König, & Büchele, 2012). These falls result in high rates of injury and consequently reduce independence and quality of life (Oliver et al., 2007; Rapp et al., 2012) therefore reducing falls rates has been identified as an industry priority.

What Works in Falls Prevention?

Large meta-analyses have found that successful single intervention strategies for reducing falls among RAC populations are providing supplementation of vitamin D and medication review by a pharmacist whilst the effect of multifactorial interventions were inconclusive (Cameron et al., 2012). Despite a multifactorial approach to falls prevention being recommended in best practice guidelines (Australian Commission on Safety and Quality in Healthcare, 2009) others have identified that there are substantial gaps between the research evidence and its translation into clinical practice, with numerous barriers being identified in the 'evidence pipeline' (Glasziou, Ogrinc, & Goodman, 2011). Evaluating current falls prevention activity allows identification of gaps in this pipeline to practice with the potential to change future falls outcomes in RAC settings.

Clinical Audit

A common process used to measure and benchmark safety and quality in clinical care is audit and feedback (A&F), which is a process that enables clinical care staff or organisations to evaluate their current performance against evidence-based guidelines and identify gaps in practice for improvement (Gould et al., 2014; Jones, Sloan, Evans, & Williams, 2015; Moore et al., 2011). Some beneficial outcomes have resulted from A&F processes with the Cochrane review (Ivers et al., 2012) reporting an overall 4.3% increase in compliance with requested practice in a variety of clinical fields. It has also been shown that when A&F is combined with action planning there is a greater improvement in implementation of best practice guidelines and practice change (Berk, Callaly, & Hyland, 2003; Jones et al., 2015). Falls prevention is a worthwhile topic for clinical audit as the cost of falls per annum in Australia was recently estimated

to be \$648.2 million AUD of which a disproportionate amount is attributable to treat falls which occur among older people in RAC (Bradley, 2013). Recommendations for conducting an effective clinical audit suggest the involvement of work place multidisciplinary staff to provide a broad range of authentic views (Benjamin, 2008; Gibson, Heaney, & Hull, 2013). However barriers to staff conducting audits have been identified as: having time due to competing priorities, lack of clinical leadership and interdisciplinary involvement (Benjamin, 2008; Bowie, Bradley, & Rushmer, 2012; Gibson et al., 2013; Kitson, 2014).

An operationalised CoP that led falls prevention action across the RAC organisation was identified as a group with characteristics conducive to conducting a clinical audit of falls prevention activity. Communities of practice have been emerging in the health care sector as a resource for bringing together expertise for problem solving and actioning new policy and practice (Ranmuthugala et al., 2011). This CoP, which was established according to principles of successful CoPs in healthcare (Ranmuthugala et al., 2011) connected and utilised the knowledge and skills of multidisciplinary RAC staff with academic researchers in falls prevention through membership. If the CoP could successfully conduct the audit, this connection could create a powerful feedback loop for translation of falls prevention evidence into practice.

The aims of the study were:

1. To evaluate if a CoP could conduct a falls prevention activity clinical audit
2. To determine if a CoP could identify gaps in falls prevention practice
3. To identify barriers to the adoption of CoP planned falls prevention activities and facilitated actions

5.3 Methods

5.3.1 Study Design

A cross-sectional survey using a validated audit tool (National Ageing Research Institute, 2009) adapted for RAC evaluated current falls prevention activity across 13 RAC sites of a not-for-profit organisation. The audit was planned by the falls prevention CoP based on the five stages of the audit cycle (see Figure 5.1) and audit

performance was benchmarked using a matrix of predetermined elements for effective clinical audits (Benjamin, 2008).

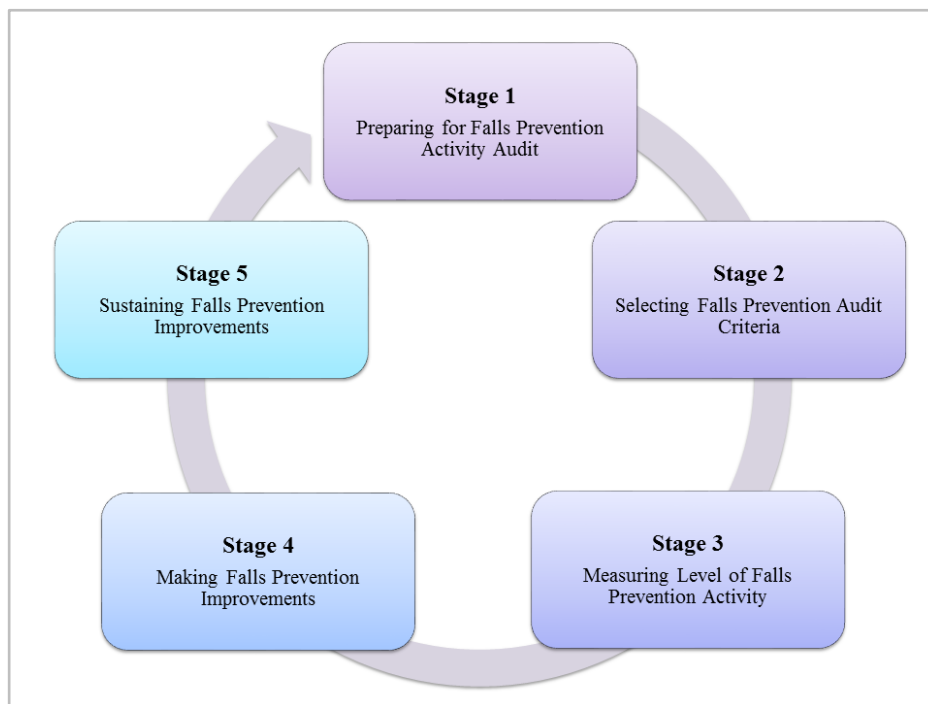


Figure 5.1 Stages of the Audit Cycle as Applied to Falls Prevention (Guided by Benjamin, 2008).

5.3.2 Participants and Setting

The audit was co-ordinated by the CoP who were a group of 20 multidisciplinary staff that included four (20%) nurses, four (20%) care managers and 12 (60%) allied health professionals employed across a not-for-profit RAC provider organisation representing 13 geographically diverse sites in metropolitan Western Australia. Eighteen (90%) were females and two (10%) males with 13 (65%) aged between 40-59 years of age. Sixteen (80%) CoP members had been employed at their RAC site for more than one year with 10 (50%) having more than six years' experience in their current job role. Eleven (55%) had completed a bachelor degree reflecting the professional disciplines participating. CoPs characteristically have a 'facilitator', a lead position, from within its membership and the RAC organisation nominated their Allied Health Consultant for this role. CoP members interacted frequently using the organisation's intranet supported by three annual face-to-face meetings. The RAC organisation provided care in a home-like environment for approximately 780 older people staffed by approximately 1185 full and part time care staff.

5.3.3 *Data Collection and Procedure*

Stage 1

A face-to-face training session was organised for CoP members to familiarise them with the audit requirements and address any queries. In preparation for conducting the audit at their RAC site CoP members used a researcher-designed template that required the CoP members to identify site staff to assist them and perceived barriers to audit data collection at their RAC site. Any barriers identified by individual CoP members were shared and discussed with the entire CoP membership to allow a range of potential facilitators to be generated.

Stage 2

A previously validated falls prevention audit tool (National Ageing Research Institute, 2009) was selected that aligned with best practice recommendations (Australian Commission on Safety and Quality in Healthcare, 2009). The audit tool comprehensively addressed nine falls prevention domains including risk factor assessment, monitoring, education for staff and residents, the environment, organisational support and a range of interventions including harm minimisation equipment and prescribed exercise programs. It contained both open and closed responses measuring items such as the proportion of residents supplemented with vitamin D, proportion prescribed low-low beds and the frequency of medication review.

Table 5.1 Evaluation of The Falls Prevention CoP in Meeting Criteria for An Effective Clinical Audit.

Stage of Audit Cycle	Summary of elements of effective clinical audit (Benjamin, 2008)	Audit by falls prevention CoP
1	<p>Clinical audit should assess structure, process, or outcomes of care</p> <p>The audit should be part of a structured program and should have a local lead</p> <p>Audit should ideally be multidisciplinary</p> <p>Patients should ideally be part of the audit</p>	<p>This audit measured falls and falls injury prevention activity across all 13 sites of a RAC organisation (n = 779 beds)</p> <p>Audit formed part of a project investigating the impact of a falls prevention CoP on falls outcomes across 13 RAC sites.</p> <p>Audit training was provided.</p> <p>Researcher-designed planning template used to identify barriers and facilitators to conducting site audits.</p> <p>Falls prevention action led by one or two CoP members at each site.</p> <p>CoP members led audit assisted by site Nurses, Care Managers and Allied Health Professionals.</p> <p>Residents were surveyed in a separate study</p>
2	<p>Choose audit topics based on high risk, high volume, or high cost problems or on national clinical audits, national service frameworks, or NICE guidelines</p>	<p>One in two older people in RAC fall annually; preventing falls for older people is a national priority.</p> <p>Cost of falls annually \$648.2 million AUD</p> <p>A ‘Falls and falls injury prevention activity audit for residential aged care facilities’ developed by the National Ageing Research Institute and modified for the RAC setting was selected.</p>
3	<p>Derive standards of measurement from good quality guidelines</p>	<p>Audit tool aligns with: Australian Commission on Safety and Quality in Healthcare. Preventing falls and harm from falls in older people. Best Practice Guidelines for Australian Residential Care Facilities 2009.</p>

Stage of Audit Cycle	Summary of elements of effective clinical audit (Benjamin, 2008)	Audit by falls prevention CoP
4	Use action plans to overcome the local barriers to change, and identify those responsible for service improvement	Falls prevention CoP formulated action plan post audit (Table 5.3) CoP members used a researcher-designed template to identify staff on site who may assist with audit improvements. CoP members leading practice change at sites.
5	Repeat audit to find out whether improvements in care have been implemented as a result of clinical audit Develop specific mechanisms and systems to monitor and sustain service improvements once the audit cycle has been completed	CoP planning repeat audit following implementation of action plans Falls prevention CoP established with intention of being a sustainable model for falls prevention action and evaluation across the RAC organisation.

Note. AUD = Australian dollars, CoP = Community of Practice, NICE = National Institute for Health and Care Excellence, RAC = Residential Aged Care

Stage 3

A web based CoP discussion on a secure organisational webpage determined the commencement date and time for the 13 site audits taking into account RAC site staff availability. CoP members co-ordinated the completion of the audit at their RAC site assisted by site staff namely care managers, nurses and allied health professionals. Multiple data sources were scrutinised including policy, process and care management documents in conjunction with observing clinical practices. Discussions with nursing and allied health assistants, cleaners, laundry and maintenance staff also contributed to establishing whether everyday practices reflected current policies.

Stage 4

Completed RAC site audits were collected by the CoP facilitator and delivered to the researchers for analysis. The CoP discussed feedback from the audit findings to determine the falls prevention areas for improvement in conjunction with barriers and facilitators to implementation. A plan of CoP actions for achieving falls prevention improvement at RAC sites was then developed e.g. increasing the proportion of residents supplemented with vitamin D at RAC sites could be facilitated by CoP access to geriatricians to educate visiting doctors on the benefits of prescription to reduce falls rates.

Stage 5

The CoP determined that the best time for repeating the site audits should be following implementation of all prioritised falls prevention activities.

5.3.4 Ethical Considerations

Clearance for the study was obtained from the human research ethics committee of the University of Notre Dame Australia (Ref. no. 014084F) and board of the RAC organisation. All CoP members provided written consent to participate.

5.3.5 Data Analysis

Qualitative data that described the audit process were collected and transcribed from CoP training documents, CoP posts on an electronic discussion board, CoP emails and researcher journal observations into a Microsoft Excel (2013) spread sheet

(Microsoft Corporation, Washington, USA). Two independent researchers familiarised themselves with the data by reading the transcripts a number of times. These data were subsequently analysed using deductive content analysis (Elo & Kyngäs, 2008). Data describing the CoP conduction of the audit process were mapped against elements (categories) of effective clinical audit (Benjamin, 2008) using a structured category matrix (Elo & Kyngäs, 2008) to address study aim one.

Quantitative data drawn from the audit were entered into the SPSS statistical software package version 22 IBM SPSS Statistics. Audit data were summarised using descriptive statistics (Portney & Watkins, 1993). Audit domain findings were mapped against evidence best practiced recommendations to address study aim two.

Qualitative data exploring any potential barriers and facilitators to engaging in falls prevention activity were mapped against audit domains using deductive content analysis (Elo & Kyngäs, 2008) to address study aim three.

Trustworthiness of the data was achieved through discussion and consensus amongst CoP members regarding categories. The CoP then used the mapping procedure to develop a falls prevention action plan.

5.4 Results

The CoP conducted the organisational falls prevention activity audit at all 13 RAC sites led by the site CoP member(s). The CoP audit and action plan met all five stage criteria for an effective clinical audit as shown in Table 5.1. Our CoP provided a multidisciplinary local leadership in assessing the high cost problem of falls in RAC in tandem with falls prevention processes and outcomes. This was measured using a validated audit tool that aligned with best practice guidelines (National Ageing Research Institute, 2009). CoP preparation for auditing at sites identified 'lack of time' due to demands from staff's usual clinical duties as the main barrier to conducting the audit. The CoP met and discussed barriers and facilitators. This resulted in the identification of the best times to conduct audit tasks; before shift handover or during resident meal times as these aligned with periods of lower clinical activity demand. CoP members subsequently engaged site nurses to assist with the audit domains of medications and continence, occupational therapists regarding equipment and environment, physiotherapists regarding risk assessment and exercise programs and care managers to

assist with audit of policy and monitoring. This resulted in the burden of the audit tasks being shared, which facilitated conduct of the audit. Three RAC sites completed the audit tool electronically and 10 in paper copy. CoP member feedback post audit determined the audit tool was user friendly in layout because it contained mostly tick boxes but also had spaces to add comments. Participating CoP members (P) reported they felt empowered after undertaking the falls prevention activity audit process as it had raised their awareness of gaps in clinical practice and motivated them to take action, P1 *“I thought we were already doing everything we could for falls prevention.”* P4 *“There’s a lot more to it (falls prevention) than I thought.”*

At subsequent CoP discussions priority gaps in falls prevention practice were identified across each audit domain. This was achieved by comparing the audit findings against falls prevention evidence and best practice recommendations (Australian Commission on Safety and Quality in Healthcare, 2009; Cameron et al., 2012). The RAC organisation’s level of compliance with falls prevention evidence and best practice recommendations for these priority areas are described in Table 5.2.

Table 5.2 Priority Findings from the Falls and Falls Injury Prevention Activity Audit Conducted by the CoP.

Audit domain	Compliance measure	Recommendation/standard	Findings
Vitamin D supplementation	Mean (<i>SD</i>) proportion residents supplemented vitamin D 41.5% (23.7)	Improve provision of adequate vitamin D supplementation (>800units/day) for all RAC sites	No CoP members (n = 20) were aware of the Level I evidence regarding effectiveness of vitamin D supplementation in reducing falls rates
Staff Education	6 (46.2%) sites	Falls prevention training provided for all RAC staff. Training should be interactive, experiential, risk factor focussed and explanatory of staff role.	No mandatory falls prevention training. Sites providing annual tutorial at staff meeting had non- standardised content, less than 50% of staff attended
Fall definition documented	2 (15.4%) sites	RAC facilities should adopt a consistent fall definition and process to ensure consistent uptake by all staff	Site definitions not standardised or clinically explained therefore subject to interpretation; impacts reliability of falls reporting
Falls prevention policy	0 (0%) sites	Multifactorial approach using standard falls prevention interventions should be routine care for all residents	Falls management policy (post fall) in place across all sites but multifactorial falls prevention not addressed
Falls Risk Assessment: On admission	12 (92.3%) sites	All older persons admitted to RAC receive falls risk assessment, on admission, post fall, after change in health condition and after change in built environment. Identified risk factors addressed with appropriate intervention	Falls risk assessment tool previously implemented by organisation covered 4/14 recognised falls risk factors with no clear alignment process to falls prevention strategies in resident care plan
Post fall	4 (30.8%) sites		

Audit domain	Compliance measure	Recommendation/standard	Findings
After change in health condition	9 (69.2%) sites		
After change in environment	2 (15.4%) sites		
Annually	7 (53.8%) sites		
Individualised balance exercise programs provided	11 (84.6%) sites	Supervised individual balance exercises, two hours per week cumulatively for improvement	Cumulative balance exercise duration range 5 – 60 minutes weekly. Duration dose delivered was sub-optimal
Included exercises in standing position (ability dependent)	9 (69.2%) sites	Challenge resident limit of stability	No current psychometric measure of balance intensity. Difficult to determine if individual resident's limits of stability were challenged.
Resident Education	6 (46.2%) sites	Engaging older people integral to preventing falls. Continuous prompts and reminders required to execute falls prevention strategies.	Sites delivered ad hoc non-standardised resident falls prevention information. Methods for prompting resident engagement in falls prevention action not reflected in policy.

Note. CoP = Community of Practice, RAC = Residential Aged Care

Audit findings that met or were close to complying with evidence and best practice recommendations included medication review by a pharmacist, which occurred annually at 10 (76.9%) sites. All 13 sites reported review of medications by visiting doctors and 10 (76.9%) sites also had a nurse practitioner review medications as requested. All 13 (100%) sites provided resident continence assessments with appropriate toileting programs. There was a 98% compliance rate for hip protector use in 13.9% of residents identified as suitable candidates for use. Resident's feet condition was reviewed every six weeks at all 13 (100%) sites by a podiatrist, footwear was checked annually at four (30.8%) sites by the physiotherapist and a process for assessing sensory deficits and aids (visual and auditory) was in place at 10 (76.9%) sites. Low-low beds were in use by 14% of residents across all sites identified as at risk of falls when attempting to get up from bed unassisted and surveillance measures were operational at 11 (84.6%) sites. Environmental modifications were not prioritised by the CoP as a comprehensive environmental audit, inclusive of safety measures, had been undertaken 12 months prior as part of another organisational project with funding allocated for recommended changes. Plans included improvements to communal corridor lighting and new outdoor paving. Overall existing falls prevention processes were perceived by staff to be working well at eight (61.5%) sites.

The CoP planned falls prevention activities and discussed barriers and facilitators to adoption at sites as shown in Table 5.3. Priority falls prevention activities that were planned included improving the proportion of residents supplemented with vitamin D, developing a mandatory falls prevention staff education program and defining falls and falls prevention policy.

Table 5.3 CoP Identified Barriers, Facilitators and Actions to Adoption of Falls Prevention Activities at Sites.

CoP plan	Barriers	Facilitators	CoP Actions
Increase number of residents supplemented with Vitamin D	Not universally prescribed. Individual residents have different doctors with varied opinions on prescribing	Engaging support from Geriatricians in targeting doctors	Engaged geriatricians to assist with preparation of a letter to visiting doctors incorporating evidence-based information and benefits of vitamin D supplementation. Letter e-mailed to all RAC site visiting doctors Two Nurse Practitioners who visit 10 RAC sites and have prescribing rights for vitamin D are providing additional support. Raising staff awareness at sites through CoP newsletter
	Cost to resident (not on PBS)	Investigate bulk buying of supplements to reduce cost	Provide information on vitamin D supplementation, including cost versus benefit in the RAC admission package
	Residents with swallowing difficulties may not manage supplement table	Investigate alternate delivery formats through pharmacist	Information provided to all site care managers that supplements are available in liquid drops and by injection
Design mandatory staff falls prevention education	Lack of relevant educational resources	Develop CoP newsletter to disseminate falls prevention information	CoP newsletter “CoPTales” produced providing feedback and information on CoP falls prevention activities. Three issues published.
	Electronic training media cannot be used on staff computers at some sites due to lack of infrastructure.	Engage ICT support.	Discussed with ICT team, audio accessibility has been enabled on site computers.
	Some staff will not attend training out of their rostered shifts.	Use multimedia so staff across all shifts can access training.	Exploring multimedia training options. Reviewing current freely available resources versus producing RAC organisation’s own tailored resources.

CoP plan	Barriers	Facilitators	CoP Actions
	Cost of providing education across multiple days / shifts.	Survey care staff to find out what they know and think about falls and falls prevention. Break down falls prevention training into modules that could be presented on site at the end of staff meetings or handovers.	Developing interactive and experiential training focussing on intrinsic (resident) and extrinsic (environmental) risk factors and staffs role regarding both. Pilot study of Care staff indicates staff would like falls prevention reminders such as checklist. Survey of care staff has been extended across eight RAC sites to further inform education design. Mandatory falls prevention training is being incorporated into the two day new RAC staff orientation package.
Adopt standardised fall definition	Many definitions in existence Clinical interpretation can impact reliability of reporting	Engaging support from research academics to assist with interpretation	Implemented fall definition by Lamb et al 2005. Writing clinical explanations for falls reporting.
Write falls prevention policy for implementation	Unco-ordinated approach to falls prevention due to lack of clear guidelines. Policy has to incorporate the organisations other care provision domains for community dwelling elderly and younger people with disabilities.	Engaging support from research academics for policy writing. Updated RAC software will allow easier review of falls incidents Engaging assistance from Document Controller (recently employed by the RAC organisation to assist with policy writing)	Developing written processes for falls prevention activities including regular standardised falls monitoring feedback to site staff. Using new software at four RAC sites to display monthly falls incident trends in a graph displayed in staff handover room Writing new falls management policy that focuses on prevention in conjunction with all stakeholder groups

CoP plan	Barriers	Facilitators	CoP Actions
Improve falls risk assessment process	<p>Many falls risk assessment tools exist resulting in confusion as to selection of most appropriate.</p> <p>Staff confusion regarding responsibility for completing the assessment tool.</p> <p>Review of residents post fall is challenging for allied health staff employed part time</p>	<p>Engaging support from research academics via CoP in finding suitable tools for consideration.</p> <p>Discussing at RAC site staff meetings</p>	<p>5 falls risk assessment tools designed for RAC settings were reviewed. The Queensland falls assessment and management plan has been selected and tailored for adoption based on their RAC site requirements.</p> <p>Discipline specific responsibilities for completing items within the assessment tool have been negotiated so tasks are shared.</p> <p>Process guidelines for falls risk assessment tool item completion are being written. All residents will receive a falls risk assessment on admission.</p> <p>The times for repeating the falls risk assessment tool is being negotiated.</p>
Improve delivery of balance exercise programs provided	<p>Low contact hours by professional staff to supervise therapy assistants implementing exercises.</p> <p>Time demands by other tasks limit ability to provide optimal therapeutic dosage.</p>	<p>Discuss with physiotherapists at all RAC sites re-review of balance exercise programs for residents with capability of completing balance exercises of sufficient challenge.</p>	<p>Met with RAC site physiotherapists regarding use of supervised individual or group balance exercises to challenge the resident's limit of stability aiming for two hours per week cumulatively. RAC site physiotherapists are educating therapy assistants regarding how to challenge a resident's limits of stability when assisting with balance exercises.</p> <p>Alert government agencies to therapy staffing levels as they do not have the opportunity to provide balance exercises to eligible individuals at the therapeutic dosage for improvement.</p>

CoP plan	Barriers	Facilitators	CoP Actions
Design resident falls prevention education	Many residents are cognitively impaired which is a challenge to educating and adopting falls prevention actions independently.	Engage staff to assist residents to prevent falls through reminders and setting up a safe environment.	Addressed through staff education actions above.
	Lack of resident compliance with falls prevention activities.	Survey residents with better levels of cognition to find out what they know and think about falls and falls prevention to further inform resource design.	Surveying residents across six participating RAC sites.
	Lack of educational resources.	Make resources available through site CoP members Information should be pictorial and written not just verbal.	Developing educational resources in appropriate formats for older learners. Therapy assistants to assist with delivery.

Note. CoP = Community of Practice, RAC = Residential Aged Care, Ax = Assessment, PBS = Pharmaceutical Benefits Scheme

5.5 Discussion

Findings from this study have contributed to the body of knowledge on CoPs in healthcare by evaluating its performance in the domain of falls prevention audit action. Meeting the criteria for effective clinical audit (Benjamin, 2008) was achievable by a CoP as members were able to share knowledge, discuss findings and action change in falls prevention activity. This aligns with the structure and purpose of CoPs described in the literature as models for collaboration and innovation (Ranmuthugala et al., 2011). The CoP was able to overcome some of the barriers to audit reported in other studies through interaction (Bowie et al., 2012; Gibson et al., 2013; Kitson, 2014). Lack of staff time, due to competing priorities, was enabled by the CoP sharing audit tasks amongst site staff to reduce the burden. Lack of clinical leadership and interdisciplinary involvement was addressed in that CoP members provided audit leadership at their respective sites and were themselves multidisciplinary clinicians. Our study also involved workplace RAC staff in the audit process unlike a similar project conducted in RAC facilities that used a trained nurse assisted by external project officers as auditors (Haralambous et al., 2010). Involving workplace staff in quality improvement initiatives, such as clinical auditing, has been shown to be more successful than using external experts (Berk et al., 2003; Gibson et al., 2013) as they will be the ones responsible for translating evidence into practice. The CoP was instrumental in contributing to the success of the A&F process as CoP members were RAC site staff with existing peer relationships. A&F is reported as being more effective in changing clinical practice when delivered by a peer or supervisor in both verbal and written formats (Gould et al., 2014; Ivers et al., 2012; Jones et al., 2015). The establishment of the CoP across the RAC organisation to sustain clinical practice improvement fulfils an important recommended step in audit cycles (Benjamin, 2008; Gibson et al., 2013).

The results of the falls prevention activity audit demonstrated there were gaps in practice; including vitamin D supplementation and staff falls prevention training. Supplementing older people in RAC with vitamin D has been shown to reduce falls rates (Cameron et al., 2012; Department of Health Western Australia, 2014) as 89% of the population are reported as having deficient or very low levels (Department of Health Western Australia, 2014), but our current proportion of residents supplemented was less than half this value. Staff education implemented as part of a multifactorial approach to

falls prevention has delivered a 50% reduction in the number of resident falls (Bouwen, De Lepeleire, & Buntinx, 2008). However simply providing generic educational material in brochures or handouts, as identified at six (46.2%) RAC sites, is reported as having little effect on staff adopting falls prevention actions. Interactive, authentic education tailored to staff sub groups and accessible to all is recommended (Anderson et al., 2012; Mitchell & Lawes, 2007). Both our results demonstrate that the process of evidence translation to practice was not complete.

Barriers to CoP planned actions centred on an unco-ordinated approach to falls prevention. This finding may have contributed to the variation in compliance with best practice recommendations seen across the RAC sites. Facilitators to CoP actions centred on access to external experts which suggests that research institutions should permanently align themselves with RAC organisations and take a more active role in the translation of evidence into practice (Nitz et al., 2012; Verbeek, Zwakhalen, Schols, & Hamers, 2013).

A key strength of this study was the inclusion of staff at all 13 sites, led by the CoP, in conducting the audit as opposed to an external agency. The characteristics of a CoP include membership through shared practice across organisational boundaries, with a common topic of focus. Members engage in sharing knowledge and innovate for change through frequent interaction (Ranmuthugala et al., 2011). Our CoP connected staff from all 13 RAC sites to address the topic of auditing falls prevention. CoP member access to frequent web-based communication enabled a co-ordinated, collaborative approach to clinical audit and the shared expertise of the membership fulfilled the multifactorial requirements of the falls prevention activity audit enabling a more efficient and effective completion. As the CoP was established by the RAC organisation as a sustainable approach to falls prevention it has the capacity to repeat this clinical audit process enabling continuous review of performance (Australian Commission on Safety and Quality in Healthcare, 2009; Benjamin, 2008). Whilst the audit was cross-sectional, spending time to identify gaps in practice and barriers to implementing falls prevention activities is advocated for enabling the adoption of practice change (Benjamin, 2008; Craig et al., 2008).

5.6 Conclusion

A CoP was able to conduct an effective falls prevention activity audit at all 13 RAC sites. Fidelity in conduction of the audits was established by benchmarking CoP activity according to the five stages of the audit cycle. This included appropriate preparation, selection of relevant audit criteria and measurement of falls prevention activity. Audit findings and subsequent actions were informative for the RAC organisation in measuring falls prevention performance and planning improvement in a sustainable way. Gaps in falls prevention practice highlighted that evidence-based falls prevention practice, such as resident supplementation of Vitamin D, required more consistent translation across the RAC organisation and foundation elements including defining a fall and falls prevention policy required implementation. Similar RAC organisations may also benefit from undertaking this audit and feedback process and action planning. We recommend the use of a workplace group of multidisciplinary staff with access to quality evidence, such as a CoP, to translate evidence into practice.

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Chapter 6:

What Worked Translating Evidence into Practice: A Realist Evaluation of the Impact of a Falls Prevention Community of Practice

Preface

This chapter describes Phase 3 (Study 3) of the research. Following the falls prevention activity audit, evidence-based falls prevention strategies prioritised by the CoP were actioned. The impact of CoP activities was evaluated at member, site and organisation levels.

This chapter is based on a manuscript submitted for publication (under peer review) and a poster presented at the 7th Biennial Australian and New Zealand Falls Prevention Conference 2016 (Melbourne, Australia) titled:

Francis-Coad, J., Etherton-Ber, C., Bulsara, C., Blackburn, N., Chivers, P., & Hill, A-M. What worked translating evidence into practice: A realist evaluation of the impact of a falls prevention community of practice.

The author's version of the manuscript is presented with modifications to suit the style and format of this thesis.

6.1 Abstract

Background

Falls prevention guidelines recommend that multifactorial prevention strategies are implemented by RAC organisations, but these require translation into clinical practice. A CoP was selected as a suitable model to support translation of the best available evidence into practice in a RAC organisation, as it could bring together like-minded people with falls expertise and local clinical knowledge providing a social learning opportunity in the pursuit of a common goal; falls prevention. The aims of the study were to evaluate the impact of a falls prevention CoP on its membership, its actions at site level and its actions at organisation level in translating falls prevention evidence into practice.

Methods

A convergent, parallel mixed methods evaluation design based on a realist approach using surveys, audits, observations and semi-structured interviews was conducted. Participants were 20 multidisciplinary staff nominating as CoP members between November 2013 and November 2015. They represented 13 sites (779 beds) of a RAC organisation. The impact of the CoP was evaluated at three levels to identify how the CoP influenced the observed outcomes in the varying contexts of its membership, the RAC site and RAC organisation.

Results

Staff participating as CoP members gained knowledge and awareness in falls prevention through connecting and sharing. Strategies prioritised and addressed at RAC site level culminated in a significant increase in the proportion of residents supplemented with vitamin D [mean increase = 28.23%, 95% CI (15.96%, 40.51%)] and development of falls prevention education for care staff. At organisation level a falls policy, reflecting preventative evidence-based guidelines, and a new falls risk assessment procedure with aligned management plans were written, modified and implemented. Variation in the impact of the CoP across the sites was observed. A key inhibitory mechanism identified by CoP members was a lack of recognition by managers of the requirement to prioritise time for members to engage in the translation of falls prevention evidence into practice. This resulted in less practice change taking place at some sites. Key enabling

mechanisms included an active CoP member who prompted staff attention to falls prevention strategies in novel ways and management support in reinforcing accountability for practice change. This resulted in better adoption of prioritised strategies.

Conclusion

Multidisciplinary staff participating in a falls prevention CoP gained connectivity and knowledge and were able to facilitate the translation of falls prevention evidence into practice in the context of a RAC site and RAC organisation. Support from RAC organisational and site management to make the necessary investment in staff time to enable change in falls prevention practice is essential for success.

6.2 Introduction

Falls are a major socio-economic problem in the RAC sector; half its population fall annually (Burland, Martens, Brownell, Doupe, & Fuchs, 2013; Haralambous et al., 2010; Nyman & Victor, 2011) and 25-30% of these falls result in physical injury (Burland et al., 2013; Oliver et al., 2007; Rapp, Becker, Cameron, König, & Büchele, 2012). Consequences for residents who fall include increased risk of mortality, functional decline, depression and anxiety (Morley, 2007; Oliver et al., 2007; Vlaeyen et al., 2015) in addition to significant cost burden for the health sector (Haines et al., 2013; Watson, Clapperton, & Mitchell, 2011). Preventing falls and resultant injury is challenging due to the multifactorial nature of falls, the complex characteristics of RAC populations who have multiple co-morbidities with age-related systems decline (Becker & Rapp, 2010; Onder et al., 2012; Rapp et al., 2012) and a diversely skilled workforce caring for them (Becker & Rapp, 2010; King et al., 2013). Two recent meta analyses in RAC populations showed different findings; a large systematic review (Cameron et al., 2012) found supplementing residents with low vitamin D levels reduced the rate of falls by 37% but not the risk of falling whilst Vlaeyen et al. (2015) reported multifactorial interventions delivered by a multidisciplinary staff reduced falls by 33% and the number of recurrent fallers by 21%. Falls prevention evidence-based guidelines also offer strategy implementation and adoption advice at staff, site and organisation levels (Australian Commission on Safety and Quality in Healthcare, 2009; National Institute for Health and Care Excellence, 2013). A systematic review conducted as part of the present research (described in Chapter 2) found that nine studies delivered interventions at all three levels and three delivered interventions at two levels (see Table 2.5 for the 12 included studies). A sub-group meta-analysis of three studies showed that when interventions were delivered at two or three levels, but were supported with external resources, there was a significant reduction in falls rates.

Implementing and adopting evidence-based falls prevention activities in the context of a RAC organisation requires embedding these activities in policy, processes and practices. To achieve this translation into practice systematic enquiry, synthesis and tailoring of falls prevention evidence for the local workplace is necessary (Glasziou, Ogrinc, & Goodman, 2011; Haines & Waldron, 2011; Tetroe, Graham, & Scott, 2011). Thus bringing people together with falls research expertise and local knowledge of barriers and facilitators to RAC workplace practices could facilitate effective translation of evidence into practice.

One option to bring like-minded people together is a CoP that enables sharing of expertise and ideas, to innovate for change in pursuit of a common goal (Bertone et al., 2013; Tolson, Lowndes, Booth, Schofield, & Wales, 2011; Wenger, 1998). CoPs have been used in health care organisations with the intent of building capacity and improving health care outcomes with inconclusive results largely due to poor or absent evaluation. Improved impact evaluations are thus indicated (Bertone et al., 2013; Li et al., 2009; Ranmuthugala, Plumb, et al., 2011).

A CoP was established to bring together RAC staff with an interest and goal in preventing falls as previously described in Chapter 4 (Francis-Coad, Etherton-Bear, Bulsara, Nobre, & Hill, 2016a). The intention was to offer a social learning opportunity (Wenger, 1998) and robustly evaluate its feasibility to facilitate translation of the current evidence using both objective outcomes and observed changes in health behaviour (Colquhoun et al., 2014; Michie, van Stralen, & West, 2011). The CoP was viewed as a complex intervention at the organisational level that could have differing impact across RAC sites and the individual staff participating as members, dependent upon leadership, culture and staff behaviours (Colquhoun et al., 2014; Ranmuthugala, Cunningham, et al., 2011; Tolson, Booth, & Lowndes, 2008). Evaluation using this realist approach could identify how the CoP influenced the observed outcomes in different contexts of its membership, the RAC site and RAC organisation (Hewitt, Sims, & Harris, 2012; Ranmuthugala, Cunningham, et al., 2011; Williams, Burton, & Rycroft-Malone, 2013).

Therefore the aims of this study were to evaluate the impact of a falls prevention CoP on its membership, its actions at site level and its actions at organisation level in translating falls prevention evidence into practice.

6.3 Methods

6.3.1 Study Design

Study 3 used a convergent, parallel mixed methods evaluation design (Creswell & Plano Clark, 2007) based on a realist approach (Pawson & Tilley, 1997). Briefly, realist approaches have been used when more than a description of an intervention's outcomes is required; they seek to identify how interventions trigger (mechanisms) the observed 'outcomes' in varying 'contexts' (Hewitt et al., 2012; Pawson & Tilley, 1997; Ranmuthugala, Cunningham, et al., 2011). Theoretical explanations of how a CoP might

impact falls prevention were derived from the literature and stakeholder meetings using a context, mechanisms and outcomes (CMO) framework described previously in Chapter 3 (Francis-Coad, Etherton-Beer, Bulsara, Nobre, & Hill, 2015). This framework was tested by posing the questions “what was it about the intervention that worked?”, “for whom?”, “how?” and “under what conditions?” Survey questionnaires, semi-structured interviews, observation journals, electronic transcripts, emails, meeting minutes, clinical records and policy documents provided data on CoP activity. An overview of the study is shown in Figure 6.1.

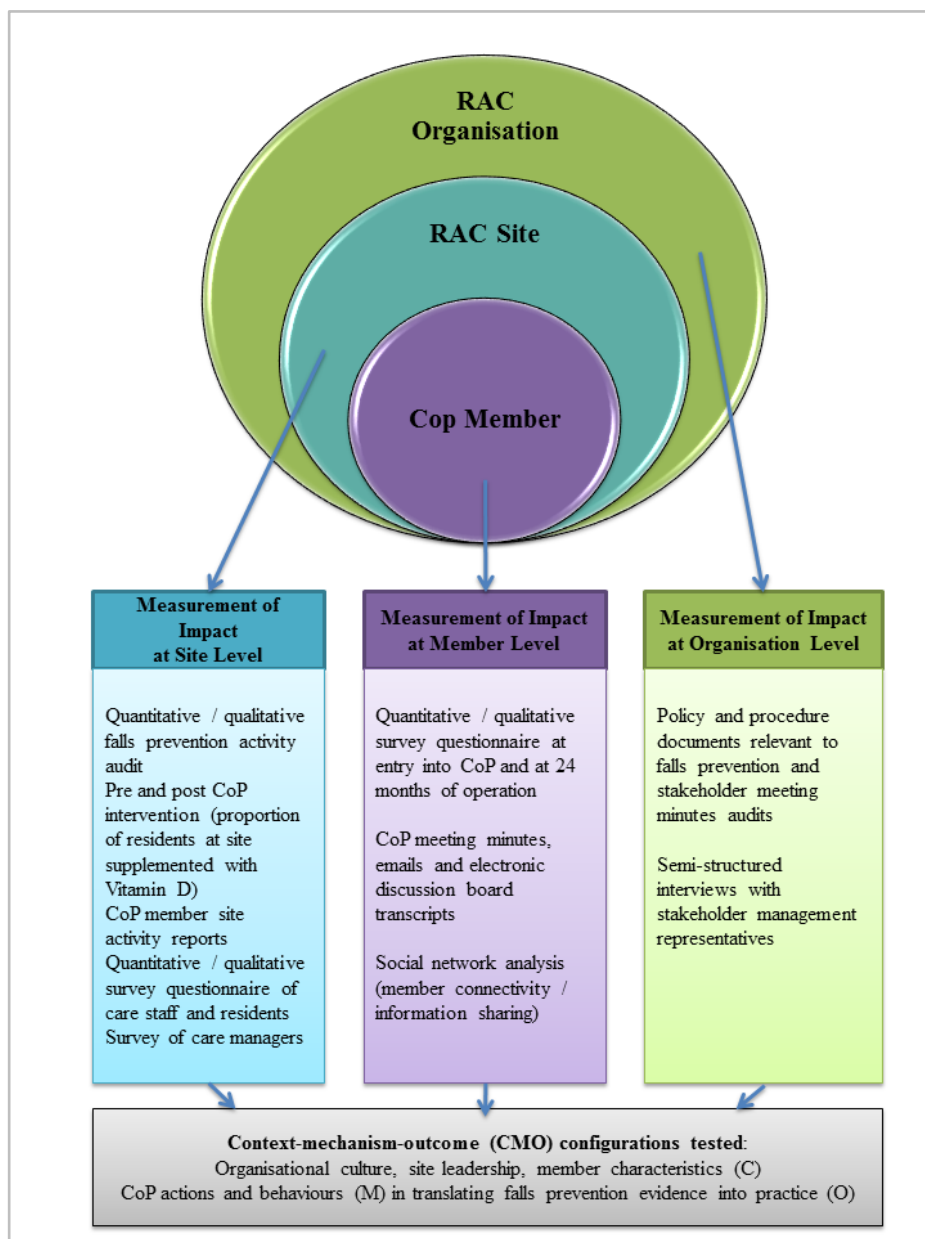


Figure 6.1 Overview of Measuring CoP Impact at Member, Site and Organisational Level.

6.3.2 *Participants and Setting*

The RAC organisation was led by a CEO from a central administrative site. There were approximately 1200 full and part time care staff across 13 geographically diverse sites providing mainly high level care in a home-like environment for approximately 780 older people at any one time, with a mean age of around 84 years. Sites were led by a care manager, with direct resident care provided mostly by care assistants supervised by professional nursing and allied health staff. All sites were represented by at least one CoP member with no more than 20 members at any one time for the duration of the study.

6.3.3 *Outcome Measures*

The impact of the falls prevention CoP on translating falls prevention evidence into practice was evaluated at three levels; RAC organisation level, RAC site level and its effect on staff who participated at membership level, as shown in Figure 6.1. This range of measured outcomes was used to inform theorised explanatory conjectured CMOs, which postulate how the outcomes were achieved considering the context in which they took place.

6.3.4 *Data Collection and Procedure*

CoP Member Level

An online survey questionnaire was administered to CoP members via an email link, using software by SurveyMonkey™, on entry into the CoP and following 24 months of CoP operation. Additional open response questions, modified from Ranmuthugala, Cunningham, et al. (2011), to determine experiences of CoP membership were included in the 24 months post CoP operation questionnaire (see Appendix I). CoP electronic communication transcripts including emails and face to face meeting minutes were used for triangulation.

The researcher kept a journal to record her observations and reflections regarding CoP member participation and operation. The observations contributed to descriptions and explanations of CoP web based communication, activity and impact (see Appendix J).

Findings were presented to the CoP members to establish respondent validation or 'member checking' (Creswell & Plano Clark, 2007; Thomas & Magilvy, 2011).

The establishment of a community through connections between its members and knowledge flow through the community was recorded by counting postings on the CoP intranet discussion web page and whom the posting was shared with, in addition to members' email frequency and attendance at face to face meetings. These CoP member interactions were recorded in a Microsoft Excel (2013) spreadsheet (Microsoft Corporation, Washington, USA).

RAC Site Level

Measurement of the impact of the CoP at site level prioritised improving the proportion of residents supplemented with vitamin D and development of falls prevention education for care staff and residents. These priority areas were determined in the early phase of CoP operation when the CoP conducted an audit of falls prevention activity as previously reported in Chapter 5 (Francis-Coad, Etherton-Ber, Bulsara, Nobre, & Hill, 2016b).

The proportion of residents at each site supplemented with vitamin D was calculated from medication charts. Electronic dispensing records from supplying pharmacists were sourced to verify the accuracy of medication chart audits.

Surveys of care staff (see Appendix K) and residents (see Appendix L) were planned to scope what they knew and thought about falls and falls prevention to inform subsequent education program design.

Care staff consenting to participate were surveyed using a self-administered questionnaire distributed in a paper format at site shift handovers, as computer access was limited. Explanation on completing the questionnaire was provided verbally and in written format by the shift registered nurse and the survey collection box was given prominence at the nurses' station. Completed questionnaires were collected after two weeks by the researcher.

Consenting residents who did not have a diagnosis of cognitive impairment were surveyed face to face by a trained research assistant who read them the questions and recorded their responses.

All site care managers were surveyed via email using a brief feedback questionnaire (see Appendix M) modified from Ranmuthugala, Cunningham, et al. (2011). This provided another perspective on CoP impact at RAC site level following 24 months of CoP operation.

RAC Organisation Level

Policy manuals, procedure documents (including forms) and stakeholder meeting minutes were scrutinised by site CoP members and professional staff at sites during the falls prevention activity audit that has been previously reported in Chapter 5 (Francis-Coad et al., 2016b). Semi-structured interviews were conducted with two managerial representatives from the organisation who had been involved with the CoP project using CoP evaluation questions modified from Ranmuthugala, Cunningham, et al. (2011). The interview procedure recommended by Liamputtong (2013) was followed; face to face contact was established, the researcher chatted with the participants ensuring their comfort and gave an explanation of the interview procedure and recording process. Participants were encouraged to speak freely and on completion these conversations were transcribed verbatim by the researcher and checked by a second researcher for accuracy. Transcripts were returned to participants for member checking.

6.3.5 Ethical Considerations

Ethical approvals for the study were obtained from the University of Notre Dame Australia human research ethics committee (Ref. no.s 013145F, 014179F [care staff survey] & 015033F [resident survey]) and the board of the RAC organisation. All CoP members, staff and residents provided written consent to participate.

6.3.6 Data Analysis

Member Level

CoP member pre and post questionnaire responses addressing capability, confidence, opportunity and motivation to champion falls prevention activity were extracted into SPSS version 22 software package (IBM SPSS Inc., Chicago IL, USA) and summarised using descriptive statistics. Differences pre CoP and 24 months post CoP operation were examined using a Wilcoxon signed rank test. A social network

analysis (SNA) was undertaken to examine the relationships, connections and flow of knowledge within the CoP. Data were organised in an excel matrix prior to entry into Ucinet 6 for Windows (Software for Social Network Analysis. Harvard, MA: Analytic Technologies). Exchanges between groups of members on the CoP discussion board provided frequency counts that were displayed in a matrix representing CoP member activity and connectivity. Qualitative data from CoP surveys, CoP face to face meeting minutes, researcher journal observations and emails were collected, transcribed verbatim and managed using NVivo analysis software (QSR International Pty Ltd. Version 10, 2012). Two independent researchers (JFC, AMH) read through all transcripts several times to become familiar with the data (Polit & Beck, 2013). Where open question responses provided further categorical data frequency counts were also undertaken. Transcripts were analysed using deductive content analysis, which uses previous knowledge around the research topic, when a theory is being tested (Elo & Kyngäs, 2008). Question led category matrices were constructed (Elo & Kyngäs, 2008) for member level responses based on the theoretical framework of what CoP activities or behaviours may have triggered the observed outcomes (Francis-Coad et al., 2015; Ranmuthugala, Cunningham, et al., 2011). It was theorised CoP outcomes would be influenced by CoP member actions and behaviours, therefore the principles of behaviour change were used as a design guideline (Colquhoun et al., 2014; Michie et al., 2011). Coding was framed around the behaviour change domains of capability, opportunity and motivation (Michie et al., 2011) to explain what worked or didn't work (CoP falls prevention actions, behaviours) for whom (CoP members, RAC sites, RAC organisation) and under what conditions (Ranmuthugala, Cunningham, et al., 2011; Williams et al., 2013). An example of coding using the COM-B model is provided (see Appendix N).

Site Level

Pre and post CoP audit measures for the proportion of residents per RAC site on vitamin D supplementation were described using proportion and percentage. Proportion differences pre and post intervention were examined using the non-parametric Wilcoxon signed rank test. Cross-sectional quantitative survey responses from care managers, care staff and resident surveys were entered into SPSS version 22 software package (IBM SPSS Inc., Chicago IL, USA) and summarised using descriptive statistics. Responses from care managers regarding their perceptions of CoP impact at

their sites were analysed using deductive content analysis and a COM-B categorisation matrix as described previously (Elo & Kyngäs, 2008).

Organisation Level

Content analysis of falls prevention related policy and process documents (electronic and paper) together with management meeting minutes at baseline and following 24 months of CoP operation was undertaken to identify newly implemented falls related documents or process reporting. Semi-structured interviews undertaken with two management representatives were transcribed verbatim and data were then analysed as described for CoP members.

After analyses for each level were completed, results from all three levels of measurement were examined to form conjectured CMOs.

6.4 Results

The impact of the falls prevention CoP at member, site and organisation level is summarised in Table 6.1.

Member Level Impact

A total of 22 staff participated as CoP members for varying durations throughout the study, with 18 completing surveys pre CoP and 24 months post CoP operation. The greatest benefit of CoP membership reported by participants was improved evidence-based falls prevention awareness and knowledge, Participating CoP member (P)11 *“I’ve a better scope of knowledge relating to falls, the awful consequences and the evidence too.”*

Table 6.1 Summary of CoP Impact at Member, Site and Organisation Level.

Impact at member level	Impact at site level	Impact at organisation level
Increased falls prevention knowledge	Annual evidenced-based falls prevention activity audit with intermittent spot checks	Falls policy (re-written and implemented)
Increased self-reported confidence and motivation	Increased proportion of residents supplemented with vitamin D at all sites	Standardised fall definition adopted

Impact at member level	Impact at site level	Impact at organisation level
to engage in falls prevention actions		
Increased connections and collaborations with multidisciplinary CoP members	Falls prevention CoP listed as agenda item at site staff meetings	New falls risk assessment tool placed in online assessment system
	Falls prevention committee formed	Aligned falls prevention management plan (developed and implemented)
	Falls prevention checklists for individual residents at highest risk of falling (“catch a falling star” program)	CoP newsletter (developed and implemented) four editions published
	Surveyed frontline care staff and residents to determine falls prevention education needs and preferences	Falls prevention CoP listed as agenda item at RAC Board Committee meetings
	Surveyed care managers to determine their perception of CoP impact at their site	
	Falls prevention poster checklist for staff and residents	
	Screening for safer resident footwear, clothing and lighting (night time sensor lights)	

CoP members (n = 18) identified falls prevention strategies they were aware of at baseline [125 correct responses, median number of correct responses = 6.00 (IQR = 3-15)] and 24 months post CoP operation [221 correct responses, median number of correct responses = 10.50 (IQR = 4-28)]. There was a significant difference between the pre and post scores with post survey scores showing increases in knowledge, $p < .001$. For example, there was increased knowledge regarding the need for a multifactorial

approach, P6 *“it has improved my personal knowledge of falls management (multifactorial approach),”* and single strategies targeting intrinsic risk factors like vitamin D deficiency and medication side effects, P8 *“I didn’t know the impact vitamin D and medications can have on falls until I joined the CoP. I bring this up for actioning when discussing with residents and staff.”*

When member survey responses regarding motivation and confidence to lead falls prevention activities were compared pre CoP and 24 months post CoP operation there were no significant differences (see Appendix O). However six members (33.3%) reported they felt motivated to undertake new falls prevention activities, such as attending external falls prevention events after joining the CoP, P3 *“I’ve registered for the local falls conference,”* and eight (44.4%) became new contributors to site falls prevention meetings, P9 *“I’m part of a regular falls meeting at my site now.”* New or improved social connections were enabled, P7 *“it was great to get to know more staff”* and the opportunity to network, ask questions and share ideas with multidisciplinary colleagues [n = 11, (61.1%)] was perceived as a membership benefit. This was reported as particularly relevant for members who were new to the RAC organisation or novice practitioners, P13 *“It was lovely to have a place where I could ask questions,”* P9 *“I feel I can contribute more to preventing falls and discussions about falls.”*

Eleven CoP members made a strong connection to the research team in the pursuit of evidence-based knowledge on falls prevention. Knowledge flow through the CoP and web-based connections amongst members was evident through frequency counts of discussion board participation and post sharing amongst CoP members (see Appendix P) and is represented visually in Figure 6.2.

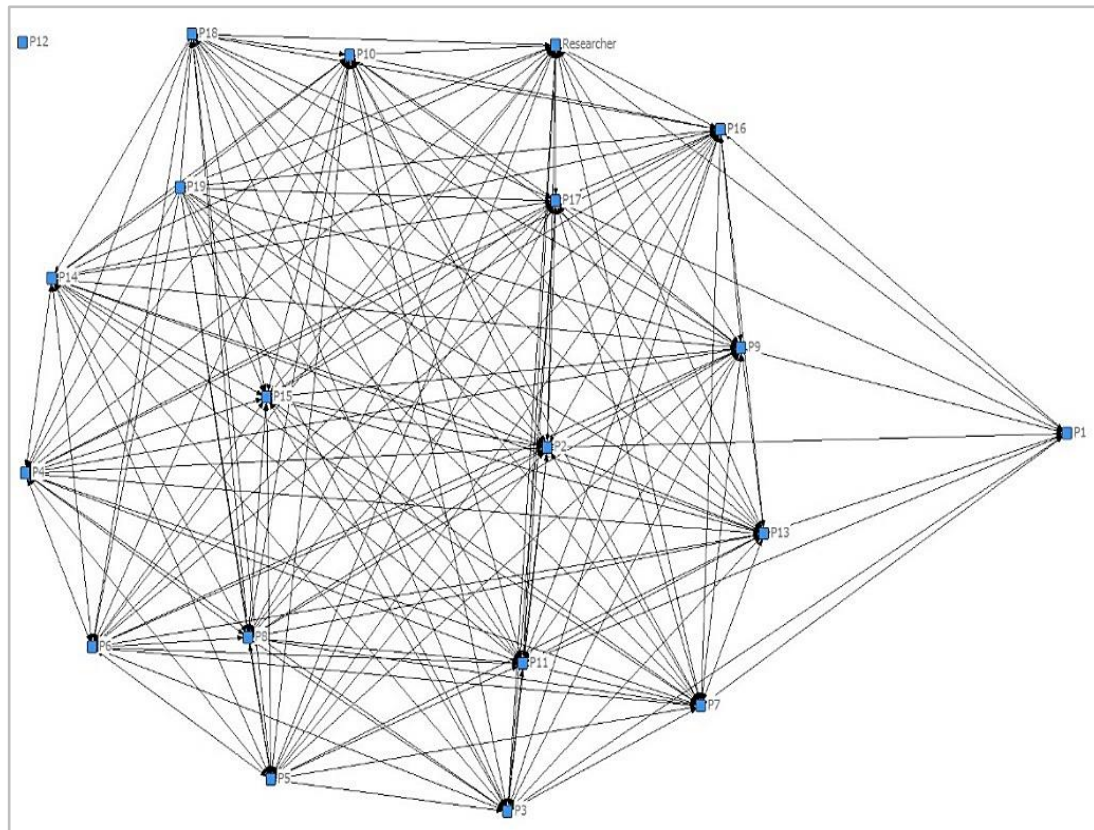


Figure 6.2 Participating CoP Member Connectivity and Knowledge Flow Amongst the Membership.

There were 11 different CoP web-based discussion topics supported by eight face to face meetings across the 24 months of CoP operation. Topics included falls prevention auditing (29 posts), promoting vitamin D supplementation (20 posts), “Ask the CoP?” (21 posts) and psychotropic medication use (11 posts).. The researcher and facilitator were the most connected across the entire membership providing a strong link between the research institution and RAC organisation. Six CoP members, who were therapists, became the most connected sharing more than eight postings and additional monthly email contact. Seventeen (94.4%) members shared falls prevention knowledge from the CoP with staff at their sites, P7 *“I gave feedback at staff meetings, clinical meetings and shift handovers”* and ten (55.6%) with residents at their sites, P8 *“we’ve discussed falls prevention in our new ‘Better Balance’ program.”*

The key barrier to member participation in the CoP was perceived to be lack of dedicated time due to competing interests [11, (61.1%)], P9 *“finding the time with so many other things to do,”* Manager 1 *“staff got no additional time to support involvement in the CoP, this was a barrier to getting things done.”*

Site Level Impact

The CoP was able to successfully lead and conduct a falls prevention activity audit at all 13 sites in the organisation as described previously in Chapter 5 (Francis-Coad et al., 2016b).

Significant improvements were made across 12 RAC sites in the proportion of residents supplemented with vitamin D from July 2014 (baseline CoP audit) to November 2015 (follow up audit of vitamin D supplementation) with the mean increase in the proportion of residents receiving supplementation of 28.23% [95% CI, (15.96-40.51), $p = .002$] presented in Figure 6.3. The transition care beds at two sites (one entire site and half the beds at another site) were not included in this data analysis as the resident populations were entirely different between baseline and follow up.

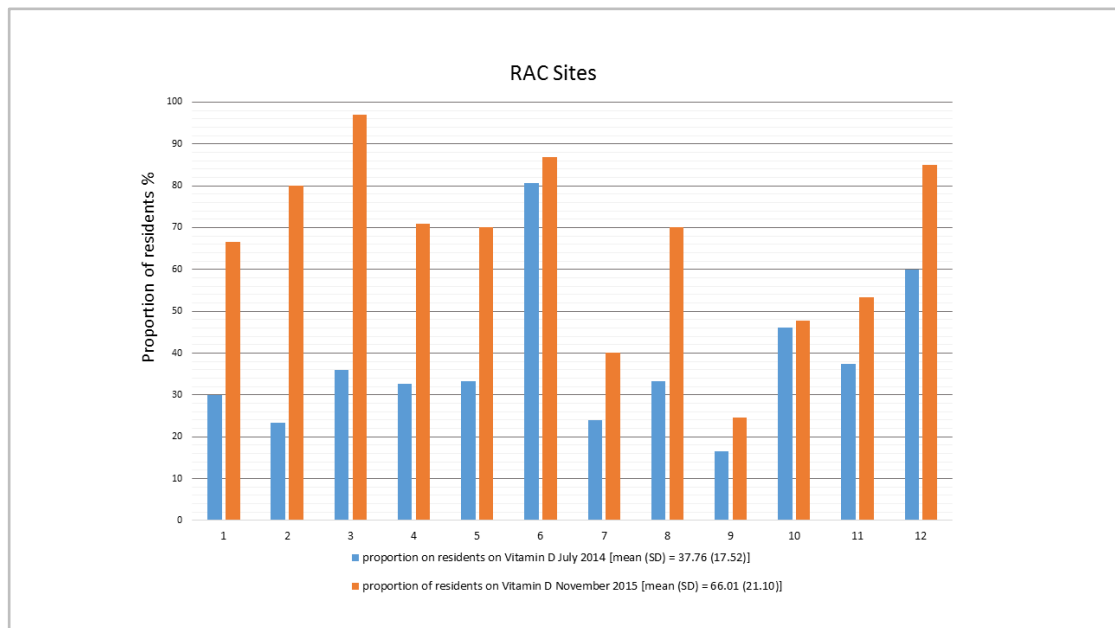


Figure 6.3 Proportion of Residents Supplemented with Vitamin D Measured in July 2014 and Re-Measured November 2015.

P8 “We have printed out all the articles on vitamin D and the nursing staff have put the articles in all our visiting doctors files and they discuss it with them so residents can be put on vitamin D.” The key barrier to supplementation was identified as lack of some doctor’s willingness to prescribe, P8 “Some doctors are very resistive to any suggestions, it’s like they think what do you know?”

The development of falls prevention education for care staff and residents was informed by surveys of both groups determining what they knew and thought about falls prevention.

The care staff survey was piloted at a single site (Hang, Francis-Coad, Burro, Nobre, & Hill, 2016) (see Appendix Q) prior to being administered at eight participating RAC sites. Briefly, 147 care staff participated (response rate 37.9%); the survey responses indicated that reminders about how to carry out falls prevention strategies by displaying posters around the site were the most popular education preference [n = 80 (54.4%)].

Forty residents who did not have a diagnosis of cognitive impairment (response rate 83.3% of all residents without a diagnosis of cognitive impairment) across six sites participated in the resident survey. Education preferences included having a reminder poster for their room, with pictures of appropriate falls prevention strategies [n = 11 (27.5%)]. These findings led to the development and implementation of a pictorial falls prevention poster checklist across all sites. One CoP member developed the ‘Catch a Falling Star’ program targeting residents assessed as at higher risk of falling and recurrent fallers using a personalised strategy checklist, P16 *“we have the falling stars program, our residents have personal checklists to remind staff of the strategies to use at all times.”*

Twenty two (78.6%) care staff (C) participating in the survey from this site discussed using the program when questioned about their knowledge of falls prevention strategies, C4 *“I check and report on the falling star plans every shift,”* C11 *“the falling star plan says to always make sure they (resident) have their call bell in reach.”* Following CoP information sharing this program was then implemented by two (15.4%) additional sites.

Falls prevention practices deemed to be effective at some sites were shared with others for adoption, these included monthly site “falls meetings” [n = 3, (23.1%)] and falls prevention becoming an agenda item at staff meetings [n = 7, (53.8%)], P3 *“we prioritised it, we discussed prevention together in team meetings to help them (staff) understand,”* P2 *“we helped staff realise how important it is by showing them the facts (displaying monthly falls rates)”* and screening resident footwear and clothing [n = 3,

(23.1%)], P16 “*we went through the cupboards checking all items that were unsafe so family could remove, if it’s not there staff can’t put it on.*”

Additional equipment, namely sensor lights for night-time toileting and bed or chair alarms, was introduced at two (23.1%) sites. Feedback provided by 12 (92.3%) care managers regarding CoP impact at their site was strongly perceived to be; improved staff falls prevention awareness and actions, through education and resources provided by the CoP members, Manager 9 “*it has given staff ideas on how to keep residents from falling, it’s a very precious tool (the CoP).*”

Barriers identified by CoP members to implementing fall prevention strategies included perceived lack of management support in realising the importance of prioritising falls prevention and member participation, P16 “*there were some care managers who didn’t provide the project with the same importance as mine,*” P17 “*at a site where the manager is not committed, sees it (CoP) as less relevant, then it’s hard to get any impact,*” Manager 1 “*if you’ve got care manager support then it’s (falls prevention) front and centre in peoples’ minds.*”

Organisation Level Impact

CoP auditing of relevant falls related policy and process documents and management meeting minutes identified gaps in governance for targeted attention, Manager 1 “*having a culture of wanting to improve is fundamental, acknowledge you are not perfect, have a willingness to change.*”

A standardised fall definition to assist in clarifying the reporting of falls was adopted, “an unexpected event in which a person comes to rest on the ground or lower level” (Lamb, Jørstad-Stein, Hauer, & Becker, 2005), P2 “*the wording is easier for everyone to understand in this one,*” P5 “*after discussing this and watching the simulation video (fall reporting) I realised that some incidences should have been counted as falls at our site.*”

The drafting and completion of a falls prevention policy, risk assessment tool and aligned management strategies by the CoP was an iterative extensive process over 11 months, which engaged CoP members with RAC management. This reflected a

cultural shift by both CoP members and RAC managers in their approach to falls from one of reactively managing falls to more proactive prevention, Manager 1 *“there were gaps and I knew we didn’t have a standardised way of addressing falls, now we do all that proactive preventative stuff.”* The CoP liaised with clinical and management groups across the organisation through face to face and email discussions regarding policy content and falls risks together with ICT personnel for adaptation into workable electronic formats, Manager 1 *“for me the major achievements of the CoP have been the policies and procedures, that was our gap and now I feel like we’re getting there.”*

Raising awareness and providing education regarding falls and falls prevention was also addressed via a CoP newsletter (see Appendix R) in electronic and paper formats four monthly across the organisation to all levels of management, clinical working groups and staff, Manager 2 *“it has had a positive impact, I’ve seen it at sites on coffee tables and noticeboards and heard staff talking about it.”* Ten (76.9%) care managers reported the CoP newsletter was distributed at their sites and 11(84.6%) thought it was a useful resource. The awareness of the problem of falls and importance of falls prevention raised by the CoP led to CoP reporting becoming an agenda item at the organisation’s care committees’ meetings, Manager 1 *“its (newsletter) included in reports to the organisation’s care committees so they’ve got it as a standing agenda item.”*

Barriers to the CoP translating evidence into practice from an organisational perspective were having conflicting priorities and realising that commitment was required to support dedicated staff time, Manager 2 *“there was a lack of focus (on falls prevention), we didn’t give it dedicated time, but there are so many things we are involved in.”*

Results from each of the three levels were iteratively examined using the framework of potential CMO configurations described in Table 3.1. This led to the development of conjectured CMOs shown in Table 6.2.

Table 6.2 Conjectured Context-Mechanism-Outcome Configurations – What Worked for Whom, How and Under What Conditions.

Member Level	
CCMO 1	Members who demonstrated higher levels of falls prevention knowledge and awareness (psychological capability) and felt strongly that they needed to action fall prevention strategies enough (reflective motivation), better engaged with other site staff to enable implementation of falls prevention strategies
CCMO 2	Members who participated more in CoP social learning opportunities and connected to experts, gained confidence and credibility and were motivated to make a greater contribution to falls prevention change at their site
CCMO 3	Membership of the CoP enabled new and more frequent multidisciplinary connections to develop, when time to participate was supported by site managers. These connections served as a resource for guidance and reduced professional isolation within the organisation.
RAC Site Level	
CCMO 4	Site visiting general practitioners (residents' family doctor) who related to RAC staff (particularly CoP members and nurse practitioners) as credible peers and advocated for the recommended evidence significantly improved their proportion of residents at their site who were supplemented with vitamin D
CCMO 5	Falls prevention strategies were best implemented and adopted by frontline staff when the required strategies were prompted in novel ways and staff were made accountable for enactment by care managers, by being required to document completion of strategies during their shift.
CCMO 6	Higher levels of care manager support, through realisation of the importance of the CoP to their site and subsequent prioritisation for staff to participate as CoP members and action falls prevention, enabled the implementation of evidence-based practices at sites
RAC Organisation Level	
CCMO 7	Organisational acknowledgment of gaps in governance and recognition of the consequences of not taking a more preventative approach (reflective motivation) regarding falls management changed the cultural focus towards pro-active management rather than reactive management of falls, following greater engagement with the CoP
CCMO 8	Failure to offer opportunity in terms of dedicated time commitment for CoP members to learn and engage in falls prevention activity above existing professional duties, limited implementation of falls prevention activities
CCMO 9	Receiving regular reports on the CoP's falls prevention actions created a stronger feedback loop from frontline care to general management and assisted in focussing dedicated and more timely attention on falls prevention

Note. CCMO = conjectured context mechanism outcome

The conjectured CMOs demonstrated how the variability observed in translating evidence into practice was influenced by the RAC context. For example, the level of site care manager support for CoP member participation and action (context), through realising the need to prioritise falls prevention activities (mechanism), influenced the success of translating evidence into practice (outcome).

6.5 Discussion

The falls prevention CoP made a positive impact at all three measured levels – member, site and organisation. CoP members perceived that they were able to translate research evidence about falls prevention strategies into practice in the context of their individual site and the broader RAC organisation.

6.5.1 Member Reflection and Realisation (CCMO 1 & 2)

Our study found that all CoP members benefited from membership by improving their knowledge of RAC falls prevention strategies through association with experts, but translating this knowledge into practice showed varied levels of success. Although possessing the relevant knowledge is a foundation step in the translation process identified by other studies (Glasziou et al., 2011; Tetroe et al., 2011), simply having more knowledge did not necessarily mean CoP members moved it into use at their sites as other factors were involved (Goodwin, Jones-Hughes, Thompson-Coon, Boddy, & Stein, 2011; Tetroe et al., 2011). Furthermore, translation appeared to be triggered by CoP members who fully understood the negative consequences of a resident fall, reflected and realised the importance of engaging their colleagues in actioning evidence-based falls prevention strategies at their site. Reflection and realising negative consequences are traits reported elsewhere as important in triggering health behaviour change (Colquhoun et al., 2014; Vestjens, Kempen, Crutzen, Kok, & Zijlstra, 2015). Our CoP, similar to that of Tolson, Irene, Booth, Kelly and James (2006), showed evidence of connecting, sharing information and problem solving together as a cohesive unit, which are fundamental elements of a functioning CoP in accordance with Wenger (1998).

6.5.2 *Opportunities, Connections and Credibility (CCMO 2 & 3)*

Membership of the falls prevention CoP enabled clinicians to gain confidence and credibility, through connections to experts and identify themselves as role models. This motivated members to then initiate and contribute to falls prevention change at their sites, particularly if they were new to the field of falls prevention. Social learning opportunity is a characteristic of CoPs whereby association of novice with expert in a field can lead to professional identity building through sharing and collaborating (Ranmuthugala, Cunningham, et al., 2011; Tolson et al., 2011). Higher levels of connectivity in social networks such as CoPs have been associated with a stronger sense of community and greater resource exchange amongst members (Ikioda, Kendall, Brooks, De Liddo, & Shum, 2013; Yousefi-Nooraie, Dobbins, Marin, Hanneman, & Lohfeld, 2015). Membership of the CoP enabled new and more frequent multidisciplinary connections to develop, which then served as a resource for guidance and reduced professional isolation within the organisation as identified by Ranmuthugala, Cunningham, et al. (2011).

6.5.3 *Relationships, Credibility and Advocating (CCMO 4)*

Improvement in the proportion of residents supplemented with vitamin D varied across the 12 participating sites, which could have been influenced by the enabling or disabling actions of the visiting family doctors as the main prescribers (of medications). It was perceived by CoP members that doctors who viewed RAC staff as credible peers, regarding providing falls prevention evidence, advocated for vitamin D supplementation, whereas those who didn't acted as a barrier. Other studies have found that doctor and nurse cooperation can influence the success of intervention implementation: A systematic review of interdisciplinary interventions in nursing home settings reported positive impacts on resident outcomes when the resident's doctor participated in the intervention (Nazir et al., 2013). Conversely Steinmo et al. (2016) also noted conflict between doctor and nurse was a key barrier to implementation success of a quality improvement program in a health care setting.

6.5.4 Sharing, Motivation and Reinforcement (CCMO 5)

More evidence-based falls prevention activities were implemented at RAC sites that had manager support and also when CoP members were motivated and provided meaningful resources. For example the ‘Catch a Falling Star’ program, supported by the site manager, was one CoP member’s motivational way of sharing falls prevention strategies that made sense to site staff and resulted in uptake of those strategies at the site. Motivational ways of sharing knowledge is recommended for enabling knowledge transfer (Steinmo et al., 2016; Tolson et al., 2011). Enactment of falls prevention strategies by frontline care staff was observed when site managers supported staff accountability, through requiring and reinforcing documentation of staff actions in resident notes. Reinforcement of desired health behaviours has been shown to assist in habit formation (Colquhoun et al., 2014; Michie et al., 2011).

6.5.5 Prioritising and Supporting (CCMO 6)

CoP members who were given the time to attend face to face CoP meetings and became involved in web-based discussion and collaboration were more successful at implementing falls prevention evidence and practice change at their site. This action was perceived by CoP members to be triggered when care manager’s realised that dedicated time was needed for CoP members to lead falls prevention change and were able to prioritise support for CoP participation. For example supported CoP members implemented additional multifactorial falls prevention strategies such as tailored resident falls prevention plans, footwear screening and regular falls prevention site committee meetings. Conversely, at sites where CoP members were not supported to participate in CoP meetings and discussions there was limited implementation of evidence-based practices. Limited dedicated time for staff to be involved is a frequent barrier reported in other health implementation studies (der Zijpp et al., 2016; Steinmo et al., 2016; Tolson et al., 2008).

6.5.6 Acknowledgment, Engagement and Cultural Change (CCMO 7)

The CoP, were able to identify gaps in the falls management policy and procedures. The CoP engaged management by providing information on the perceived costs and benefits of taking preventative action, to gain their support for a cultural

change towards fall reduction. Taking a more proactive cultural approach to reducing falls may lead to better outcomes for residents as RAC culture has been linked to quality outcomes for residents (Etherton-Beer, Venturato, & Horner, 2013; Tolson et al., 2008). Providing information on the costs and benefits of performing a behaviour is an established means of facilitating health behaviour change as described extensively in the field of health behaviour research (Connor & Norman, 2005; Michie et al., 2011). The further engagement of CoP members, who were clinical staff delivering resident care, in writing the new falls policy and procedures brought authenticity and relevancy to the resultant organisational documentation and actioned changes in this area. This tailoring of knowledge by the users has been identified as a step in successful translation (Bertone et al., 2013; Tetroe et al., 2011).

6.5.7 Opportunity and Engagement (CCMO 8)

At organisational level failure to consistently support opportunity, in terms of dedicated time commitment, for CoP members to learn and engage in falls prevention activity was perceived to limit implementation of falls prevention activities. Whilst CoP members were cognisant of the fact that the organisation had to manage a range of complex issues, they felt this still reflected a lack of realised importance of the need to learn and action falls prevention in the workplace and achieve even better outcomes. Limited time and resources has been identified in other studies as a barrier to work place learning and implementing new practices (O'Connell, Ostaszkiewicz, Sukkar, & Plymat, 2008; Tolson et al., 2008).

6.5.8 Feedback Loop and Focus (CCMO 9)

Regular CoP reporting to management group meetings within the RAC organisation regarding their falls prevention actions and outcomes, created a strong feedback loop from frontline care staff to organisational management. Recognition of higher levels of feedback for systems, teams or individuals is a factor linked with successful implementation (Bertone et al., 2013; Ivers et al., 2012) and use of evidence in practice (Glasziou et al., 2011). CoP reporting to the organisation's care committees assisted in focussing attention and subsequent support for falls prevention activity. Organisational support has been reported as a CoP enabling mechanism regarding implementation (Ranmuthugala, Cunningham, et al., 2011), whilst shifting

organisational priorities has been identified as a barrier to implementation by others (Sorensen et al., 2011; Tolson et al., 2008).

6.5.9 Limitations

In this study we have postulated possible mechanisms that triggered the observed outcomes under certain contextual conditions. Whilst findings from evaluating a single RAC organisation are not generalisable they provide valuable learnings for similar RAC organisations looking to translate falls evidence into practice. The size of the CoP may appear small ($n = 20$) but we feel it reflects the authentic number of staff that a RAC organisation of this size may assign to participate in a given project. Whilst elements of this study relied on self-report, we have supported validity and credibility of the findings by incorporating quantitative data where possible, triangulating findings using multiple data sources and maintaining an audit trail. Ideally interviews of care staff, site managers and representatives of the organisation's care committees would have provided further depth to our insights, however the pragmatics of such an undertaking were beyond the scope of this study. The intranet software was unable to track members accessing the CoP web site unless they posted comments on the electronic discussion board but future upgrades to the software should have the capacity to track access across all areas. Evaluation and explanation of the impact of operating a falls prevention CoP on falls outcomes will be described in Chapter 7.

6.6 Conclusion

A multidisciplinary falls prevention CoP was able to facilitate translation of falls prevention evidence into practice in the context of the RAC site and RAC organisation. CoP members who engaged in social learning gained knowledge but those who realised the importance of engaging their site colleagues in falls prevention activities, backed by management support, were most successful at facilitating evidence-based practice change. The progression from novice to expert practitioner in falls prevention was also observed most in CoP members who connected frequently amongst the diverse membership. The improvement in the proportion of residents supplemented with vitamin D varied across RAC sites was heavily influenced by credible relationships between prescribing Doctors and RAC CoP members. At organisation level the CoP engaged management in falls prevention through a variety of dissemination sources

creating a feed back loop between workplace practice and board level decision making. This resulted in a proactive falls prevention culture developing. Support by RAC management to provide the necessary investment in staff time to better enable change in falls prevention practice is essential for success. Future research should continue to test these conjectured mechanisms of action noting the contextual conditions that produce the desired or undesired outcomes. This may better inform how CoPs impact their membership and the translation of evidence into practice.

6.7 References

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Chapter 7:

Evaluating the Impact of Operating a Falls Prevention Community of Practice on Falls in a Residential Aged Care Setting

Preface

This chapter describes Phase 3 (Study 4) of the research that evaluated the impact of the CoP on falls and injurious falls. This research was undertaken in tandem with the evaluation of CoP impact in translating falls prevention evidence into practice as described in Study 3 (Chapter 6).

The chapter is based on a manuscript accepted for publication and was also presented at the 7th Biennial Australian and New Zealand Falls Prevention Conference 2016 (Melbourne, Australia) titled:

Francis-Coad J., Haines T., Etherton-Ber C., Nobre D., & Hill A-M. (in press).

Evaluating the impact of operating a falls prevention community of practice on falls in a residential aged care setting. *Journal of Clinical Gerontology and Geriatrics*

The author's version of the manuscript is presented with modifications to suit the style and format of this thesis.

7.1 Abstract

Background

A model with the capacity to bring organisational staff together in a manner that can facilitate changes at multiple levels is a CoP. The aim of this study was to investigate the impact of a falls prevention CoP, acting at multiple levels of a RAC organisation on falls rates and injurious falls (resulting in fracture) rates.

Methods

A prospective quasi-experimental pre/post design was undertaken. Thirteen RAC sites (779 beds) participated, with 20 multidisciplinary staff volunteering as CoP members.

Results

Falls rates pre CoP operation were 10.1/1000 occupied bed days (OBD) compared with 10.9 /1000 OBD post CoP operation [coefficient 0.7, 95% CI (-33.5, 34.9) $p = .967$]. This was confounded by an increased use of beds for short stay transition care services and identified differences in defining falls between sites. The rate of injurious falls resulting in fractures pre CoP was 0.2/1000 OBD compared with 0.1/1000 OBD post CoP; [coefficient -0.3, 95% CI (-1.1, 0.4) $p = .423$].

Conclusion

A falls prevention CoP delivering evidence-based interventions for 18 months was unable to reduce falls rates in that time frame but there was a trend to a reduction in falls resulting in fracture. Additional time for implementation and evaluation of falls prevention interventions will be required in complex settings such as RAC organisations. Valid comparisons of falls rates and injurious falls rates within the RAC population require the adoption of standardised definitions to improve reporting reliability.

7.2 Introduction

Falls are a leading adverse event in the RAC sector with reported rates ranging between 3-13 falls per 1000 occupied bed days (OBD) (Morley, Rolland, Tolson, & Vellas, 2012; Oliver et al., 2007; Rapp, Becker, Cameron, König, & Büchele, 2012). Highly prevalent disability (81.3%) and cognitive impairment (68%) (Onder et al., 2012) put this vulnerable population at high risk of falls with 50% of residents sustaining a fall within the first year of admission and 25-30% sustaining a physical injury (Burland, Martens, Brownell, Doupe, & Fuchs, 2013; Oliver et al., 2007). Australian national data demonstrate that approximately 27% of all hospital admissions for falls related injury for people aged 65 years and over were coded as being from RAC facilities (Bradley, 2013), even though older people living in RAC comprise only 6% of the total older population (Australian Institute of Health and Welfare, 2012).

The consequences of falls have a negative impact on the RAC sector at a number of levels: for the older person physical and psychological trauma can result in loss of independence and confidence that negatively impact their quality of life (Oliver et al., 2007), for RAC facilities the additional burden of care has to be accommodated (Becker & Rapp, 2010; Oliver et al., 2007) and at the health care systems level there is the financial burden with cost of a single fall in RAC conservatively estimated at \$1887 AUD (Haines et al., 2013).

A limited number of studies have addressed falls prevention in the RAC population with two meta analyses presenting different key findings; the first meta-analysis of five trials found that a single intervention of supplementing residents with low vitamin D levels reduced the rate of falls by 37%, 95% CI (0.46-0.86) but not the risk of falling. Authors also suggested that multifactorial interventions could be effective but that evidence was inconclusive (Cameron et al., 2012). The second more recent meta-analysis included trials where settings consisted of nursing homes with only care-dependent residents. Meta-analysis of four trials found that multifactorial interventions significantly reduced falls by 33% as well as reducing the number of recurrent fallers by 21%, 95% CI (0.65–0.97) (Vlaeyen et al., 2015).

National guidelines (Australian Commission on Safety and Quality in Healthcare, 2009; Panel on Prevention of Falls in Older Persons, American Geriatrics

Society & British Geriatric Society, 2011) and falls researchers recommend that RAC facilities implement multifactorial interventions, which should be translated into practice by a multidisciplinary team, to improve falls outcomes (Quigley et al., 2010; Vlaeyen et al., 2015). Additionally, findings from a critical literature review by Quigley et al. (2010) propose that the testing of future research models include falls and falls injury prevention interventions delivered at resident, unit (site) and organisation levels. A sub-group analysis of three studies conducted as part of the meta-analysis in the present research (described in Chapter 2) found that delivering falls prevention interventions at two or three levels supported by added resources, reduced falls rates. One model with the capacity to bring organisational staff together in a manner that can facilitate changes at multiple levels is a CoP (Francis-Coad, Etherton-Beer, Bulsara, Nobre, & Hill, 2015; Ranmuthugala, Cunningham, et al., 2011) this could enable multifactorial interventions are able to be successfully delivered by a RAC organisation. CoPs also have the capacity to be sustainable as they allow diversification of membership and expertise, thus enabling multifactorial problems to be addressed from a range of perspectives and solutions actioned (Ranmuthugala, Plumb, et al., 2011), especially where executing multi level changes is likely to take considerable time (Quigley et al., 2010; Vlaeyen et al., 2015). To our knowledge there are no studies examining the impact of a CoP on falls prevention outcomes across a RAC organisation. Our study aimed to investigate the impact of a falls prevention CoP, acting at multiple levels of a RAC organisation on falls rates and injurious falls (resulting in fracture) rates.

7.3 Methods

7.3.1 Study Design

A prospective quasi-experimental pre–post design was undertaken. This study represented the final phase of the present research (research methods described in Chapter 3) that aimed to evaluate the impact of a falls prevention CoP at membership, site and organisation levels (as described in Chapter 6).

7.3.2 Participants and Setting

A 779 bed RAC provider organisation with 13 geographically diverse RAC sites designated as providing general aged care and respite care participated. Two of

these sites provided transition care, which is a short stay service designed to facilitate the transition of an older person from the acute care (hospital) sector to community settings (Gray et al., 2012). Four sites also provided care for residents with complex disabilities, such as those with dementia exhibiting high levels of behavioural and psychological symptoms, Huntington's chorea and older residents with acquired brain injury. The RAC organisation employed approximately 1185 full and part time care staff.

7.3.3 Intervention

A falls prevention CoP was established, piloted and then operationalised across the RAC organisation as described in Chapter 4 (Francis-Coad, Etherton-Beer, Bulsara, Nobre, & Hill, 2016a). Members of the CoP (n = 20) who were drawn from the RAC staff represented all 13 sites. The CoP met face to face three to four times annually, interacted in 11 web-based discussion forums supported by frequent email contact, to lead falls prevention audits and intervention implementation at their RAC sites. Falls prevention activities prioritised by the CoP (Francis-Coad, Etherton-Beer, Bulsara, Nobre, & Hill, 2016b), which were all directed towards translating falls prevention evidence into practice, have been described in Chapter 6.

7.3.4 Outcome Measures

The outcome measures prospectively defined were resident rate of falls per 1000 occupied bed days, resident rate of injurious falls resulting in fracture per 1000 occupied bed days and the proportion of residents who fell one or more times during the study observation period. These outcomes are recommended for use by falls researchers (Cameron et al., 2012) in consensus with falls research guidelines (Lamb, Jørstad-Stein, Hauer, & Becker, 2005). Occupied bed days (calculated using the site census) represented the denominator and number of falls the numerator multiplied by 1000.

A fall was defined by the researchers as any event recorded in the electronic clinical incident system as a fall. All falls recorded in the electronic system during the study observation period were included in the falls outcome data set. The organisation had no pre-determined fall definition in their policy, but all sites followed a pre-determined organisation procedure that instructed them to report falls into the electronic system. There

was no organisation wide injurious fall classification. An injurious fall was defined as an event recorded in the electronic clinical incident system classified as resulting in a fracture. All injurious falls resulting in fractures were also recorded in a separate section of the clinical incident reporting system, as they all resulted in the resident being transferred to hospital. This allowed them to be reliably identified in the electronic system. A person who fell was defined as a resident who was recorded in the organisation's electronic clinical incident reporting system as sustaining one or more falls during the study observation period of three years. Electronic falls data records from each RAC site were combined at organisational level.

7.3.5 Procedure

The study periods for establishing and operating the CoP are shown in Table 7.1, each period lasted six months. The control period of the trial, period one and two, provided 12 months data prior to the CoP becoming operational (2014). During period three the CoP met via web-based discussions supported by face to face meetings to plan and conduct a falls prevention audit identifying gaps in practice as previously described in Chapter 5 (Francis-Coad et al., 2016b). In periods four, five and six the CoP developed and implemented falls prevention activities, as described previously in Chapter 6, where the CoP determined the timing and type of interventions that occurred (see Table 7.1).

Table 7.1 Periods of The Trial and The Establishment of The Falls Prevention Community of Practice.

Six monthly measurement periods	CoP activity at RAC site level	CoP activity at RAC organisational level
1 (Jan 2013 - Jun 2013)	Pre CoP establishment	Pre CoP establishment
2 (Jul 2013 – Dec 2013)		Establishment of the CoP. Testing feasibility of operating a CoP using ICT
3 (Jan 2014 - Jun 2014)	CoP preparation and conduction of falls prevention clinical audit across all sites.	CoP official launch and commencement of operation
4 (Jul 2014 – Dec 2014)	Differences in falls reporting across sites identified. Interventions planned as priority implementation (post audit)	Clarifying what constitutes a fall, definition implemented. New falls policy and risk assessment discussed with stakeholder groups. CoP educational newsletter implemented
5 (Jan 2015 - Jun 2015)	Vitamin D supplementation promoted, care staff and residents surveyed re falls prevention education needs	New falls prevention policy and risk assessment (with aligned management plan) iteratively drafted.
6 (Jul 2015 – Dec 2015)	Revised risk assessment (with aligned management plan) piloted. Staff and resident falls prevention poster checklist developed.	New injurious falls classification reporting implemented Aug 2015. New falls prevention policy made available online

7.3.6 Ethical Considerations

Ethical approval for the study was obtained from the University of Notre Dame Australia Human Research Ethics Committee (Ref. no. 013145F). The board of the RAC organisation also approved the study. All CoP members and staff provided written consent to participate.

7.3.7 Statistical Analysis

The demographic characteristics of the 13 sites and of the residents present at any site during one or more of the six periods of the study were summarised using

descriptive statistics. The proportion of residents who fell during the study was calculated by finding the percentage of residents who fell one or more times, out of the total number of residents present for one or more days at any site. The falls rates and fracture rates for each period of the study were calculated by dividing the number of falls or fractures during each period of the study by the number of occupied bed days for that period. Site rates of falls were also calculated using the same approach.

Mixed-effects, multilevel, linear regression using site as a random effect and pre versus post intervention periods as a fixed effect was used to compare the rates of falls between these periods. One summative data point for each outcome was considered for each site at each period time point in these analyses. A Gaussian distribution was employed for these analyses as the summative falls data of this nature reflected a normal distribution rather than the negative binomial distribution conventionally used in patient-level analyses. The pre-intervention period was considered to include periods one and two, while the post-intervention period included periods four, five and six. Period three falls data were not included in these analyses as they were treated as an ‘intervention wash-in’ effect period. All analyses were adjusted for the mean age of residents present at each site during each period and the proportion of residents present at each site during each period with cognitive impairment as fixed effects. Results were presented using coefficients and 95% confidence intervals with an alpha of $<.05$ considered significant.

We further explored a site-by-intervention interaction effect to examine possible treatment effect heterogeneity. The effect of the intervention at each site was examined individually by including a site (random) by intervention (fixed) interaction effect in the analyses. We then extracted the best linear unbiased predictor of this effect at each site and presented these with 90% confidence intervals given the reduced statistical power of interaction effects. All statistical analyses were completed using Stata 14 (Stata SES Texas).

7.3.8 Protocol Amendments

It was planned to adjust analyses for residents’ level of care as classified by the Australian Government aged care funding instrument care rating, however this adjustment was not completed. This measure did not remain stable during the periods of the study, as residents were re-classified more than once and within each resident care

rating multiple individual changes to some items meant that the overall classification changed during more than one period of the study. We did not pursue analyses investigating the impact of the intervention on the percentage of residents who had a fall during each time period. This was because of variation in the number of beds being allocated to transition or respite care over the follow-up. An increase in these beds accompanied by rapid turn-over of residents using them increases the denominator when examining the percentage of residents who fall, giving the appearance of a decrease in this outcome. So we instead focused analyses on the rate of falls per 1000 occupied beds days that was not affected by these changes in the same way.

7.4 Results

There were 3819 admissions during the research period of which 3015 were unique admissions and 804 were multiple admissions. The mean age of residents on admission across all sites was 80.8 years (*SD* 10.4). There were 1293 (42.9%) males and 1708 (56.7%) females (data were missing for 14 residents). The mean length of stay was 433.2 days (*SD* 850.5 days), while the median length of stay was 57 days (IQR 19-387). There were 2680 (70.1%) admissions where the older person was resident at a site for six months or less and 738 (19.3%) admissions where the older person was resident for longer than two years. The demographic characteristics of the residents by site and of the sites is presented in Table 7.2.

Table 7.2 Demographic Characteristics of the RAC Sites.

Site	Number of beds	Admission Type, <i>n</i> = 3819	Proportion of residents with cognitive impairment (%)	Mean Age (years)	LOS, days, median (range)
1	60	GAC 79 TC 548 RC 10	56.9	81.3	41 (1-5421)
2	33	GAC 50 RC 85	50.5	85.9	14 (1-3575)
3	30	GAC 50 RC 1	61.2	82.4	1124 (4-4429)
4	20	GAC 35 RC 2	58.3	86.9	957 (25-5430)

Site	Number of beds	Admission Type, n= 3819	Proportion of residents with cognitive impairment (%)	Mean Age (years)	LOS, days, median (range)
5	64	GAC 40 TC 1251 RC 54	58.7	81.8	41 (1-3318)
6	110	GAC 237 RC 165	62.6	81.8	132 (3-4199)
7	62	GAC 117 RC 69	59.6	74.6	207 (1-7176)
8	61	GAC 120 RC 10	72.6	74.8	579 (2-5869)
9	50	GAC 97	83.9	78.7	834 (14-5862)
10	30	GAC 51 RC 2	67.3	77.0	1109 (1-4392)
11	131	GAC 278 RC 92	66.7	82.0	360 (1-3768)
12	61	GAC 119 RC 71	81.4	74.8	162.5 (1-5645)
13	65	GAC 119 RC 67	98.9	75.7	335 (1-4439)

Notes. GAC = General aged care, TC = Transition care, RC = Respite care, LOS = Length of stay

There were 10763 falls and 137 fractures across all 13 sites during the three years (control and intervention periods) of the study. There were 1432 (47.5%) residents who fell during the study period. Of those, 476 (33.2%) sustained a single fall whilst 956 (66.8%) had more than one fall (range 2-193 falls). Two hundred and fourteen residents sustained two falls, 142 sustained three falls, 101 sustained four falls, 378 sustained between 5-18 falls and 121 residents sustained between 19-193 falls. Falls outcomes are presented in Table 7.3 and falls rates across all 13 sites over each period are presented in Figure 7.1.

Table 7.3 Falls Outcomes Pre and Post Operationalisation of the CoP.

Site	Periods Pre CoP - Post CoP	Falls, <i>n</i>=10763	Fractures <i>n</i>=137
1	1-3	188	2
	4-6	283	5
2	1-3	84	4
	4-6	122	4
3	1-3	120	1
	4-6	86	4
4	1-3	58	1
	4-6	63	1
5	1-3	476	12
	4-6	538	4
6	1-3	848	18
	4-6	577	5
7	1-3	184	1
	4-6	436	4
8	1-3	253	4
	4-6	287	2
9	1-3	184	5
	4-6	206	2
10	1-3	143	8
	4-6	139	1
11	1-3	1853	6
	4-6	1167	13
12	1-3	430	5
	4-6	526	5
13	1-3	734	11
	4-6	778	9

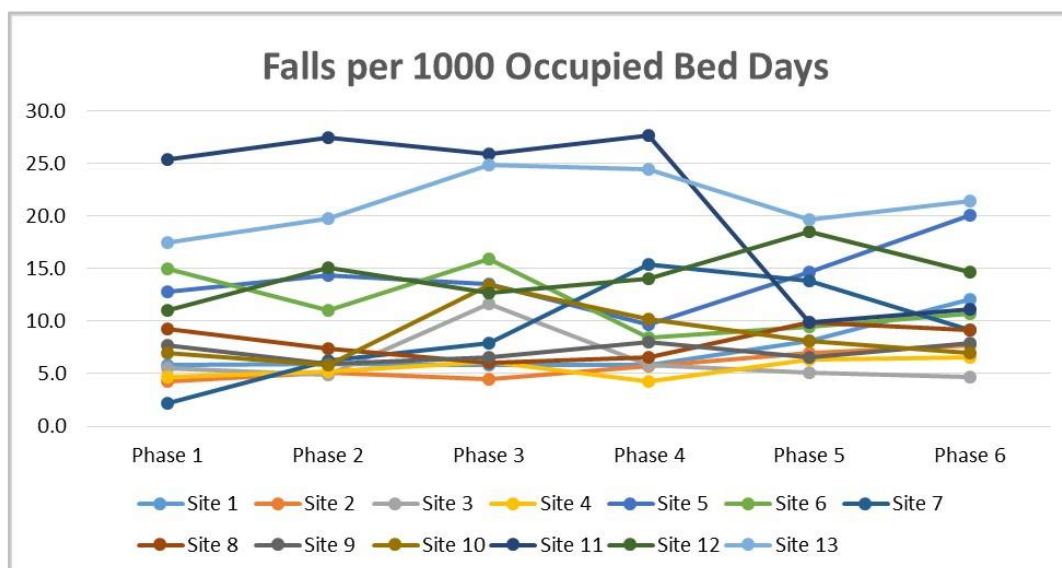


Figure 7.1 Falls Rates Measured Across Six Phases at All RAC Sites.

There was no significant difference in either rates of falls or fractures after the commencement of the CoP compared to the year prior to commencement, as shown in Table 7.4.

Table 7.4 Comparison of Falls Outcomes Pre and Post Operationalisation of the CoP.

Rate	Outcome	Coefficient, (95% CI), p value ^a
Falls rates, Pre CoP/post CoP, falls/1000 bed days ^b	10.1 / 10.9	0.7, (-33.4, 34.9), 0.967
Fracture rates, Pre CoP/ post CoP, falls/ 1000 bed days ^b	0.2 / 0.1	-0.3, (-1.1, 0.4), 0.423

^a all analyses adjusted for age and presence of cognitive impairment, ^b comparing periods one and two with periods four, five and six

The site level effect estimates demonstrated there were no significant differences in the falls rates across the different sites. The best linear unbiased predictors for each site are presented in Figure 7.2.

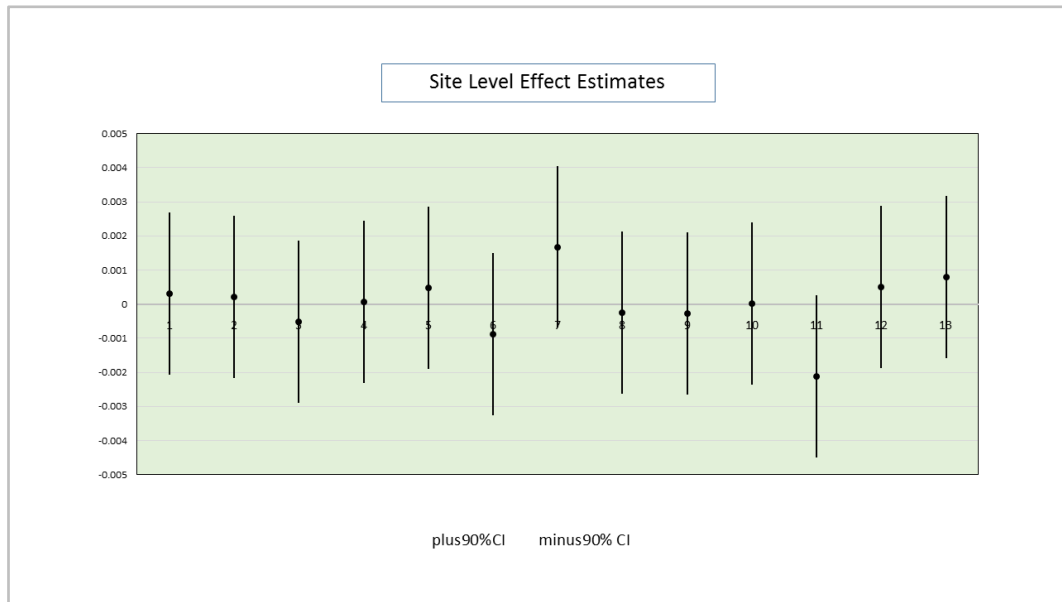


Figure 7.2 Best Linear Unbiased Predictors for Each RAC Site.

Visual inspection of these indicated the intervention may have been more effective at site 11, but this was not significant given the width of the 90% CIs.

The injurious falls data are presented in Table 7.5. For the first five periods of the study only falls that resulted in a fracture were required to be recorded as injurious, this meant 98% of falls were not classified as to whether they resulted in injury. At the commencement of study period six the organisation changed its reporting requirements so the 13 sites had to classify falls according to the level of injury sustained. During period six there were 27.98% of falls classified as causing injury.

Table 7.5 Classification of Injurious Falls Prior to and After Changes in Reporting Practice.

Classification	Periods 1-5, <i>n</i> (%)	Period 6, <i>n</i> (%)
Total falls (10,763)	9062	1701
Total fractures (137)	121(1.3%)	16 (0.9%)
Other injury	30 (0.3%)	not classified
Moderate injury	not classified	172 (10.1%)
Minor first aid	not classified	288 (16.9%)
No injury	24 (0.3%)	1206 (70.9%)
Not classified	8887 (98.1%)	19 (1.1%)

7.5 Discussion

The overall falls rate reported in our study was within the range of reported falls rates for RAC settings (Morley et al., 2012; Oliver et al., 2007; Rapp et al., 2012) however we did not demonstrate a significant difference in falls rates following the falls prevention CoP commencing operation. Like other studies delivering multifactorial interventions at multiple levels our falls rates trended upwards (Burland et al., 2013; Kerse, Butler, Robinson, & Todd, 2004). Our study showed rapid increases in the number of falls at sites one and five, this heterogeneity may be explained by the fact that these sites had converted to provide transition care services shortly after the research partnership commenced. Transition care services have a maximum stay of 12 weeks with an average stay of seven weeks (Gray et al., 2012) and hence these sites had considerably more admissions of older people not yet functionally recovered from acute care settings compared with than any other sites. Our study also showed a trend towards a reduction in injurious falls resulting in fracture as reported in a similar study by Becker et al. (2003), but as the overall number of fractures was small it is likely to have been similarly underpowered to show a significant difference. As the RAC organisation is now classifying four levels of injurious falls amalgamating them may provide larger sample sizes for future comparison.

We previously identified gaps in falls prevention policy, protocols and practice (previously reported in Chapter 5) for CoP attention (Francis-Coad et al., 2016b). However the pre-specified periods for CoP activity were found to be inadequate due to the unexpected need to extensively develop falls prevention policy and protocols prior to implementing interventions. A study reporting the potential of CoPs in nursing homes suggests allowing six months for implementation of an intervention but when development of an evidence-based protocol, such as falls prevention, is required a period of 18-36 months is necessary (Tolson et al., 2011), which we found was the case in our trial. A similar study in a RAC setting where RAC staff were participants in the process of implementing evidence-based interventions delivered the same finding that extra time was required (Nitz et al., 2012). This extensive time requirement limited the ability of the CoP to deliver more multifactorial interventions in the short term hence the true impact on falls outcomes is likely not fully evident and requires longer term follow up. Additionally, as CoP members (staff) had autonomy prioritising falls prevention

activity at their sites implementation impact was less uniform, as reported by a study similarly involving RAC staff in the research process (Nitz et al., 2012).

Falls reporting varied between RAC sites prior to the implementation of an organisation wide fall definition. Following implementation periods five and six showed the more uniform effect of standardised reporting on falls rates. A large proportion of falls were not classified as to whether they resulted in injury other than fracture until period six. Consistency in reporting falls is important (Lamb et al., 2005) particularly for RAC organisations choosing to make reliable site comparisons to learn from each other's practices.

7.5.1 Clinical Implications

As the RAC population continues to age and thus potentially acquire increased falls risk factors, a more realistic evaluation may be to focus on delivering a trend in fall reduction (Nitz et al., 2012) and injurious falls reduction, particularly fractures, as these are also more robustly measured, as suggested by other studies (Burland et al., 2013; Quigley et al., 2010).

Additional time for implementation and evaluation of falls prevention interventions will be required in complex settings such as RAC organisations. Sustainable models with flexibility are required to provide long term focus and follow up, as the constrained nature of the sector means that favourable outcomes delivered by external assistance, enabled through short term funding sources, is not able to be sustained (Capezuti, Taylor, Brown, Strothers, & Ouslander, 2007; Ray et al., 1997). We feel an operationalised CoP could offer this but more time investment is required so that falls outcomes can continue to be measured.

In the absence of a RAC industry wide adoption of a standardised fall definition and injury classification the accuracy of comparing injurious falls rates and injurious fall rates across the sector remains a challenge. Likewise the co-location of transition care services within RAC settings means that there is now another high risk sub-group of the population in this location, which could have different requirements for effective falls prevention.

7.5.2 *Strengths and Limitations*

This study used a quasi-experimental pre-post design to accommodate 13 RAC sites that were pre-existing populations all doing some falls prevention interventions prior to the trial commencing. It was problematic to use individual resident level data to ascertain the proportion of fallers, due to multiple admissions and discharges across the study period. Whilst this design does not have the rigour for generalisation provided by randomised controlled trials we, like Burland et al. (2013), felt this design provided a clear indication of intervention outcomes under “real world” conditions that are likely to be similar in other RAC settings.

We underestimated the requirement for longer term follow up on falls outcomes (falls rates and injurious falls rates). However it was difficult to plan for this prior to ascertaining the results of falls prevention site audits conducted following the commencement of the larger project (Francis-Coad et al., 2016b).

Changes in falls reporting during the trial is likely to have confounded fall rates as staff’s clinical understanding of what constitutes a fall is likely to have influenced what events were actually recorded as falls. However the adoption of standardising falls reporting and classification (Lamb et al., 2005) is likely to rectify this in the longer term.

7.6 Conclusion

A falls prevention CoP operating across 13 RAC sites was unable to reduce falls rates or injurious falls rates after 18 months of operation, although a reduction in the number of injurious falls resulting in fracture was observed. The unexpected task of developing a falls prevention policy and protocols extended the implementation period and limited the delivery of evidence-based falls prevention interventions during this time. Measuring the effects of complex interventions in RAC settings when policy and protocols need development requires a far greater time investment. Changes to falls prevention reporting coupled with changes in bed type to provide transition care services are likely to have confounded falls rates. In addition to this, RAC sites had autonomy for prioritising the implementation of falls prevention interventions, which may explain some of the observed heterogeneity. However the falls prevention CoP was established as a sustainable way of actioning and evaluating falls prevention activity and will continue to measure falls outcomes into the future.

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Chapter 8:

Synthesis and Conclusion

Chapter

8

Preface

This chapter summarises and synthesises the findings from the research conducted as part of this thesis. This research has added to existing evidence about how RAC organisations can address falls prevention. Strengths and limitations of the research are discussed and the thesis concludes with a number of recommendations for clinical practice and future research.

8.1 Overview of the Research

We recognised that preventing falls in a frail, co-morbid population cared for by a diversely skilled workforce was complex and therefore may require a complex intervention strategy delivered at multiple levels, as suggested by the other research, including systematic reviews in this area (Anderson, Issel, & McDaniel, 2002; Cameron et al., 2012; Craig et al., 2008; Quigley et al., 2010). The purpose of this research was to evaluate the impact of a falls prevention community of practice (CoP) on falls outcomes in a residential aged care (RAC) setting. The evaluation of the impact of the CoP was comprehensive as it measured changes at three levels: member, site and organisation. We partnered with a single not-for-profit RAC provider organisation, comprised of 13 geographically diverse sites in metropolitan Western Australia.

This research used a mixed methods design (Creswell & Plano Clark, 2007) framed by a realist approach to gain a better understanding of how CoP interventions were influenced by current conditions (contexts) in triggering (mechanisms) the observed outcomes (Pawson & Tilley, 1997). Data were gathered from diverse sources to triangulate the research methodology and findings. The journey of the CoP was mapped across three phases. Phase 1 described the development of the CoP, then evaluated its establishment and web-based operation across the 13 RAC sites using the organisation's intranet. In Phase 2 CoP members at each site conducted an evidence-based falls prevention audit and identified gaps in practice, determining areas for priority intervention with use of a feedback loop. Areas for prioritised intervention included; improving the proportion of residents supplemented with vitamin D, staff education and re-designing falls prevention policy and falls risk assessment at organisation level. The audit findings informed CoP activity in Phase 3. A comprehensive evaluation of the impact of CoP activity was subsequently undertaken at member, site and organisation levels which culminated in measuring falls rates and injurious falls rates.

8.2 Review of the Research Problem

Our systematic review and meta-analysis (Chapter 2) synthesised the best available evidence for the effectiveness of complex falls interventions delivered at multiple levels. We found that multifactorial falls prevention interventions delivered at resident, RAC site and RAC organisation levels were inconclusive in reducing falls

rates, which concurred with findings from other large systematic reviews (Cameron et al., 2012; Vlaeyen et al., 2015). Our sub-group analysis showed a significant reduction in falls rates after 8-12 months follow up when additional resources were provided to the RAC facilities to undertake the interventions (Chapter 2) (Becker et al., 2003; Dyer et al., 2004; Jensen, Lundin-Olsson, Nyberg, & Gustafson, 2002). This condition of additional resource support, in the context of multifactorial falls prevention intervention success, has also been noted by Kerse (2010). However in today's constrained RAC environment, organisations cannot rely on the provision of additional resources (Belardi, 2014; Colón-Emeric et al., 2016; Lea et al., 2015). Therefore, as suggested by other researchers, potential solutions need to be designed involving RAC staff (Lindeman et al., 2003; Nitz et al., 2012) and using existing resources in innovative ways (Kerse, 2010). Our research sought to address this problem by harnessing existing resources to develop a sustainable model that could target the translation of falls prevention evidence into practice holistically and at an organisational level. This was realised by establishing and operating a CoP.

8.3 Synthesis of the Research Findings

8.3.1 Phase 1: Establishing a CoP - Development, Operation and Evaluation

Phase 1 of the research commenced in collaboration with the RAC partner organisation to establish a "Falls Prevention CoP". Our selection of a CoP model concurred with other pioneers in the healthcare sector seeking to bring together expertise, problem solvers and activists for learning and achieving goals (Barnett et al., 2014; Grealish, Bail, & Ranse, 2010; Ranmuthugala, Cunningham, et al., 2011; Tolson, Irene, Booth, Kelly, & James, 2006).

Aim: Study 1

- The aims of this study (Chapter 4) were: to describe the development and evaluate the establishment of a web-based CoP to lead falls prevention activity in a RAC organisation; to explore CoP members' capability, confidence, opportunity and motivation to participate in web-based activity using the organisation's intranet and to identify barriers and facilitators for sustainable web-based CoP member participation.

It was possible to successfully establish a falls prevention CoP in a RAC setting by collaborating closely with our RAC partner organisation. From a research perspective, we also developed and utilised an evaluation matrix. This allowed us to benchmark the CoP development process against determinants of success identified in the literature, ensuring the structure of the CoP was congruent with its theoretical underpinnings (Ranmuthugala, Cunningham, et al., 2011).

CoP members reported high levels of perceived capability, opportunity and motivation to participate in web-based falls prevention activity. However amongst our membership cohort (n = 20), of whom 13 (65%) members were aged between 40-59 years of age, low levels of confidence using ICT applications such as a blog were identified. This gap in multidisciplinary RAC staff (CoP members) capabilities to engage with ICT applications in the workplace was similar to that identified in a national survey of nurses (Eley, Fallon, Soar, Buikstra, & Hegney, 2008), suggesting web-based RAC staff training is required to enable frequent web-based interaction.

Findings from the operational trial also showed that frequency of engagement in web-based activity by CoP members was low. Evaluation of web-based CoP operation identified members had lower capabilities using ICT applications than expected and limited opportunity for web-based participation. We identified barriers and facilitators to web-based participation providing new insights into operating a web-based CoP in a RAC setting. These included limited opportunity, in terms of time for CoP members to engage in web-based activity due to competing demands from other clinical tasks and challenges building rapport with members from other RAC sites whom they saw infrequently. Other studies have also reported findings that having technology that was easy to use in a time supportive environment was paramount to the successful operation of a web-based CoP (Barnett, Jones, Bennett, Iverson, & Bonney, 2012; Dubé, Bourhis, & Jacob, 2006). Although we developed the CoP to predominantly function as web-based, we planned some face-to-face meetings to build rapport as recommended by other health CoP researchers (Li et al., 2009; Ranmuthugala, Cunningham, et al., 2011). In health care it could be that meeting face to face for clinical staff is still an important means of interaction to drive practice change, even though some health related groups operate CoPs in a virtual capacity only (Barnett et al., 2014; Ikioda, Kendall, Brooks, De Liddo, & Shum, 2013).

In summary a CoP in RAC settings that operates predominantly web-based could be facilitated if members are given web-based training as other studies have recommended (Dubé, Bourhis, & Jacob, 2003; Eley et al., 2008; Hanssen, Norheim, & Hanson, 2016), and RAC management support dedicated time for web-based participation. This may enable CoP members to interact frequently enough to effectively drive practice change and deliver beneficial healthcare outcomes.

8.3.2 Phase 2: Audit, Feedback and Action Planning by a Falls Prevention CoP

Phase 2 involved the CoP scoping falls prevention activity across all 13 sites of the RAC organisation using an evidence-based audit (National Ageing Research Institute, 2009) and feedback process. Audit and feedback has been established as an effective way of measuring clinical quality and safety in areas such as falls prevention (Gould et al., 2014; Ivers et al., 2012; Moore et al., 2011). Previous studies in healthcare settings have reported use of the CoP model as enabling workplace staff to address clinical problems, but little was known about their ability to audit and influence practice change.

Aim: Study 2

- The aims of this study (Chapter 5) were to evaluate if a CoP could conduct a falls prevention activity clinical audit, to determine if a CoP could identify gaps in falls prevention practice and to identify barriers to the adoption of CoP planned falls prevention activities and facilitated actions.

We found that the CoP was able to effectively conduct a falls prevention activity audit at all 13 RAC sites (100% response rate) and identify gaps in practice. Meeting the criteria for effective clinical auditing was achievable by a CoP as members were able to plan activity, share procedural knowledge, discuss findings from a local perspective and action falls prevention practice change. The CoP reported the audit tool was user friendly, enabling full completion with ease by RAC site staff. The use of a validated audit tool that was evidence-based (National Ageing Research Institute, 2009) assisted the CoP in prioritising falls prevention activity to undertake in the next phase of their operation. For example, it was noted that only two (15.4%) sites reported a documented fall definition when research recommends organisations gathering falls data

use a standardised fall definition (Lamb, Jørstad-Stein, Hauer, & Becker, 2005; Nitz et al., 2012). The mean proportion of residents supplemented with vitamin D was found to be 41.5% (*SD* 23.7%), when research suggests around 89% of the RAC population are either deficient or have low levels of vitamin D (Waldron, Hill, & Barker, 2012) and supplementing residents is a recommendation based on Level 1 evidence (Cameron et al., 2012; Waldron et al., 2012).

Additionally the structure of the CoP connected managers with RAC site staff, meaning that audit findings and subsequent actions were informative for the RAC organisation at site and management level in planning improvements. We found that gaps in falls prevention practice highlighted that falls prevention evidence required more consistent translation across the RAC organisation. These findings were supported by other studies in this area that have found that health care organisations may have difficulty in implementing and sustaining evidence-based strategies (Craig et al., 2008; Glasziou, Ogrinc, & Goodman, 2011) including in RAC (Berta et al., 2010; Kennedy et al., 2012).

In summary we believe conducting a clinical audit was a novel use of a CoP. By leading the audit and feedback process themselves the CoP members became more aware of the gaps in evidence-based falls prevention practice (Berk, Callaly, & Hyland, 2003; Gould et al., 2014). Combining this process with action planning, created a powerful feedback loop that potentially contributed to CoP members driving practice change in falls prevention (Berk et al., 2003; Jones, Sloan, Evans, & Williams, 2015).

8.3.3 Phase 3: Evaluation of the CoP in Translating Falls Prevention Evidence into Practice and Effect of Falls Outcomes

There was limited empirical data on the impact of CoPs in the healthcare setting (Li et al., 2009; Ranmuthugala, Plumb, et al., 2011) to support or reject their pursuit. Using the audit findings from Study 2 the CoP then prioritised actions within their local and organisational context and initiated and led the implementation of evidence-based falls prevention interventions at multiple levels. The complexity of the CoP, as an intervention in its own right, required a comprehensive method of evaluation. This was enabled by using a realist approach (Pawson & Tilley, 1997; Schierhout et al., 2013), which considered the context in which the observed intervention outcomes were

triggered. We therefore employed a range of outcome measures to evaluate how the CoP (intervention) in the context of the 13 RAC sites triggered the desired outcomes (falls prevention).

Aim: Study 3

- The aim of this study (Chapter 6) was to evaluate the impact of a falls prevention CoP on its membership, its actions at site level and its actions at organisation level in translating falls prevention evidence into practice.

Our findings showed the CoP had a positive impact at all three levels. We have provided new empirical information regarding how a CoP worked in the context of falls prevention in a RAC setting. For example, our CoP demonstrated web-based operational capacity. Our social network analysis validated that overall CoP members gained web-based connections to multidisciplinary peers at the other participating sites and 11 CoP members made a strong connection to the research team in the pursuit of falls prevention knowledge. CoP members were significantly more knowledgeable about evidence-based falls prevention strategies after 24 months of CoP participation compared to baseline. There was a significant improvement in the proportion of residents supplemented with vitamin D [mean increase = 28.23%, 95% CI (15.96%, 40.51%)] across the 12 participating sites (excluding transition care beds). A falls prevention policy and more comprehensive risk assessment tool with aligned management plans were also initiatives of the CoP, which were subsequently developed and implemented across the organisation. Management support, in terms of enabling time to participate in CoP activities and prioritising falls prevention action at sites, were key mechanisms in achieving successful implementation outcomes.

We believe we are the first to use a realist approach to evaluating the delivery of falls prevention interventions in a RAC setting (Chapter 3) and were able to identify mechanisms that may have triggered the outcomes we observed under certain contextual conditions. Variation is highly likely amongst RAC site resources, management, staffing and resident populations (Cameron et al., 2012; Quigley et al., 2010; Vlaeyen et al., 2015), thus the same interventions delivered at the 13 RAC sites could lead to different outcomes (Chapter 6). For example, the implementation and adoption of residents' tailored fall prevention strategies (outcome) was enabled for frontline care staff when

they were prompted in a novel way (mechanism) i.e. the ‘catch a falling star program’ (Poster checklist of tailored resident strategies in residents room) and the documentation of enacting falls prevention strategies with the resident was made accountable by the care manager (context). At RAC sites where there was limited care manager support (context) due to a lack of realisation and prioritisation (mechanism) regarding falls prevention, the CoP member was not enabled to fully participate in the CoP and lead practice change. This resulted in fewer falls prevention interventions being implemented and adopted (outcome) at that site. However successfully implementing falls prevention strategies occurred towards the end of the study at sites with care manager support, but this late implementation did not result in a significant reduction in falls rates or injurious falls rates. Our use of the realist approach provided new understandings of how the contextual conditions of the RAC site triggered the observed outcomes in falls prevention. The flexibility of being able to prioritise the interventions required at the RAC site and to deliver them with tailored intensities is important in a demanding environment of complex care where time and resources are very limited (Craig et al., 2008; Kennedy et al., 2012).

We were able to demonstrate that web-based operation can overcome geographic barriers and travel constraints enabling more frequent interaction amongst multidisciplinary RAC staff at different sites. Our study is the first to undertake a social network analysis showing the strength of interdisciplinary connections and flow of knowledge amongst a falls prevention CoP membership in a RAC setting (Chapter 6). This is important as professional staff in RAC settings are often isolated from the traditional support structures for peer learning and professional development (Grealish et al., 2010; Lea et al., 2015) available in other healthcare environments such as hospitals. Providing access to expertise with the opportunity to question and collaborate, as afforded by membership of a CoP, staff may be attracted and retained within RAC settings.

The CoP took considerable time to translate falls prevention evidence into practice as multiple levels within the RAC organisation required addressing. Facilitating the translation of evidence into practice requires change at the organisational level (Berta et al., 2010; Kennedy et al., 2012). Writing organisational falls prevention policy and re-designing falls risk assessment and management processes were CoP actions that

expedited subsequent practice change at the RAC sites. However leading audits and surveys, then disseminating information to staff at their sites, in tandem with their usual clinical duties limited the pace of the translation of CoP actions into practice change. Thus longer term commitment is required to address falls prevention change at multiple levels as noted by other studies (Quigley et al., 2010; Vlaeyen et al., 2015).

In summary our results demonstrated benefits from operating a falls prevention CoP at all levels. Multidisciplinary RAC staff perceived that they benefitted from participating in a falls prevention CoP and that the CoP was able to translate falls prevention evidence into practice in the context of their individual site and the RAC organisation.

8.3.4 Phase 3: Evaluation of the Impact of Operating a Falls Prevention CoP on Falls in a Residential Aged Care Setting

For 12 months prior to CoP establishment and during the operational phases of the CoP (two years) we simultaneously measured falls outcomes at six monthly periods. The final phase of the research was to evaluate if the CoP's translation of falls prevention evidence into practice impacted on falls rates and injurious falls rates to benefit residents.

Aim: Study 4

- The aim of this final study (Chapter 7) was to investigate the impact of a falls prevention CoP, acting at multiple levels of a RAC organisation on falls rates and injurious falls (resulting in fracture) rates.

Falls rates and injurious falls rates at 18 months after the CoP began delivering falls prevention interventions were not significantly different to the baseline period. Injurious falls, as measured by fracture rates, trended downwards and falls trended upwards at some sites. We postulated that actions by the CoP regarding defining falls and re-classifying injurious falls possibly raised awareness, leading to more robust falls reporting across the organisation. We also found the extensive time requirement for falls prevention policy and protocol development limited the ability of the CoP to deliver more multifactorial interventions in the short term. Hence the impact of the CoP on falls outcomes in the longer term is likely not fully evident and requires longer term follow up. Other studies that delivered falls prevention interventions in RAC settings without

extra resources also found increases in falls rates (Burland, Martens, Brownell, Doupe, & Fuchs, 2013; Kerse, Butler, Robinson, & Todd, 2004; McMurdo, Millar, & Daly, 2000). One explanation postulated was that in trying to accommodate delivering falls prevention interventions alongside usual duties, a lower level of intervention intensity resulted. This, combined with a raised awareness of falls prompting better reporting, may have contributed to the finding.

There was variation in the change in falls rates across the RAC sites as evidenced by the best linear unbiased predictors (Figure 7.2). This may be partly attributed to RAC population heterogeneity, with some of our RAC sites providing care for older people with multiple falls risk factors and the most complex of care needs making falls prevention intervention at the resident level more challenging. In addition to this, two sites commenced admitting a sub acute resident population, older people requiring transition care services following hospitalisation, during the study.

The cohort of residents at each RAC site also continues to age. Thus the effects of ageing and disease processes advance, probably leading to increased frailty and risk factors for falls, some of which are not modifiable. This makes the goal of reducing falls rates increasingly challenging, as reported by Nitz et al. (2012).

Our evidence-based falls prevention audit also identified several falls prevention interventions that some RAC sites were already undertaking. These included regular medication reviews, exercise programmes including strength and balance exercises and vision reviews by an optometrist. At sites already undertaking recommended multifactorial falls prevention interventions greater gains get progressively more challenging to show.

Whilst viewed as a positive change led by the CoP, the need to embed the new classification of injurious falls into policy meant implementation only took place in the final data collection period.

Individuals who were multiple fallers can confound falls data. In our study (Chapter 7) 378 residents sustained between 5-18 falls and one resident at one RAC site fell 193 times. In a similar study by Nitz et al. (2012) 42 falls were incurred by a single faller. Thus it is important for RAC organisations evaluating the implementation of falls prevention interventions to be aware of potential confounding when interpreting their

falls data. Judgements about intervention effect or comparison with other RAC site populations may be difficult for RAC site care managers without research experience, hence connections to research experts via a CoP could be beneficial, particularly when resource allocation is involved.

In summary establishing a falls prevention CoP did not reduce falls rates from baseline to 18 months after delivering falls prevention interventions, but there was a trend to a reduction in falls resulting in fracture. In complex settings such as RAC organisations additional time for implementation and evaluation of falls prevention interventions will be required. The adoption of standardised definitions to improve reporting reliability could allow for more valid comparisons of falls rates and injurious falls rates between different studies and within the RAC population.

This research was to our knowledge first to use a CoP to target falls prevention in a RAC setting and first to use a realist approach to evaluation of a falls prevention CoP in a RAC setting. Possible explanations for the differences in observed findings, in the context of 13 RAC sites, may inform how the translation of evidence into practice can be improved to benefit residents.

8.4 Strengths of the Research Findings

Health service research is increasingly utilising both quantitative and qualitative methods in research designs seeking answers to complex problems (Craig et al., 2008; Onwuegbuzie & Leech, 2005), such as preventing falls in older people. Our selection of a mixed methods design with a realist approach to evaluation enabled integration of complementary methodologies and delivered many advantages in that it validated the findings of varying methodologies via triangulation; developed a more extensive analysis, provided richer detail; and initiated new lines of thinking through attention to the unexpected as well as expected (Onwuegbuzie & Leech, 2005; Rossman & Wilson, 1985). Pursuing how our intervention worked using the realist questions of what worked, for whom? how? and under what conditions? provided deeper insights into explaining the outcome variations observed.

We strengthened our research findings by utilising multiple measurement sources along the research continuum as evidenced by evaluation matrices, an evidence-based audit, mixed surveys and a social network analysis. This assisted in determining

the capability of the CoP to translate evidence into practice. There has been very little use of measurement in evaluating CoPs with the many investigations being anecdotal rather than empirical (Barnett et al., 2012; Li et al., 2009; Ranmuthugala, Plumb, et al., 2011). This thesis is a first in providing empirical findings on the impact of a falls prevention CoP at membership, site and organisation levels in a RAC setting and thus makes a valuable contribution to the body of literature on health related CoPs (Chapter 6).

We observed that our CoP was able to initiate a cultural shift in the approach to falls, from one of reaction (post-fall management) to that of pro-action (fall prevention), through policy and practice change. However, our CoP membership noted that in Australia funding was being driven by the consequences of falls rather than preventing them and they felt this made it difficult for RAC organisations to foster a proactive culture. Other RAC falls researchers (Burland et al., 2013; Nitz et al., 2012; Oliver & Masud, 2004) have reported that there is a need for emphasis on alternative endpoints for analysis other than outcomes that achieve statistical significance to drive a proactive culture (Oliver & Masud, 2004). For example, implementation and adoption of comprehensive falls risk assessment post fall and environmental safety modifications could be endpoints for demonstrating a safety culture. Directives to improve residents' functional mobility, such as tailored exercises and restraint minimisation that may lead to improved health and quality of life outcomes for both residents and staff (Burland et al., 2013; Oliver & Masud, 2004; Rask et al., 2007) have also been suggested. However we need to be mindful to measure evidence-based endpoints in relation to falls prevention, such as the proportion of residents supplemented with vitamin D and reduction in the prescription of culprit psychotropic medications (Cameron et al, 2012, Oliver & Masud, 2004). Recognition through financial reward by Government RAC funding bodies for the provision of evidence for proactive practices to reduce falls could foster this culture.

Even though it was timely for the CoP to take falls prevention action, we felt that partnering with a RAC organisation to deliver falls prevention interventions at multiple levels was an effective way to bring about sustainable change. Previous researchers have emphasised that quality improvement in health organisations is difficult to undertake and is most effectively achieved by combining the skills of both

managers and clinicians (Greenfield, Nugus, Travaglia, & Braithwaite, 2011). We found a CoP was a successful model for bringing together managers and multidisciplinary staff enabling falls prevention to be addressed at resident, site and organisation levels.

8.5 Limitations and Challenges of the Research

The CoP was an intervention at organisation level and its structure and function would have been compromised if divided. Hence, the quasi-experimental pre/post design meant that blinding and prospective allocation to groups did not occur. Additionally, we were required to accommodate 13 RAC sites with pre-existing populations, who were all undertaking some level of falls prevention activity. As we were unable to undertake a RCT, which is recognised as providing the strongest level of evidence (Level 1) and necessary for establishing cause and effect, we cannot rule out that factors other than the CoP may have influenced our findings. However, our design was strengthened by the mixed method data collection from a number of sources, the multiple data measurement points and the involvement of RAC staff as CoP members. We considered outcomes from our design reflected the ‘real world’ conditions of RAC settings as reported by Burland et al. (2013).

A limitation of our research was underestimating the timeframe required for establishing the CoP as an intervention at organisational level and measuring the outcomes of CoP activity beyond translating evidence into practice i.e. the subsequent effect of the practice change on falls rates and injurious falls rates. Our CoP undertook a series of prioritised actions, including targeting supplementation of vitamin D, which is a recommendation with Level 1 evidence and were able to make improvements that were significant. The CoP was not able to concurrently action other strategies to completion, such as implementing staff and resident education resources and exercise programs (balance and strength) for better functioning residents. However these are actions that the CoP are continuing to undertake. The extent of the practice gap identified following the audit could not have been pre-determined, but planning contingency for the ‘worst case scenario’ should be considered in complex settings with complex interventions. Our CoP felt that sustained organisational change, such as use of a robust falls risk assessment with aligned management process was important. This took time to establish in the organisation’s electronic software but is now available for use. We concur with other researchers (Craig et al., 2008; Nitz et al., 2012; Tolson, Lowndes,

Booth, Schofield, & Wales, 2011) in recommending planning for longer term follow up to ascertain if complex interventions, such as a CoP, could reduce falls rates and injurious falls rates. Our CoP continues to be informed by falls rates measured at the organisation.

Analysis of falls data presented challenges. Our measurement of injurious falls was represented by those resulting in fracture. The smaller number of fractures are likely to have underpowered our finding as reported by Becker et al. (2003). However more robust reporting of injurious falls that include soft tissue and head injuries may enable meta-analysis from future studies to be sufficiently powered to show an effect. Investigating the impact of the CoP on the percentage of residents who had a fall during each time period was not analysed in this study. This was because there was variation in the number of beds allocated to transition or respite care over the follow-up. An increase in these beds, accompanied by the rapid turnover of residents using them, increases the denominator when examining the percentage of residents who fall. This would have given the appearance of a decrease in this outcome. It is known that falls data are underreported in hospital systems when only using incident reporting systems, which infers that the falls rates reported may not reflect the total falls (Hill et al., 2010). However we also reported injurious falls resulting in fractures, which can be reliably measured by the requirement of hospitalisation for confirmatory x-rays. Falls reporting is also required to be robust, however we identified some variation at RAC site level that may be attributed to a standardised fall definition not being in use.

A moderate limitation of this research was the conversion of beds at two participating RAC sites (1 and 5) to provide transition care services after the commencement of the research partnership. In our research observation period, over 45% of the recorded admissions were to transition care beds. Very little is known about falls in this older population but our study showed rapid increases in the number of falls at both transition care sites. As transition care provides short stay services and admitted older people immediately post hospital discharge, the setting had considerably more admissions of older people from acute care not yet functionally recovered (Gray et al., 2012). It is known that older people are at increased risk of falls and hip fracture after hospital discharge (Hill et al., 2011; Mahoney et al., 2000; Wolinsky et al., 2009). An Australian study found that among episodes of hospital re-admissions from transition care services,

orthopaedic conditions incurred the highest costs, with many of these for elective procedures and others resulting from falls (Comans, Peel, Cameron, Gray, & Scuffham, 2015). This population was considered at very high risk of falling, compared with the other sites. Falls data from this population should be recorded separately to enable independent analysis as two of our RAC sites provided combined data from transition care and general RAC populations which was not our choice. This has important implications for service providers in that different approaches to falls prevention may be required for older people in transitional care services.

Finally this thesis reported on the impact of one CoP in a single RAC organisation where the contextual conditions may not be entirely universal, therefore careful interpretation of the findings are required.

8.6 Recommendations of the Research

8.6.1 Implications for Practice

As RAC staff turnover and the emergence of new evidence perpetuate the need for ongoing learning, ways to achieve this in the workplace are required. We envisage models such as CoPs could provide the internal learning forums that other researchers have suggested may benefit the RAC sector (Grealish et al., 2010; Tolson et al., 2006; Tolson et al., 2011). This may assist in delivering the upskilling and professional development required to both enable facilitate better resident outcomes and retain and attract staff to the sector (Grealish et al., 2010; O'Connell, Ostaszkiwicz, Sukkar, & Plymat, 2008; Robinson, 2010).

Combining the skills of multidisciplinary care staff and managers has been reported as an effective way of improving care quality and safety in healthcare organisations (Braithwaite, Runciman, & Merry, 2009; Greenfield et al., 2011) but enabling these disciplines to meet is challenging. Our use of a web-based CoP connected multidisciplinary RAC clinical staff and managers across an organisation. We recommend web-based operation of a CoP to enable increased interdisciplinary connections and frequency of interaction to drive practice change within an organisation.

Delivery of evidence-based practice in a sustainable way is a current requirement and we, like Ranmuthugala, Plumb, et al. (2011), recommend that a CoP

can add value to an organisation by determining how resources are used to deliver improved falls prevention practice. Our CoP was able to make an impact at member, site and organisation levels. This resulted in a range of benefits from learning more about evidence-based falls prevention, auditing, action planning, policy writing and implementing interventions to evaluating outcomes. The organisation now has a model in place, which can lead and sustain its falls prevention efforts in the longer term.

A CoP is an effective model to engage staff in the clinical audit process. Clinical audits can raise staff awareness of gaps in practice and motivate staff to plan and action change (Ivers et al., 2012) as recommended in best practice guidelines (Australian Commission on Safety and Quality in Healthcare, 2009). Similar RAC organisations may also benefit from undertaking this audit and feedback process combined with action planning by involving their own staff in facilitating practice change. We recommend the use of a workplace group of multidisciplinary staff with access to quality evidence, such as a CoP.

Falls reporting is widely documented as challenging (Lamb et al., 2005; Oliver & Masud, 2004) across older populations, particularly when fall definitions vary and the clinical interpretation of a fall in varying contexts is open to subjective judgement. Providing standardised fall definitions and workplace opportunities for staff to discuss how falls should be interpreted and reported should form part of falls prevention education.

8.6.2 Implications for Research

The CoP based its activities on the best available evidence for falls prevention in RAC settings (Australian Commission on Safety and Quality in Healthcare, 2009; Cameron et al., 2012; Vlaeyen et al., 2015) but there is still a considerable degree of uncertainty about what works best. More research is required to establish exactly what combination of interventions is ideal to deliver to this population. In addition to this, further research is required to investigate how falls can be reduced in RAC settings where transition care is provided as a component of the service delivery.

Although the RCT is considered the gold standard design it may not always provide answers that explain intervention success or failure in different contexts, thus further post-hoc process evaluations are required. Realist evaluations may be a promising

alternative to the RCT in complex healthcare settings but are still evolving as a methodology of choice (Greenhalgh et al., 2009; Hewitt, Sims, & Harris, 2012; Pawson & Tilley, 1997). Therefore more studies need to test this approach to confirm its merits or refine its pitfalls. This methodology may then offer a robust alternative to the RCT, which is not always feasible in complex settings such as RAC. We encourage other researchers to test our conjectured mechanisms noting the contextual conditions that produce the desired or undesired outcomes. This is required to verify if there are beneficial outcomes for members, site and organisation in other RAC settings and to better inform how CoPs translate falls prevention evidence into practice in RAC organisations.

Our CoP connected ‘evidence makers’ (researchers) with ‘end-users’ (RAC staff) demonstrating its potential for translating evidence into practice. Access to researchers with falls expertise was identified as a facilitator for CoP falls prevention action. Thus we support the recommendation that research institutions should permanently align themselves with RAC organisations and take a more active role in the translation of evidence into practice (Lea et al., 2015; Verbeek, Zwakhalen, Schols, & Hamers, 2013).

The high cost of falls sustained in RAC to the health care system is well documented (Church, Goodall, Norman, & Haas, 2011; Haines et al., 2013; Heinrich, Rapp, Rissmann, Becker, & König, 2010; Watson, Clapperton, & Mitchell, 2011) but there is limited information on the cost and subsequent benefits of falls prevention interventions (Church et al., 2011), particularly those of a multifactorial nature delivered by models such as a CoP. Although a CoP established for student nurse education in a RAC setting has been reported as a relatively low cost intervention (Grealish et al., 2010), CoPs with different purposes are likely to entail varying costs. Whilst undertaking a cost-benefit analysis was beyond the scope of this research, future research endeavours investigating falls prevention CoPs should consider an economic perspective.

8.7 Conclusion

A multidisciplinary falls prevention CoP delivered benefits for its membership and was able to facilitate translation of falls prevention evidence into practice, in the context of a RAC site and RAC organisation. This was enabled when management supported an active CoP member, connected to research evidence operating in a

proactive falls prevention culture. The translation of evidence into practice was not uniform and we were unable to show a reduction in falls rates within the research time frame. However, there was a trend to a reduction in falls resulting in fracture. Since delivering falls prevention interventions in RAC settings is complex, it is important that the evaluation of their impact includes determining what worked, for whom, how and under what conditions.

The problem of falls in RAC settings will need continued focus as the population ages and resources for the sector remain constrained. Solutions therefore will need to be sustainable and possibly derived from within the existing operational capacity of RAC organisations themselves. A CoP could form part of such a solution.

8.8 References

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Appendix A:

Co-Author Signed Consent Forms

Paola Chivers

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by Jacqueline Francis-Coad and accept the declaration made by the author.



Name of co-author: Dr Paola Chivers

Signature of co-author:

Date: 12/08/2016

Deborah Nobre

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author: Deborah Nobre

Signature of co-author:



Date: 11/08/2016

Nicole Blackburn

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author: Nicole Blackburn

Signature of co-author: 


Date: 15/8/16

Chiara Naseri

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author: CHIARA NASERI

Signature of co-author: 


Date: 16.8.16

Anne-Marie Hill

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author: Anne-Marie Hill

Signature of co-author: 

Date: 15/8/16

Terry Haines

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author:

Prof Terry P Haines

Signature of co-author:



Date: 7th September 2016

Christopher Etherton-Beer

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by
Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author: C D Etherton-Beer

Signature of co-author: 


Date: 11 Aug 2016

Caroline Bulsara

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by
Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author: Caroline Elizabeth Bulsara

Signature of co-author: 

Date: 11th August, 2016

Jo-Aine Hang

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author: Jo-Aine Hang

Signature of co-author:



Date: 22/8/2016

Elissa Burton

Re: published articles and articles under review in thesis

I consent to the inclusion of papers I co-authored in this thesis submitted by Jacqueline Francis-Coad and accept the declaration made by the author.

Name of co-author: ELISSA BURTON

Signature of co-author:



Date: 8 September 2016

Appendix B:

Published Manuscript
*(JBI Database of Systematic Reviews
 and Implementation Reports)*
Contributing to Chapter 2

Title

The Effect of Complex Falls Prevention Interventions on Falls in Residential Aged Care Settings: A Systematic Review Protocol

Background

Falls in the residential aged care [RAC] sector are a major concern worldwide with rates reported to range between 3-13 falls per 1000 bed days.¹⁻⁴ The estimated incidence of injurious falls in Australian aged care facilities in 2009-10 was 8,352 per 100,000 population; this is six times higher than the age-standardized rate of falls for older people living in their own home.⁵ For the older person, falling can result in loss of independence and confidence, physical injury such as fracture, reduced quality of life and in some cases mortality.^{2, 3, 6} Consequentially there are additional resident care and rehabilitation requirements for RAC staff and RAC organizations to manage^{7, 8} together with an increased economic burden for the health care system.^{9, 10}

The cause of most falls is complex involving combinations of risk factors presenting at the time of the fall event.^{1, 11} Older people residing in aged care facilities are recognized as a high falls risk population due to the frequent presence of many of these risk factors, including activities of daily living (ADL) disability, cognitive and visual impairments, multiple medications and reduced strength and balance.^{1, 11, 12} A European study of 57 long term care homes with over 4000 residents observed cognitive impairment in 68% of residents and ADL disability in 81.3%,¹³ suggesting that older people in residential care are particularly vulnerable when it comes to falls and often lack the capability to prevent falling without prompting or assistance. Falls prevention is challenging as it involves a number of interacting components making both intervention and evaluation complex.^{14, 15} Researchers have trialed a range of different intervention approaches in addressing falls among this older population from single strategies implemented by individuals to multifactorial approaches delivered by a multidisciplinary staff.^{11, 16, 17} Two recent meta analyses examining falls prevention programs in RAC populations showed different findings; the Cochrane review¹¹ concluded that supplementing residents with low vitamin D levels reduced the rate of falls by 37% (95% CI 0.46-0.86) but not an individual's risk of falling whilst Vlaeyen et al¹⁸ reported that fall prevention interventions decreased the number of people with recurrent falls by 21% (95% CI 0.65-0.97). However these reviews focused on individual or multifactorial approaches at the clinical level and inclusion criteria differed; the former included some mixed population studies¹¹ whilst the latter included only nursing home populations and randomized or cluster randomized controlled designs.¹⁸ Randomized designs are a challenge in this RAC population for several reasons. High levels of cognitive impairment make consent an issue, thus in RAC settings approximately 49% of residents are recruited and by 12 months 16% are lost, largely due to mortality. Adherence to interventions can also vary considerably, for example, 11- 93% for multifactorial interventions and by 12 months only a third of those in residential care were likely to be still adhering to interventions.¹⁹ This suggests that results from RCTs in RAC populations must also be interpreted with caution; therefore other designs that are flexible and inclusive may also provide useful evidence.^{2, 19}

Implementing falls prevention evidence based practice into a RAC setting predominantly requires staff to master the content of such a program and apply it to the care of the residents.¹⁴ Whilst the capacity to deliver system wide approaches to address complex issues, such as effective falls prevention, is strongly influenced by an organization's managerial direction and culture, which in turn must support change.^{20, 21} This requires connections between managers, staff and researchers to deliver effective policy through interdisciplinary problem solving, discussion and staff behavioral change.²²⁻²⁴ Consequently some researchers have suggested that organizations need to make changes at multiple levels using a systematic approach to enable evidence to be translated into practice.^{14, 20, 25, 26, 27} Interventions that are delivered across multiple levels have been characterized as complex because a number of groups and organizational levels are being targeted.¹⁴ For falls prevention interventions delivered in RAC settings these levels can be categorized as: resident, RAC facility and RAC organization and if at least two or all of these levels are targeted then the intervention can be considered complex. Resident level describes intervention delivery involving resident participation, such as the resident undertaking an exercise program or having a medication review. Facility level delivery describes interventions that target RAC staff, such as giving staff falls prevention education or undertaking safety maintenance on patient equipment. Organization level describes interventions involving RAC management participation in bringing about practice change such as revising professional staff roles and reviewing policy around falls prevention. A limited number of studies have evaluated complex multi-level interventions that included elements that addressed aspects of organizational change including staff training, reassignment of staff roles and adoption of best practice at a facility level.^{8, 28, 29} Such studies include; a participatory action research design that trained a falls resource nurse to lead the implementation of evidence based strategies resulting in a reduction in the proportion of fallers in RAC facilities²⁸ whilst a falls management program targeting cultural change and quality improvement had no effect on falls.²⁹ Another study, led by a falls coordinator, used tailored falls risk management delivering best practice interventions found that falls rates increased in similar RAC settings.⁸ These variations in results hence lead to uncertainty about the effectiveness of such approaches.

A preliminary search of the The Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library, latest issue), The JBI Database of Systematic Reviews and Implementation Reports (JBISRI), MEDLINE and CINAHL found no existing systematic reviews on this topic. PROSPERO lists an ongoing systematic review of studies that identify factors that may complicate or facilitate falls prevention implementation at program level in RAC facilities³⁰ rather than comparison of the effect of complex multi-level organization wide interventions. To our knowledge there are no recent systematic reviews either published or underway that synthesize the evidence for effectiveness of complex interventions to falls prevention for the RAC population. The absence of synthesized best available evidence for multi level organization wide approaches to falls prevention in the RAC setting justifies this current review. Given that clinicians and falls researchers are now undertaking and evaluating these complex multi-level interventions there is a need to know how effective they are at reducing falls outcomes.

Review objective

The objective of this review is to synthesize the best available evidence for the effectiveness of complex falls prevention interventions, implemented at two or more of the following levels: organization, facility or resident, on falls in the residential aged care population.

Review question

What is the effect of complex falls prevention interventions on falls in RAC settings?

Keywords

Falls prevention; residential aged care; implementation; intervention; organization approach

Inclusion criteria

Types of participants

This review will consider all studies that include people aged 65 years of age or older. Studies that describe people who are less than 65 years of age will be included if the mean age of the group is over 65 years. Studies will be considered for inclusion if they were conducted in long-term care settings where older people are provided with 24-hour supervision and/or care assistance.

Studies will be excluded if they are conducted in a setting that was community-based, assisted living in retirement communities, retirement homes, continuing care retirement centers, a palliative care facility, transition care or in a hospital. It has been found by other falls researchers that the participant characteristics and the environment differ between these settings and hence require different falls prevention interventions.¹¹

Types of intervention(s)/phenomena of interest

This review will consider studies that evaluate complex falls prevention interventions which are delivered across at least 2 or all of the following levels: residents, RAC facility and RAC organization. Interventions may include multiple or multifactorial falls prevention interventions delivered by single discipline or multidisciplinary staff teams, collaborative teams, clinical networks or communities of practice. For example residents may receive vitamin D supplementation and hip protectors, the facility may provide falls prevention education for staff and the organisation may revise its professional staff roles to lead falls prevention change.

Comparators

Comparisons of intervention complexity by delivery level i.e. whether the interventions were delivered at resident, facility and/or organization levels will be included. This review will consider studies that offer no comparison, a passive comparison (such as no treatment, standard care), or an active comparison (such as variation of the intervention).

Types of outcomes

Studies will only be included in this review if an outcome measure related to falls prevalence is used. The outcome measures must be measured before and after the investigated intervention. Outcome measures related to falls prevalence may include the rate of falls (expressed as the number of falls per 1000 occupied bed days), the number of participants who became fallers (expressed as the number of participants who fell) and the rates of injurious falls (expressed as the number of falls with injury per 1000 occupied bed days).

Studies that measure falls as secondary outcome measure will be included if they provide data where the falls rate can be calculated.

Types of studies

This review will include any experimental study design that incorporates randomized controlled trials, controlled clinical trials and experimental studies where randomization has been used. In the absence of these methods, comparative studies without randomization, cohort and case control studies and quasi-experimental studies with a pre post design will be considered for inclusion. Studies will only be included if they use repeated measures and compare an intervention against standard treatment, no treatment or another intervention.

Search strategy

This review aims to find both published and unpublished studies, written in English from January 1 1990 to May 31 2016. The phenomena of interest, which is the incidence of falls in RAC settings, began to be addressed in published studies from around 1990. Falls prevention strategies which involve concepts to engage healthcare organizations and employees in improving outcomes were also conceived after 1990, hence the selection of the search date parameter.³¹ A three-step search strategy will be used when undertaking this review. An initial limited search of MEDLINE (Pubmed) and CINAHL Plus with full text (EBSCO) using initial key words will be undertaken with the aim of identifying all possible key words from the text words contained in the title and abstract of the retrieved literature. A second extensive search using all key words identified and terms will then be carried out across all included databases. Thirdly, the reference list of all identified literature will be searched for additional studies not previously identified during the first or second search strategy.

The databases to be searched include The Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library, latest issue), JBISRI, MEDLINE, CINAHL, EMBASE, AMED and Psych INFO. The search for unpublished studies will include an electronic search of trials registers; Current Controlled Trials (<http://www.controlled-trials.com>), the National Institute of Health Clinical Database (<http://clinicaltrials.gov>), Universal Index of Doctoral Dissertations in Progress, Mednar, Grey Literature Report and Google. All studies identified during the database search will be retrieved and examined to ensure relevance and that they meet the inclusion criteria using the title, abstract and description/MESH heading by two independent reviewers. If the two independent reviewers disagree on whether a study should be included, a third independent reviewer will be consulted until a consensus has been reached.

Assessment of methodological quality

Papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardized critical appraisal instruments from the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MASARI) (Appendix I). Data will be extracted and quality assessed by one reviewer and checked by a second reviewer with discrepancies resolved by discussion and arbitration with another reviewer if necessary. The process of including studies will be illustrated in a PRISMA flow chart.³²

Data extraction

Quantitative data will be extracted from the retrieved papers by two independent reviewers using the standardized data extraction tools from the JBI-MASARI (Appendices I & II). The data extracted will include details about the interventions, populations, study methods and outcomes of significance to the review objective.

Data synthesis

Quantitative data will, where possible, be pooled in statistical meta-analysis using Rev-Man.³³ All results will be subject to double data entry. Statistical analysis will be carried out for primary outcomes wherever possible using the inverse variance method. All studies will be analyzed in terms of primary outcomes where data are available regardless of their settings or combinations of intervention. Pooled risk ratios (RR) with 95% confidence intervals (CI) will be calculated using a random effect model as the authors may be uncertain of the

homogeneity of RAC populations and setting of studies. Rate ratios will be pooled comparing: (i) rate of falls; (ii) the number of residents who became fallers; (iii) rate of injurious falls. Heterogeneity will be assessed statistically using the standard Chi-square. Where statistical pooling is not possible the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate.

Conflicts of interest

None to be declared.

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APPENDIX I JBI Critical Appraisal Checklist

JBI Critical Appraisal Checklist for Randomised Control / Pseudo-randomised Trial

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Was the assignment to treatment groups truly random?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were participants blinded to treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Was allocation to treatment groups concealed from the allocator?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were those assessing outcomes blind to the treatment allocation?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Were the control and treatment groups comparable at entry?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were groups treated identically other than for the named interventions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in the same way for all groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

JBI Critical Appraisal Checklist for Comparable Cohort/ Case Control

Reviewer Date

Author Year Record Number

	Yes	No	Unclear	Not Applicable
1. Is sample representative of patients in the population as a whole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the patients at a similar point in the course of their condition/illness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has bias been minimised in relation to selection of cases and of controls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Are confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info.

Comments (Including reason for exclusion)

APPENDIX II JBI Data Extraction Tool

**JBI Data Extraction Form for
Experimental / Observational Studies**

Reviewer Date

Author Year

Journal Record Number

Study Method

RCT Quasi-RCT Longitudinal

Retrospective Observational Other

Participants

Setting _____

Population _____

Sample size

Group A _____ Group B _____

Interventions

Intervention A _____

Intervention B _____

Authors Conclusions:

Reviewers Conclusions:

JBI Data Extraction Tool (continued)

Study results

Dichotomous data

Outcome	Intervention () number / total number	Intervention () number / total number

Continuous data

Outcome	Intervention () number / total number	Intervention () number / total number

Appendix C:

Search Strategy Used to Conduct the Systematic Review

Appendix

C

	Search Key	Results
	MEDLINE (1990 to May 2016)	
1	Accidental fall*.mp	18153
2	Fall* prevention.mp	2256
3	Faller*.mp	1485
4	1 OR 2 OR 3	18951
5	programme*.mp	151502
6	program*.mp	761294
7	Intervention*.mp	414530
8	Quality improvement.mp	28176
9	Best practice.mp	8125
10	Multifactorial.mp	30124
11	Collaborative*.mp	40732
12	Community of practice.mp	2396
13	Communities of practice.mp	383
14	Organization and management.mp	22631
15	5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14	1201781
16	Nursing home*.mp	38853
17	Residential aged care.mp	609
18	Residential facility*.mp	5414
19	Residential facility.mp	288
20	Residential home.mp	266
21	Skilled nursing facilities.mp	4213
22	Long term care.mp	31857
23	Home* for the aged.mp	12672
24	16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23	75566
25	4 AND 15 AND 24	423
26	Limit 25 to (humans and English language and yr = "1990-current")	361

Search Key	Results	
CINAHL (1990 to May 2016)		
1	“Accidental fall*”	14908
2	(MH “Accidental falls/PC”)	6718
3	(MH “Accidental falls/EV”)	121
4	“Falling”	4834
5	“Faller*”	697
6	Fall* prevention	7145
7	1 OR 2 OR 3 OR 4 OR 5 OR 6	18271
8	“programme*”	39646
9	“program*”	313797
10	“Intervention*”	235454
11	“Quality improvement”	37111
12	“Best practice”	5233
13	“Multifactorial”	3916
14	“Collaborative”	17091
15	“Community of practice”	820
16	“Communities of practice”	314
17	Organization and management.mp	175
18	(MH “Quality Management, Organizational”)	925
19	(MH “Evaluation and Quality Improvement Program”)	25
20	8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19	547076
21	“Nursing home*”	31778
22	“Residential aged care”	596
23	“Residential facility*”	3754
24	“Residential home*”	161
25	“Long term care”	25516
26	“Home* for the aged”	192
27	21 OR 22 OR 23 OR 24 OR 25 OR 26	51805
28	7 AND 20 AND 27	434
29	Limiters – Publication Year: 1990-2016, English language	432
EMBASE (1990 to May 2016)		
1	Accidental fall*.mp	1618
2	Falling/pc [Prevention]	2826
3	Falls prevention.mp	1091
4	1 OR 2 OR 3	5090

	Search Key	Results
5	programme*.mp	192653
6	program*.mp	1061192
7	Intervention*.mp	936316
8	Quality improvement.mp	30816
9	Best practice.mp	12811
10	Multifactorial.mp	40013
11	Collaborative*.mp	53209
12	Organization and management.mp	443868
13	5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12	2306296
14	Nursing home*.mp	51185
15	Residential aged care.mp	662
16	Residential facilit*.mp	1031
17	Residential facility.mp	356
18	Residential home/	6069
19	Skilled nursing facilities.mp	1102
20	Long term care.mp	110415
21	Home* for the aged	9890
22	14 OR 15 OR 16 OR 17 OR 18 OR 19 OR 20 OR 21	163379
23	4 AND 13 AND 22	279
24	Limit 23 to (human and English language and yr = "1990-current")	242
AMED		
1	Accidental fall*.mp	1881
2	Fall.mp	1673
3	Falls.mp	2499
4	Fall* prevention.mp	285
5	Faller*.mp	228
6	Falling*.mp	842
7	1 OR 2 OR 3 OR 4 OR 5 OR 6	3591
8	programme*.mp	4607
9	program*.mp	19759
10	Intervention*.mp	21959
11	Quality improvement.mp	252
12	Best practice.mp	303
13	Multifactorial.mp	363
14	Collaborative*.mp	1035

	Search Key	Results
15	Community of practice.mp	53
16	Communities of practice.mp	22
17	Organization and management.mp	192
18	Organisation and management.mp	52
19	8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19	38502
20	Nursing home*.mp	1502
21	Residential aged care.mp	32
22	Residential facilities.mp	671
23	Residential facility.mp	29
24	Residential home.mp	26
25	Skilled nursing facilities.mp	78
26	Long term care.mp	1199
27	Home* for the aged.mp	246
	20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27	3217
28	7 AND 19 AND 27	67
29	Limit 23 to (English language and yr = "1990-current")	65
PsychINFO		
1	Accidental fall*.mp	128
2	Falls.mp	9145
3	Faller*.mp	414
4	Falling.mp	7447
5	Fall* prevention.mp	731
6	Exp Falls/	2028
7	1 OR 2 OR 3 OR 4 OR 5 OR 6	15674
8	programme*.mp	34491
9	program*.mp	350083
10	Intervention*.mp	292588
11	Quality improvement.mp	3418
12	Best practice*.mp	11255
13	Multifactorial.mp	3508
14	Collaborative*.mp	31871
15	Community of practice.mp	1850
16	Communities of practice.mp	1567
17	Exp "Communities of practice"/	566
18	Organization and management.mp	17166

	Search Key	Results
19	Organisation and management.mp	1720
20	8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16 OR 17 OR 18 OR 19	618336
21	Nursing home*.mp	11089
22	Residential aged care.mp	308
23	Residential facilities.mp	805
24	Residential facility.mp	596
25	Residential home.mp	10469
26	exp Residential care institutions/	35755
27	Skilled nursing facilities.mp	234
28	Long term care.mp	7100
29	Home* for the aged.mp	956
30	21 OR 22 OR 23 OR 24 OR 25 OR 26 OR 27 OR 28 OR 29	45091
31	7 AND 20 AND 30	307
32	limit 31 to (human English language and yr = "1990-current")	281
Cochrane Central Registry of Controlled Trials		
1	"Fall*":ti,ab,kw	11717
2	"accidental fall*":ti,ab,kw	977
3	"Faller*":ti,ab,kw	189
4	Fall* prevention:ti,ab,kw	425
5	1 OR 2 OR 3 OR 4	11717
6	"program*":ti,ab,kw	54101
7	"Intervention*":ti,ab,kw	108290
8	"Quality improvement" :ti,ab,kw	946
9	"Best practice":ti,ab,kw	381
10	"Multifactorial":ti,ab,kw	1072
11	"Collaborative":ti,ab,kw	2463
12	"Community of practice":ti,ab,kw	10
13	"Organisation and management":ti,ab,kw	256
14	6 OR 7 OR 8 OR 9 OR 10 OR 11 OR 12 OR 13	139831
15	"Nursing home":ti,ab,kw	2171
16	"Residential aged care":ti,ab,kw	38
17	"MH Residential facilities":ti,ab,kw	163
18	"Residential home*":ti,ab,kw	119
19	"Long term care facilities":ti,ab,kw	246
20	15 OR 16 OR 17 OR 18 OR 19	2551

	Search Key	Results
21	5 AND 14 AND 20	160
22	Limit publication year from 1990 to 2016	158
JBI Database of Systematic Reviews and Implementation Reports		
1	Accidental fall*.mp	17
2	Fall.mp	286
3	Falls.mp	295
4	Faller*.mp	28
5	Falling.mp	159
6	Fall* prevention.mp	62
7	1 OR 2 OR 3 OR 4 OR 5 OR 6	535
8	programme*.mp	2086
9	program*.mp	579
10	Intervention*.mp	3440
11	Quality improvement.mp	194
12	Best practice*.mp	3853
13	Multifactorial.mp	102
14	Collaborative*.mp	299
15	Community of practice.mp	18
16	(Organization and management).mp	508
17	(Organisation and management).mp	231
18	8 OR 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 16 OR 17	5075
19	Nursing home*.mp	400
20	Residential aged care.mp	232
21	Residential facilit*.mp	48
22	Residential home.mp	8
23	Skilled nursing facilities.mp	18
24	Long term care.mp	314
25	Home* for the aged.mp	28
26	19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25	617
27	7 AND 18 AND 26	176

Note. ab = abstract, kw = keyword, MH = mesh heading, mp = multi-purpose, ti = title

Current Controlled trials

“Falls prevention” = 37

National Institute of Health Clinical Database

Falls = 2

Falls + prevention = 23

Falls + nursing homes = 6

Universal Index of Doctoral Dissertations in Progress

“Falls” = 2

Mednar

“Prevent falls” = 86

Grey Literature Report (GreyLit.org)

“Falls” AND Prevent* = 45

Google

“Falls prevention in aged care” = 0

“Falls prevention in aged care facilities” = 0

“Falls prevention program” = 3

“Nursing home fall prevention” = 0

Citation mining

Reference lists of relevant articles = 9

Appendix D:

List of Studies Excluded from the Systematic Review with Reasons

Citation	Reason for exclusion
Beasley K. Benefits of implementing an interdisciplinary and multifactorial strategy to falls prevention in a rural, residential aged-care facility. <i>Int J Evid Based Healthc</i> 2009; 7(3): 187-92.	Selection bias, sub sample of population. Falls data not the primary outcome, limited measurement.
Bonner A, MacCulloch P, Gardner T, Chase CW. A student-led demonstration project on fall prevention in a long-term care facility. <i>Geriatr Nurs</i> 2007; 28(5): 312-8.	Intervention not broadly delivered at multiple levels. Setting does not match inclusion criteria.
Bouwen A, Lepeleire J, Buntinx F. Rate of accidental falls in institutionalised older people with and without cognitive impairment halved as a result of a staff-oriented intervention. <i>Age Ageing</i> 2008; 37: 306-10.	Intervention not broadly delivered at multiple levels. Falls outcome was a sub group of falls with medical consequences.
Colon-Emeric CS, McConnell E, Pinheiro SO, Corazzini K, Porter K, Earp KM, Landerman L, Beales J, Lipscomb J, Hancock K, Anderson RA. CONNECT for better fall prevention in nursing homes: results from a pilot intervention study. <i>J Am Geriatr Soc</i> 2013; 61: 2150-9.	Intervention not broadly delivered at multiple levels
Cox H, Puffer S, Morton V, Cooper C, Hodson J, Masud T, Oliver D, Preedy D, Selby P, Stone M, Sutcliffe A, Torgerson D. Educating nursing home staff on fracture prevention: a cluster randomised trial. <i>Age Ageing</i> 2008; 37: 167-72.	Intervention not broadly delivered at multiple levels
Crotty M, Whitehead C, Rowett D, Halbert J, Weller D, Finucane P, Esterman A. An outreach intervention to implement evidence-based practice in residential care: a randomized controlled trial [ISRCTN67855475]. <i>BMC Health Serv Res</i> 2004; 4: 6.	Intervention not broadly delivered at multiple levels. Falls data not the primary outcome.

Citation	Reason for exclusion
Gama ZA, Medina-Mirapeix F, Saturno PJ. Ensuring evidence-based practices for falls prevention in a nursing home setting. <i>J Am Med Dir Assoc</i> 2011; 12(6): 398-402.	Selection bias, sub sample of population. Falls data not the primary outcome, limited measurement.
Kaleta J. Improving LTC safety to reduce falls injuries. <i>Canadian Nursing Home</i> 2009; 20(3): 11-3.	Publication is a magazine. Report only. Not an intervention study.
Neyens JC, Dijcks BP, Twisk J, Schols JM, Haastregt JC, Heuvel WJ, Witte LP. A multifactorial intervention for the prevention of falls in psychogeriatric nursing home patients, a randomised controlled trial (RCT). <i>Age Ageing</i> 2009; 38: 194-9.	Setting did not include general aged care residents, sub population of psychogeriatric residents only.
Rubenstein LZ, Robbins AS, Josephson KR, Schulman BL, Osterweil D. The value of assessing falls in an elderly population. A randomized clinical trial. <i>Ann Intern Med</i> 1990; 113(4): 308-16.	Intervention not broadly delivered at multiple levels.
Teresi JA, Ramirez M, Remler D, Ellis J, Boratgis G, Silver S, Lindsey M, Kong J, Eimicke JP, Dichter E. Comparative effectiveness of implementing evidence-based education and best practices in nursing homes: Effects on falls, quality-of-life and societal costs. <i>Int J Nurs Stud</i> 2013; 50: 448-63.	Intervention not broadly delivered at multiple levels.
Ward JA, Harden M, Gibson RE, Byles JE. A cluster randomised controlled trial to prevent injury due to falls in a residential aged care population. <i>Med J Aust</i> 2010; 192(6): 319-22.	Intervention not broadly delivered at multiple levels

Appendix E:**Extraction of Data from Included Studies
and Calculations for Meta-Analysis**

- Table E.1 Data extracted from RCTs (1)
- Table E.2 Data extracted from RCTs (2)
- Table E.3 Data extracted from quasi-experimental studies
- Table E.4 Calculation of mean falls rates, mean difference, standard deviation and standard error for RCTs
- Table E.5 Calculation of mean injurious falls rates, mean difference, standard deviation and standard error for RCTs

Table E.1 Data extracted from RCTs (1)

Study/year	Follow-up	Sample size		Number of falls		Number of fallers		N = injurious falls		Overall rate (falls per 1000 bed days)		Overall rate (injurious falls / 1000 bed days)	
		I	C	I	C	I	C	I	C	I	C	I	C
Becker/2003	12 months	509	472	547	980	188	247	x	x	3.83	7	x	x
Dyer/2004	12 months	89	83	194	266	56	51	x	x	5.94	11.01	x	x
Jensen/2002	34 weeks	167	157	273	346	82	109	62	68	6.67	8.32	1.51	1.63
Kerse/2004	12 months	239	177	863	436	173	103	339	184	11.23	6.29	4.38	2.739
McMurdo/2000	12 months	47	38	68	67	20	22	x	x	4.00	4.8	x	x
Ray/1997	12 months	221	261	x	x	x	x	28	44	x	x	0.375	0.545
Ray/2005	12 months	4932	5626	x	x	x	x	406	432	x	x	0.29	0.270

Table E.2 Data extracted from RCTs (2)

Study/year	RR (95% CI falls)	RR (95% CI Fallers)	OR (95% CI Fallers)	RR (95% CI Injurious falls)
Becker/2003	0.55 (0.41, 0.73)	0.75 (0.57, 0.98)	x	x
Dyer/2004	x	x	1.03 (0.59, 1.80)	x
Jensen/2002	0.60(0.50, 0.73)	x	0.49 (0.37, 0.65) Adj	x
Kerse/2004	1.34 (1.06, 1.72) Adj	x	x	1.12(0.85, 1.47) Adj
McMurdo/2000	x	x	0.45(0.19,1.14)	x
Ray/1997	x	x	x	x
Ray/2005	x	x	x	0.98 (0.83, 1.16)Adj

Note. x= no data reported, I= intervention group, C= control group, Adj= adjusted

Table E.3 Data extracted from quasi-experimental studies

Study/year	Follow-up	Sample size	Number of falls		Number of fallers		Number of injurious falls		Overall rate (falls per 1000 bed days)			RR (95% CI falls) <i>Adj</i>	OR (95% CI Fallers)
			Pre	Post	Pre	Post	Pre	Post	Pre	Post			
Burland et al/ 2013	39 months	721	708	1451 [1393]	x	x	208	361[447]	5.3	6.10	6.10	1.46 (1.24,1.71) <i>Adj</i>	x
Colon-Emeric et al/ 2006	9 months	36/353 [#]	x	x	x	x	x	x	6.1	5.60	5.60	x	x
Hofmann et al/ 2003	12 months	120	479	299	x	x	x	x	x	x	10.94	x	x
Nitz et al/ 2012	24 months	670*	904	1003	333	283	x	x	x	x	10.50	x	x
Rask et al/ 2007	12 months	19/23 [#]	x	x	x	x	x	x	17.3/100 res months	5.40	5.40	x	x

Note. x= no data reported, [#]homes participating/non-participating, parenthesis denote control home data, *number residents in both phases, Adj= adjusted

Table E.4 Calculation of mean falls rates, mean difference, standard deviation and standard error for RCTs

Study/year	Days	Control	Changes to mean falls rate per 1000 bed days				
			Intervention	Control	MD	SD	SE
Becker et al / 2003	365	472	3.83	7.00	-3.17	2.241528496	1.585
Dyer et al / 2004	365	83	5.94	11.01	-5.07	3.585031381	2.535
Jensen et al / 2002	238	157	6.67	8.32	-1.65	1.166726189	0.825
Kerse et al / 2004	365	177	11.23	6.29	4.94	3.493107499	2.470
McMurdo et al / 2000	365	38	4.00	4.80	-0.80	0.565685425	0.400

Table E.5 Calculation of mean injurious falls rates, mean difference, standard deviation and standard error for RCTs

Study/year	Days	Control	Changes to mean falls rate per 1000 bed days				
			Intervention	Control	MD	SD	SE
Jensen et al 2002	238	157	1.510	1.630	-0.120	0.084852814	0.0600
Kerse et al 2004	365	177	4.380	2.739	1.641	1.160362228	0.8205
Ray et al 1997*	365	261	0.375	0.545	-0.170	0.120208153	0.0850
Ray et al 2005*	365	5626	0.290	0.270	0.020	0.014142136	0.0100

Note. MD= mean difference, SD= standard deviation, SE= standard error

Appendix F:

Published Manuscript
(*Journal of Advanced Nursing*)
Contributing to Chapter 3

JAN

Informing Practice and Policy Worldwide through Research and Scholarship

PROTOCOL

Investigating the impact of a falls prevention community of practice in a residential aged-care setting: a mixed methods study protocol

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Abstract

Aim. The aim of this study was to facilitate the implementation and operation of a falls prevention Community of Practice in a residential aged-care organization and evaluate its effect on falls outcomes.

Background. Falls are a substantial concern across the residential aged-care sector with half its older population falling annually. Preventing falls requires tailoring of current evidence for reducing falls and adoption into daily activity, which is challenging for diversely skilled staff caring for a frailer population. Forming a community of practice could provide staff with the opportunity to share and develop their expertise in falls prevention and innovate change.

Design. A mixed methods design based on a realist approach conducted across 13 residential care facilities ($N = 779$ beds).

Method. Staff will be invited to become a member of the community of practice with all sites represented. The community of practice will be supported to audit falls prevention activity and identify gaps in practice for intervention. The impact of the community of practice will be evaluated at three levels: individual member level, facility level and organizational level. A pre post design using a range of standardized measures supported by audits, surveys, focus groups and interviews will determine its effect on falls prevention practice. Falls outcomes will be compared at five time intervals using negative binomial regression and logistic regression. The study is funded 2013 2017.

Conclusion. Findings from this research will assist residential aged-care providers to understand how to effectively translate evidence about falls prevention into clinical practice.

Keywords: allied health professionals, community of practice, falls prevention, nurses, residential aged-care, staff education

Why this study is needed?

- There is limited evidence about how to reduce falls rates in residential aged-care settings, including uncertainty about how to translate known evidence into sustainable clinical practice.
- A community of practice may be an effective model to translate falls prevention evidence into practice but evaluation is required to validate its impact on falls outcomes.
- Falls rates in residential aged care are among the highest reported worldwide therefore preventing falls for these frail, older people may enable them to maintain their independence and quality of life.

Introduction

Falls rates across the residential aged-care (RAC) sector are among the highest reported worldwide, therefore reducing the falls rates through the adoption of evidence-based falls prevention strategies is a global priority. Preventing falls for older people in residential aged-care facilities (RACF) may enable them to maintain their independence, enhance their well-being and sustain their quality of life. This study partners a University research team with staff and residents of a residential aged-care provider organization. This collaboration aligns with the Australian Government's national initiative of preventing falls among older people (National Public Health Partnership [NPHP] 2004, Lord *et al.* 2011).

Background

Falls are a substantial concern across the residential and long-term aged-care sector with half its population falling annually (Haralambous *et al.* 2010, Nyman & Victor 2011, Burland *et al.* 2013). Between 25-30% of falls among older people in residential aged care result in physical injury (Oliver *et al.* 2007, Burland *et al.* 2013) and are associated with an increased risk of mortality functional decline, depression and anxiety (Rubenstein 2006, Morley 2007, Oliver *et al.* 2007). Frail, older people who require nursing home care are at high risk of falls as they present with combinations of; multiple co-morbidities, age-related systems decline and cognitive impairment (Rubenstein 2006, Onder *et al.* 2012). Meta-analyses of studies investigating falls prevention in residential aged-care settings have found that the two strongest evidence-based interventions are, the supplementation of Vitamin D and medication review by a pharmacist (Bischoff-Ferrari *et al.* 2004,

Cameron *et al.* 2012, Nazir *et al.* 2013). Multifactorial interventions incorporating staff education, resident exercise programmes and environmental modification show inconclusive outcomes in reducing falls rates indicating a problem exists (Cameron *et al.* 2012, National Institute for Health and Care Excellence (NICE) 2013). Despite this, adopting a multifactorial approach to falls prevention is still considered as industry best practice in the absence of further specific evidence. It is also recognized that effective interventions for this population differ from community interventions (Cameron *et al.* 2012, Gillespie *et al.* 2012) because older people in RAC may have difficulty adopting falls prevention strategies independently (Oliver & Masud 2004, Rubenstein 2006, Oliver *et al.* 2007). This suggests that staff and healthcare systems providing care to this population need to play a significant proxy role in providing falls prevention intervention for those at risk.

Policy, processes and practices reflecting evidence-based falls prevention are required for implementation and adoption in the context of an RAC organization. This requires systematic enquiry, synthesis and adaptation to tailor relevant falls prevention knowledge for translation into practice (Graham *et al.* 2006, Haines & Waldron 2011, Tetroe *et al.* 2011). However, undertaking this translation process in its entirety requires collaboration, research expertise, clinical and management skills all of which may not be present in the RAC workforce expected to undertake this process (Haines & Waldron 2011). The use of external falls prevention experts to implement change independently has been shown to reduce falls rates in the short term but following withdrawal the effect has not been sustained (Ray *et al.* 2005, Capezuti *et al.* 2007). Therefore, combining research expertise with workplace clinical experience could be a viable means of translating current falls prevention evidence into effective practice (Tolson *et al.* 2006, 2011, Fixsen *et al.* 2011).

An innovation that is yet to be applied to the problem of falls prevention in the RAC sector is the formation of a community of practice (CoP). A CoP is a group of like-minded people with a mutual interest in a topic who get together to share and develop their expertise and then innovate and facilitate change in pursuit of a common goal (Wenger 1998, Li *et al.* 2009, Conklin *et al.* 2011, Ranmuthugala *et al.* 2011b), in this case falls prevention. A CoP applied to a RAC setting could provide an opportunity to connect nurses, allied health staff, managers, residents and researchers in collaboration to action evidence-based best practice (Tolson *et al.* 2006, Ranmuthugala *et al.* 2011b).

The study

Aims

The purpose of this research was to evaluate the impact of the falls prevention CoP on falls outcomes in a RAC setting by measuring:

- Changes in individual CoP member knowledge, motivation and confidence to champion falls prevention activities.
- Changes in implementation and adoption of falls prevention strategies at each participating RAC site measured simultaneously with falls rates, fall-related hospitalization rates and the proportion of residents falling.
- Changes in RAC organizational policy or systems supporting falls prevention.

Design and methodology

This study used a convergent, parallel mixed methods design across three phases (Creswell & Plano Clark 2007) based on a realist approach (Pawson & Tilley 1997) (Figure 1). The realist approach to evaluation has been used previously in health services research where a comprehensive understanding of complex interventions is required

(Greenhalgh *et al.* 2009, Rycroft-Malone *et al.* 2010, Williams *et al.* 2013). Realist evaluators seek to provide not just a descriptive profile of an intervention's outcomes, but also to identify more comprehensively, ways these interventions are influenced by current conditions (contexts) in triggering (mechanisms) the observed outcomes (Pawson & Tilley 1997, Ranmuthugala *et al.* 2011a, Hewitt *et al.* 2012). These context mechanism outcome (CMO) configurations serve as a framework for identifying what works (or not) for whom, how and under what conditions. Early stakeholder participation, in our case, the RAC organization staff and researcher team steering committee, via meetings, emails and telephone contact assisted the development of potential CMO configurations (see Table 1). The potential CMO's have been scoped broadly to guide qualitative and quantitative data collection but can be readily adapted to construct emergent CMO associations from research findings (Ranmuthugala *et al.* 2011a, Williams *et al.* 2013).

Participants, setting and recruitment

This study will partner university researchers with staff members across a not-for-profit RAC provider organization with 13 geographically diverse sites in metropolitan Western Australia. The RAC organization provides care for 779 older people with a mean age of 80-65 years. There is approximately 1185 full- and part-time care staff members

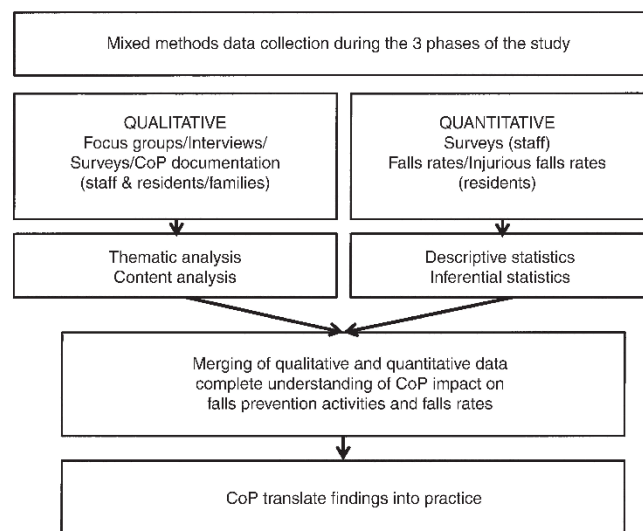


Figure 1 Mixed methods data collection overview (guided by Creswell & Plano Clark 2007).

Table 1 Potential context mechanism outcome associations.

Contexts
RAC organizational culture
RAC site leadership
RAC site environmental infrastructure
Resident care Level (dependence/independence)
CoP characteristics
Staff characteristics
Possible mechanisms
CoP actions
CoP activities
CoP member behaviours
Outcomes proposed
Changes in resident falls rates and fall-related hospitalization rates
Changes in adoption of falls prevention strategies
Changes in staff confidence and motivation to address falls prevention strategies
Changes in the environment (that affect resident falls risk)
CoP can achieve maturity through member participation and collaboration

RAC, residential aged-care; CoP, community of practice.

across each of the 13 RAC sites; a care manager leads sites and staff includes nursing (practitioners, clinical specialists, registered, enrolled and assistants) and allied health professionals. A separate corporate office provides centralized support for all sites such as human resources, clinical and quality control departments and information technology (IT). Commitment to this partnership is endorsed by the organization's CEO and General Managers.

Outcome measures and evaluation

In this study the impact of the falls prevention CoP will be evaluated at three levels: (1) At an individual member level we will measure changes in their knowledge, confidence and motivation to champion falls prevention activities and confidence in using IT for communication; (2) At the facility level we will measure changes in implementation and adoption of falls prevention strategies in conjunction with falls rates and fall-related hospitalization rates; (3) At the organizational level we will describe changes in policy or systems supporting falls prevention (Figure 2).

Data collection and procedure

Phase 1

A steering committee comprising research and service provider representatives from nursing and allied health will be formed to discuss CoP formation, operation and study logistics. An RAC organizational member of staff will be assigned

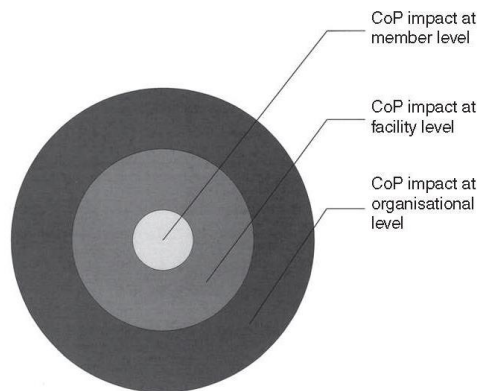


Figure 2 Levels of evaluation of CoP impact on falls prevention outcomes (guided by Ranmuthugala *et al.* 2011a).

part of their managerial role as the CoP facilitator and study liaison person with the university researchers. All staff members expressing an interest in falls prevention currently part of the organization's workforce will be invited to volunteer as CoP members, with a minimum of one representative from each of the organization's sites. The organization's staff members, residents and built environment will be the recipients of the falls prevention activities implemented by the CoP. To overcome geographical separation, CoP members will pilot the use of the organization's intranet to communicate on a regular basis supported by approximately three face to face meetings annually. All staff members nominating as CoP members will complete a range of questionnaires to gather demographic information and to explore their knowledge, confidence and motivation about falls prevention practice and confidence in using IT for communication. Researcher and CoP facilitator documented observations will inform evaluation and modify CoP operation as required across the duration of the study. CoP members will repeat these measures at the end of the study period. Additional documents will be used to describe CoP formation and operation including stakeholder steering committee meeting minutes, CoP discussion transcripts, emails and the researcher and CoP facilitator observation journals.

Phase 2

Evaluating current falls prevention activity and comparing it with evidence-based guidelines (Australian Commission on Safety & Quality in Healthcare 2009, Cameron *et al.* 2012, National Institute for Health and Care Excellence (NICE) 2013) will identify gaps in practice for targeted intervention. The CoP will therefore be supported to con-

duct a scoping audit across all RAC sites using a validated tool. CoP members will co-ordinate audit completion at their RACF site assisted by site staff members, including those with an awareness of policies and practices in each facility, such as care managers, nurses and allied health professionals. Discussions with other RACF staff members such as nursing and allied health assistants, cleaners, laundry and maintenance staff members may also contribute to establishing whether everyday practices reflect current policies. The selected audit tool will address domains such as falls risk assessment, falls and falls injury prevention interventions, the environment, falls and falls injury prevention staff training and information for residents. After analysis of all audits, The CoP will then discuss the prepared report of the audit findings, reflecting current falls prevention activity, to determine the areas for development and intervention. Repeating this audit at the conclusion of this study will enable the comparison of changes in falls prevention activity across the RACF sites following CoP determined interventions.

Findings from the scoping audit will be discussed and prioritized in terms of actioning by the CoP, taking into account their available resources. Actioning falls prevention activities will firstly involve the CoP members disseminating information to multidisciplinary staff groups at their facility (Anderson *et al.* 2012). Subsequently the CoP's actioning of falls prevention activities will be measured using an appropriate series of methods such as questionnaires, focus groups and interviews reflecting the diversity of practice in providing clinical care.

A quasi-experimental pre/post design will be adopted for determining the quantitative outcomes of interventions addressed by the CoP at each site and across all sites. Appropriate standardized tools will be selected to measure changes in falls outcomes dependent on the area of need defined by the CoP. This will be guided by the findings of the scoping audit and therefore cannot be pre-determined. However, possible CoP falls prevention activities are likely to take a multifactorial approach that includes the staff members, the residents and the environment. Examples may include: Staff intervention through the development of a mandatory falls prevention education and training package informed by a survey of care staff. Resident intervention through the administration of Vitamin D supplementation via Nurse Practitioner, GP and Pharmacist liaison and the environment may be modified to minimize hazards and maximize resident safety (Figure 3). All CoP falls prevention activity is likely to involve RAC policy and practice development or modification and resource creation to facilitate the adoption of falls prevention activities.

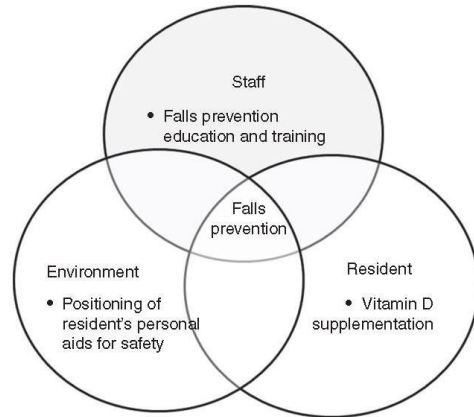


Figure 3 An example of a possible CoP intervention in each interactive domain of falls prevention.

Specifying the intervention context, measuring the proposed outcomes and identifying trigger mechanisms will determine what CoP facilitated falls prevention activities worked, for whom, how and under what conditions in the RAC organization.

The establishment of a community through connections between its members and knowledge flow through the community will be recorded by the organization's intranet platform. Frequent communication, interaction and knowledge exchange between members are characteristics associated with CoPs. A social network analysis (SNA) will be undertaken to examine the relationships, connections and flow of knowledge in the CoP, as the behaviour of the CoP is likely to be influenced by its structure and the characteristics of its members. The exchange between members on the CoP intranet discussion board and CoP facilitator emails will provide frequency counts representing CoP member activity and connectivity. The presence and strength of these connections may assist in comprehending which features of the CoP relate to improvement in falls prevention activity and tacit knowledge exchange (Ranmuthugala *et al.* 2011a, Gainforth *et al.* 2014, Yousefi-Nooraie *et al.* 2014).

Falls outcomes

A prospective quasi-experimental pre post design will measure falls rates, falls related hospitalization rates and the proportion of older people sustaining one or more falls. Falls rates across 2 years will be compared with rates at baseline and at six monthly intervals. As this is a quasi-experimental design, the CoP is considered an intervention at organizational level. Consistent with international recom-

recommendations for a common outcome data set for falls injury prevention trials, the definition of falls by Lamb *et al.* (2005) will be adopted by this study:

an unexpected event in which an individual comes to rest on the ground, floor or lower level

Falls data will be collected from the organization's electronic clinical record system that records all reported falls by staff members at RACFs. The organization also records all falls that require a transfer to hospital due to injury sustained from a fall. These data will also be collected from the organization's electronic clinical record system for the duration of the study. Falls rates and falls related hospitalization rates will be reported as falls/1000 resident bed days. Bed days of care (calculated using the facility census ie number of beds occupied across 30 days) will represent the denominator and number of falls the numerator multiplied by 1000. As residents of the participating aged-care facilities may remain in the study for varying lengths of time due to death, hospital admission or discharge, the probability of falling will be calculated relative to the duration they were exposed to the risk of falling.

Falls prevention activities and falls outcomes will be measured by CoP members in conjunction with the RAC organization's staff members. The researcher will provide the falls prevention expertise and links to external falls prevention experts as required through participation in the CoP and will be responsible for evaluating the CoP on the three levels previously described.

Phase 3

Organizational falls prevention management such as policies or quality improvement systems will be reviewed as part of the audit process described in phase two. Different types of organizational documents will be scrutinized including policy documents, practice manuals and meeting minutes by bench marking against current evidence and clinical guidelines (Australian Commission on Safety & Quality in Healthcare 2009, Cameron *et al.* 2012, National Institute for Health and Care Excellence (NICE) 2013).

Data analysis

Quantitative

Data drawn from surveys and audits throughout phases one to three will be allocated a value representing a category such as gender, first language and type of exercise offered. A 5-point Likert scale will be used to measure subjective variables such as attitudes, beliefs, confidence and motivation through extent of agreement to the responses gener-

ated. Categorical response items used to measure engagement in falls prevention activities will be analysed using non-parametric methods where required. Both nominal and ordinal data from surveys and audits will be entered into the spss statistical software package version 22 IBM SPSS Statistics. Parametric data will be described as means, frequencies and percentages and non-parametric data will be described as medians, interquartile ranges and displayed in tables. Frequency analyses cross comparisons between facilities will be undertaken. Relationships between variables will be examined between two or more sets of responses and cross tabulations and contingency tables used where appropriate (Portney & Watkins 1993, Punch 2003). Survey results will be presented in reports using bar graphs and tables.

Falls incident data will be collected at five time points in six monthly intervals over 2 years (Table 2) and analyses completed using recommended methods for falls data (Lamb *et al.* 2005, Robertson *et al.* 2005). Falls outcomes (falls and fall-related hospitalization rates per 1000 resident days, proportion of residents falling) will be compared between baseline and at 2 years after the introduction of the CoP using negative binomial regression (falls rates) and logistic regression (proportion of residents falling) with

Table 2 Proposed evaluation during the three phases of research.

Phase 1. CoP member level	Phase 2. RACF level	Phase 3. Organizational level
Member baseline survey	Falls outcome data 1* RACF site meetings	CoP formation stakeholder meetings IT liaison meetings/email
CoP feasibility study	Falls outcome data 2* CoP Falls prevention activity audit	Management meetings
Member activity reports	Falls outcome data 3* CoP Falls prevention activities targeting resident/staff/environment Falls outcome data 4* CoP Falls prevention activities targeting resident/staff/environment	Present policy/system changes
Member final survey Semi-structured interviews	Falls outcome data 5* CoP Falls prevention activity audit	Evaluate uptake of recommended policy/system changes

*Falls outcome data 1-5 includes falls rates, fall-related hospitalization rates and proportion of residents falling.

adjustment for age, presence of dementia and aged-care funding instrument (ACFI) care rating with the results presented as incident rate ratios and odds ratios with 95% confidence intervals and a $P < 0.05$ will be considered significant.

The SNA will use software such as UCI-Net; this allows visual examination of each of the relationships in question, in our study these will be CoP member interactions and knowledge flow through frequency counts (Ranmuthugala *et al.* 2011a, Yousefi-Nooraie *et al.* 2014). Results will be presented as matrices or graphs.

Qualitative

Interview or focus group digital recordings will be transcribed verbatim. Open-ended qualitative responses from questionnaires, researcher observation journal and all CoP documentation will be scrutinized by the primary researcher (JFC) and second researcher (AMH). Responses seeking further categorical information, such as other types of exercise programs provided, will be subjected to content analysis. Data will be extracted on the number and frequency of categories identified in each document. All other responses will be coded and thematically analysed by two researchers and arbitrated by a third researcher based on the realist framework of context, mechanisms and outcome configurations (Pawson & Tilley 1997, Williams *et al.* 2013). The analysis of the qualitative data will be assisted by the data management software package QSR NVivo 10 for windows. A reflective, iterative process to determine common repeated patterns of meaning or themes across responses will be undertaken (Miles *et al.* 2014) and interpreted within the realist framework (Pawson & Tilley 1997). CoP communication transcripts and observations from researcher and CoP facilitator study journals will be used to inform the survey and interview data. Questionnaires will be administered as previously described in phase one.

Data integration. The reduced qualitative data will be integrated with the quantitative data across phases one to three to aid explanation and to holistically present the results of the study (Creswell & Plano Clark 2007).

Ethics

Researchers from the University have formed a partnership with the RAC organization to ensure that research priorities and study design are in keeping with the philosophy of the RAC organization. Approval has been granted from the organization for the study to be conducted as part of their

continuous quality improvement priorities. Ethical approval from the university human ethics committee (HREC) has been granted for the first phase of the research. Subsequent phases of study will request further HREC approvals as undertaken in phase one. All individual participation will be voluntarily sought following the presentation of verbal and written information to participants. Written consent to participate will be obtained from all who volunteer, with participants being free to withdraw from the study at any time.

Validity and reliability/rigour

Health service research is increasingly using both quantitative and qualitative methods in research designs seeking answers to complex problems, such as preventing falls in older people. This integration of complementary methodologies has many advantages in that it can enhance confirmation or corroboration of varying methodologies via triangulation; elaborate or develop analysis, provide richer detail; and initiate new lines of thinking through attention to convergent and divergent findings (Rossman & Wilson 1985, Onwuegbuzie & Leech 2005). Credibility will be demonstrated through the participation of two independent researchers in the thematic analysis of all qualitative data. Any disagreement will be resolved by discussion with a third researcher. Member checking, a process where participants are provided with opportunity to verify or change the researcher interpretations of collected data (e.g. interview and CoP discussion transcripts) to ensure they have been truly represented, will be undertaken (Creswell & Plano Clark 2007, Thomas & Magilvy 2011). The primary researcher and CoP facilitator will keep a journal to record their observations and reflections regarding CoP member participation and evaluation ensuring the identification of any bias and actions to contain it. Confirmability will be established through the use of verbatim quotations to represent the voices of participants (Polit & Beck 2013). Dependability will be demonstrated through the provision of an audit trail enabling an external researcher to follow the decisions made and mapped by the study researchers. In our study this will be established by describing the purpose of the study, detailing the context, mechanism and outcome configurations of the complex intervention, describing how the data will be collected and analysed, presenting the evaluation findings in a coherent and logical style and reporting both processes and outcomes (Thomas & Magilvy 2011). The primary researcher will be positioned on the fringe of the CoP providing support as required and con-

necting the CoP members to falls prevention research evidence and other research experts.

Discussion

The problem of intervening to prevent falls in a residential aged-care organization is complex. The recipient population is older, frailer and more cognitively impaired compared with community dwelling older people. The staffs are diverse in skill-level and experience and may lack the expertise to translate falls prevention strategies into clinical practice. Individual organizational facilities are geographically diverse so there is potential for them to operate as silos and not benefit from each other's workplace knowledge and expertise when dealing with similar complex problems. The culture in RAC organizations may also be lacking in terms of optimal communication, leadership and teamwork as perceived by their own staff members (Eherton-Beer *et al.* 2013). The representation of RACF staff members as part of a falls prevention CoP has the potential to enable communication, leadership, idea sharing and collaboration. In harnessing a community of individuals, as opposed to reliance on a single individual, the CoP may have a better chance to become the change agent for falls prevention activity through diverse perspectives and collaboration. The use of a CoP with links to a research team with relevant expertise may enable the translation of falls prevention evidence into clinical practice through tailoring for the local context. Measuring the impact of a CoP will also augment the current CoP literature. Study strengths include the use of the realist approach to enable the study findings to be robustly evaluated and determine what worked or didn't work in the context of a RAC organization.

Limitations

Limitations include: the quasi-experimental pre post design but this will be strengthened by the mixed method data collection from several sources. Falls data are known to be underreported in hospital systems when only using incident reporting systems which could mean that falls rates obtained may not reflect the total falls (Hill *et al.* 2010). However, we will also be measuring fall-related hospitalization rates for falls that are mandatory to report at RACFs.

Conclusion

To the best of our knowledge, there is no previous literature that clearly identifies and measures how a CoP could affect falls prevention and falls rates in a RAC organiza-

tion. If successful, the actions implemented by a CoP have the potential to improve outcomes for residents in terms of independence and quality of life and empower organizational staff through improved policy and practice. The CoP could then become a value-adding aspect of the organization.

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Conflict of interest

No conflict of interest has been declared by the authors in relation to this study.

Author contributions

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (<http://www.icmje.org/recommendations/>)]:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

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Appendix G:

Appendix

G

CoP Member Baseline Survey

PARTICIPANT INFORMATION

TITLE: Exploring and Describing the Implementation of a Falls Prevention Community of Practice in a residential aged care provider organisation: a feasibility study

INVESTIGATOR(s): Jacqui Francis-Coad and Dr Anne-Marie Hill

By clicking on the link in the email sent to you by Tim Lo you have been brought to this site and are invited to take part in an online survey.

What is the study about?

This study aims to explore and describe the implementation of a falls prevention Community of Practice (CoP) in your residential aged care provider organisation. The findings from this survey will contribute to a larger research project that aims to investigate what effect operating a falls prevention CoP has on the rate of falls in the residential aged care population.

What will I be asked to do?

If you continue, you will be taken to the questionnaire. This questionnaire should take around fifteen to twenty minutes of your time to complete.

Are there any risks associated with participating in this study?

There are no foreseeable risks associated with this study.

What are the benefits of the research study?

The study will explore whether each CoP member can use the Brightwater intranet as an effective means of communication as this is imperative for collaboration. The baseline measures for CoP member perceived risk of falls, knowledge of falls and falls prevention strategies will be established for future comparison.

Can I withdraw from the study?

Participation in this survey is completely voluntary. If you agree to participate, you can withdraw from the survey at any time. However you cannot withdraw after you submit your survey, as surveys are non-identifiable.

Will my results remain confidential?

No one person will be identified in the survey results. The results will be presented collated/grouped from respondents. Responses will be stored securely in the School of Physiotherapy at The University of Notre Dame Australia for a period of five years.

Will I be able to find out the results of the survey?

We will email a summary of the survey to all those who receive this initial invite regardless of participation.

Who do I contact if I have questions about the study?

Please feel free to contact Jacqui or Anne-Marie if you have any questions.

jacqui.francis-coad@nd.edu.au

anne-marie.hill@nd.edu.au

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at The University of Notre Dame Australia (approval number). If participants have any complaint regarding the manner in which a research project is conducted, it should be directed to the Executive Officer of the Human Research Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0943, research@nd.edu.au

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

I want to participate! How do I begin?

By clicking the link to begin you are indicating your consent to be a part of this project.

Yours sincerely,

Jacqui Francis-Coad

Dr Anne-Marie Hill

Section 1 – Your details

* 1. Please state your Code number in the box below:

* 2. Please state your gender (Tick one)

Female

Male

* 3. Using your age at your last birthday, which age bracket describes you? (Tick one)

<19 years

20-29 years

30-39 years

40-49 years

50-59 years

60-69 years

* 4. What is the highest level of education you have completed? (Tick one)

Completed Year 10

Completed Year 12

TAFE Certificate III or IV

Graduate Certificate

Graduate Diploma

Bachelor Degree

Masters Degree

Other

Other and / or overseas equivalent (please specify)

* 5. What is your current job role? (Tick one)

- Care Manager
- Registered Nurse
- Enrolled Nurse
- Personal Care Assistant
- Physiotherapist
- Occupational Therapist
- Therapy Assistant
- Other

Other (please specify)

* 6. How many years experience do you have in your current job role, either at Brightwater or elsewhere?
(Tick one)

- <1 year
- 1-2 years
- 3-5 years
- 6-10 years
- >11 years

* 7. How long have you worked for Brightwater in your current job role? (Tick one)

- <1 year
- 1-2 years
- 3-5 years
- 6-10 years
- >11 years

* 8. Do you work with residents (either directly or indirectly) who require (Tick as many as appropriate):

- High level care
- Low level care
- Dementia specific care

* 9. What language do you mainly speak at home? (Tick one)

English (skip to question 10)

Other

Which other language? (please specify)

10. If you specified a language other than English in the previous question, do you have any difficulties communicating (i.e. speaking, reading or writing) in English? (Tick one)

Yes

No

Unsure

Would you like to comment further on your answer here?

Section 2 - Falls Prevention Community of Practice Communication

* 11. I use the following technologies: (Tick as many as appropriate)

- Email
- Internet
- Social media (eg Facebook/Twitter etc)
- Other

Other (please specify)

* 12. I use the Brightwater intranet as part of my every day work practice (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 13. I have easy access (i.e. a computer that is available for your use) to the Brightwater intranet at my work site/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 14. I am confident to use the Brightwater intranet to communicate with other staff members (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 15. I have time to use the Brightwater intranet at my work site/facility for CoP participation (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 16. A BLOG is a personal web site or web page on which an individual records opinions on a regular basis.

Have you ever used a blog to communicate? (Tick one)

- Yes
- No
- Unsure

* 17. I feel confident to use a blog for communicating with other CoP members (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

18. Are there any anticipated difficulties in using the Brightwater intranet for CoP communication on which you would like to comment?

19. Is there anything you think would facilitate CoP communication using the Brightwater intranet on which you would like to comment?

20. What do you hope to gain by participating in this CoP?

Section 3 – Falls and Falls Prevention

Some of the following questions require a response from your ‘current understanding’ to establish a baseline for future comparison. It is therefore important not to confide in others or look up information in pursuit of a better answer; all responses will be treated anonymously.

* 21. How would you define ‘a fall’?

* 22. Have you participated in falls prevention training in the past? (Tick one)

- Yes
 No (skip to Question 23)
 Unsure

23. If you answered ‘Yes’ to the previous question please briefly describe the training (eg Internal – Brightwater seminar or External - ‘Stay on your feet’ workshop)

* 24. State the falls prevention strategies that you are aware of for your residents:
(note – there is no minimum or maximum number required in this list)

* 25. From your answer to the previous question, which falls prevention strategy would you rate as most effective?

* 26. I think falls are a problem in the residential aged care population (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 27. I think falls are a problem across the Brightwater organisation (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 28. I think falls are a problem at my work site/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 29. I am regularly informed (eg monthly reporting) of the number of falls or falls rates at my workplace/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 30. A "FALLS CHAMPION" is a person who assumes a leadership role in raising awareness, actioning and evaluating falls prevention management in the work place.

I feel motivated to be a "falls champion" at my work site/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 31. I feel confident I could be a "falls champion" at my work site/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 32. I think representatives from the following groups of people could help me action falls prevention management at my work site/facility (Tick one response in each row)

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Care Managers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nurses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal Care Assistants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Physiotherapists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Occupational Therapists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Therapy Assistants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kitchen staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cleaning staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laundry Staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brightwater volunteers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Residents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Resident' family members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

* 33. I think the following resources/training would help me implement falls prevention management at my work site/facility (Tick one response in each row)

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Posters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brochures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Checklists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Staff forums (discussions)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Video training (customised for different target groups)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Presentations by 'Experts' (in the field of interest)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

* 34. I think falls prevention training should be available to staff using technology (making access to learning convenient to them) such as

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Brightwater intranet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Secure Internet site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tablet (eg iPad) App	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Phone App	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

35. Can you identify any difficulties to implementing falls prevention strategies at your work site?

36. Do you have any other comments in relation to falls prevention and your facility at Brightwater?

37. Please comment on anything you think could be improved in the design of this questionnaire for future use

You have now completed the questionnaire,

Thank you for your kind participation.

Appendix H:

Published Manuscript (*Australian Health Review*) Contributing to Chapter 5

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Using a community of practice to evaluate falls prevention activity in a residential aged care organisation: a clinical audit

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Abstract

Objective. This study evaluates whether a community of practice (CoP) could conduct a falls prevention clinical audit and identify gaps in falls prevention practice requiring action.

Methods. Cross-sectional falls prevention clinical audits were conducted in 13 residential aged care (RAC) sites of a not-for-profit organisation providing care to a total of 779 residents. The audits were led by an operationalised CoP assisted by site clinical staff. A CoP is a group of people with a shared interest who get together to innovate for change. The CoP was made up of self-nominated staff representing all RAC sites and comprised of staff from various disciplines with a shared interest in falls prevention.

Results. All 13 (100%) sites completed the audit. CoP conduct of the audit met identified criteria for an effective clinical audit. The priorities for improvement were identified as increasing the proportion of residents receiving vitamin D supplementation (mean 41.5%, s.d. 23.7) and development of mandatory falls prevention education for staff and a falls prevention policy, as neither was in place at any site. CoP actions undertaken included a letter to visiting GPs requesting support for vitamin D prescription, surveys of care staff and residents to inform falls education development, defining falls and writing a falls prevention policy.

Conclusion. A CoP was able to effectively conduct an evidence-based falls prevention activity audit and identify gaps in practice. CoP members were well positioned, as site staff, to overcome barriers and facilitate action in falls prevention practice.

What is known about the topic? Audit and feedback is an effective way of measuring clinical quality and safety. CoPs have been established in healthcare using workplace staff to address clinical problems but little is known about their ability to audit and influence practice change.

What does this paper add? This study contributes to the body of knowledge on CoPs in healthcare by evaluating the performance of one in the domain of falls prevention audit action.

What are the implications for practitioners? A CoP is an effective model to engage staff in the clinical audit process. Clinical audits can raise staff awareness of gaps in practice and motivate staff to plan and action change as recommended in best practice guidelines.

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Introduction

Older frail people who live in residential care are at very high risk of falls with falls rates across the residential aged care (RAC) sector ranging from 3 to 13 falls per 1000 bed days of care.^{1,2} These falls result in high rates of injury and consequently reduce independence and quality of life,^{1,2} therefore reducing falls rates has been identified as an industry priority.

What works in falls prevention?

Large meta-analyses have found that successful single-intervention strategies for reducing falls among RAC populations are providing supplementation of vitamin D and medication review by a pharmacist, however the effect of multifactorial interventions were inconclusive.³ Despite a multifactorial approach to falls prevention being recommended in best practice guidelines,⁴ others have identified that there are substantial gaps between the research evidence and its translation into clinical practice, with numerous barriers being identified in the 'evidence pipeline'.⁵ Evaluating current falls prevention activity allows identification of gaps in practice, with the potential to change future falls outcomes in RAC settings.

Clinical audit

A common process used to measure and benchmark safety and quality in clinical care is audit and feedback (A&F). This is a process that enables clinical care staff or organisations to evaluate their current performance against evidence-based guidelines and identify gaps in practice for improvement.⁶⁻⁸ Some beneficial outcomes have resulted from A&F processes with the Cochrane review⁹ reporting an overall 4.3% increase in compliance with requested practice in a variety of clinical fields. It has also been shown that when A&F is combined with action planning there is a greater improvement in implementation of best practice guidelines and practice change.^{8,10} Falls prevention is a worthwhile focus of clinical audit as the acute care cost of falls per annum in Australia was estimated to be A\$648.2 million, of which a disproportionate amount is attributable to falls that occur among older people in RAC settings.¹¹ Recommendations for conducting an effective clinical audit suggest the involvement of multidisciplinary workplace staff will help provide a broad range of authentic views.^{12,13} However barriers to staff conducting audits have been identified as staff having limited time due to competing priorities and a lack of clinical leadership and interdisciplinary involvement.¹²⁻¹⁵

We determined that an operationalised community of practice (CoP) that led falls prevention action across the RAC organisation would be well placed to conduct clinical audits of falls prevention activity. CoPs have been emerging in the healthcare sector as a resource for bringing together expertise for problem solving and actioning new policy and practice.¹⁶ The CoP in the present study, which was established according to principles of successful CoPs in healthcare,¹⁶ connected and used the knowledge and skills of multidisciplinary RAC staff working with academic researchers in falls prevention. If the CoP could successfully conduct the audits, this connection could create a powerful feedback loop for translation of falls prevention evidence into practice.

The aims of the study were:

- (1) to evaluate if a CoP could conduct falls prevention activity clinical audits;
- (2) to determine if a CoP could identify gaps in falls prevention practice; and
- (3) to identify barriers to the adoption of CoP planned falls prevention activities and facilitated actions

Methods

Design

A cross-sectional survey using a validated audit tool¹⁷ adapted for RAC evaluated current falls prevention activity across 13 RAC sites of a not-for-profit organisation. The audit was planned by the falls prevention CoP based on the five stages of the audit cycle (Fig. 1) and audit performance was benchmarked using a matrix of predetermined elements for effective clinical audits.¹²

Participants and setting

This study formed part of a larger project investigating the impact of a falls prevention CoP in a RAC setting. The protocol for the larger project has been described elsewhere.¹⁸ The audit was coordinated by the CoP. The CoP was made up of 20 multidisciplinary staff that included four (20%) nurses, four (20%) care managers and 12 (60%) allied health professionals employed by a not-for-profit RAC provider across 13 geographically diverse sites in metropolitan Western Australia. Eighteen (90%) were women and two (10%) men, with 13 (65%) aged between 40 and 59 years. Sixteen (80%) CoP members had been employed at their RAC site for more than 1 year, with 10 (50%) having more than 6 years' experience in their current job role. Eleven (55%) had completed a bachelor degree in their field. CoPs characteristically have a facilitator, a lead position, from within its membership and the RAC organisation nominated their allied health consultant for this role. CoP members interacted frequently using the organisation's intranet supported by three annual face-to-face meetings. The RAC organisation provided care in a home-like environment to a total of 779 older people and was staffed by around 1185 full- and part-time care staff.



Fig. 1. Study overview, adapted from Benjamin.¹²

Data collection and procedure

Stage 1

A face-to-face training session was organised for CoP members to familiarise them with the audit requirements and address any queries. In preparation for conducting the audit at their RAC site, CoP members used a researcher-designed template that required the CoP members to identify site staff who could assist them and perceived barriers to audit data collection at their RAC site. Any barriers identified by individual CoP members were shared and discussed with the entire CoP to allow a range of potential facilitators to be generated.

Stage 2

A previously validated falls prevention audit tool¹⁷ was selected that aligned with best practice recommendations.⁴ The audit tool comprehensively addressed nine falls prevention domains, including risk factor assessment, monitoring, education for staff and residents, the environment, organisational support and a range of interventions including harm-minimisation equipment and prescribed exercise programs. It contained both open and closed responses, measuring items such as the proportion of residents supplemented with vitamin D, proportion prescribed low-low beds and the frequency of medication review (see Table S1 available online as Supplementary Material to this article).

Stage 3

A web-based CoP discussion on a secure organisational webpage determined the commencement date and time for the 13 site audits, taking into account RAC site staff availability. CoP members coordinated the completion of the audit at their RAC site assisted by site staff namely care managers, nurses and allied health professionals. Multiple data sources were scrutinised including policy, process and care management documents in conjunction with observing clinical practices. Discussions with nursing and allied health assistants, cleaners, laundry and maintenance staff also contributed to establishing whether everyday practices reflected current policies.

Stage 4

Completed RAC site audits were collected by the CoP facilitator and delivered to the researchers for analysis. The CoP discussed feedback from the audit findings to determine the falls prevention areas for improvement in conjunction with barriers and facilitators to implementation. A plan of CoP actions for achieving falls prevention improvement at RAC sites was then developed, for example increasing the proportion of residents supplemented with vitamin D at RAC sites could be facilitated by CoP access to geriatricians to educate general practitioners (GPs) on the benefits of prescription to reduce falls rates.

Stage 5

The CoP determined that the best time for repeating the site audits would be following implementation of all prioritised falls prevention activities.

Ethical considerations

Clearance for the study was obtained from the human research ethics committee of the university and board of the RAC organisation; all CoP members provided written consent to participate.

Data analysis

Qualitative data that described the audit process were collected and transcribed from CoP training documents, CoP posts on an electronic discussion board, CoP emails and researcher journal observations into a Microsoft Excel 2013 spreadsheet (Microsoft Corporation, Redmond, WA, USA). Two independent researchers familiarised themselves with the data by reading the transcripts several times. These data were subsequently analysed using deductive content analysis.¹⁹ Data describing the CoP conduction of the audit process were mapped against elements (categories) of effective clinical audit¹² using a structured category matrix¹⁹ to address Study Aim 1.

Quantitative data drawn from the audit were entered into the SPSS statistical software package version 22 (IBM SPSS Inc., Chicago, IL, USA). Audit data were summarised using descriptive statistics.²⁰ Audit domain findings were mapped against evidence-based best practice recommendations to address Study Aim 2.

Qualitative data exploring any potential barriers and facilitators to engaging in falls prevention activity were mapped against audit domains using deductive content analysis¹⁹ to address Study Aim 3. Trustworthiness of the data was determined through discussion and consensus amongst CoP members regarding category naming and grouping. The CoP then used the mapping procedure to develop a falls prevention action plan.

Results

The CoP conducted the organisational falls prevention activity audit at all 13 RAC sites led by the site CoP member(s). The CoP audit and action plan met all five criteria for an effective clinical audit as shown in the Supplementary Material (Table S1). The CoP provided multidisciplinary, local leadership for assessing the high-cost problem of falls in RAC in tandem with assessing falls prevention processes and outcomes. These processes, practices and outcomes were measured using a validated audit tool that aligned with best practice guidelines.¹⁷ CoP preparation for auditing at sites identified lack of time due to demands of staff's usual clinical duties as the main barrier to conducting the audit. The CoP met and discussed barriers and facilitators. This resulted in the identification of the best times to conduct audit tasks as before shift handover and during resident meal times, as these aligned with periods of lower clinical activity demand. CoP members subsequently engaged site nurses to assist with the audit domains of medications and continence, occupational therapists regarding equipment and environment, physiotherapists regarding risk assessment and exercise programs and care managers to assist with audit of policy and monitoring. This resulted in the burden of the audit tasks being shared, which facilitated conduct of the audit. Three RAC sites completed the audit tool electronically and 10 completed a paper copy. CoP member feedback post audit determined the audit tool was user friendly in layout because it contained mostly tick boxes but also

had spaces to add comments. CoP members reported feeling empowered after undertaking the falls prevention activity audit process, as it had raised their awareness of gaps in clinical practice and motivated them to take action:

'I thought we were already doing everything we could for falls prevention.' (CoP member 1.)

'There's a lot more to it [falls prevention] than I thought' (CoP member 4.)

Audit findings were discussed at subsequent CoP discussions priority gaps in falls prevention practice were identified across each audit domain. This was achieved by comparing the audit findings against falls prevention evidence and best practice recommendations.^{3,4} The RAC organisation's level of compliance with falls prevention evidence and best practice recommendations for these priority areas are described in Table 1.

Audit findings that met or were close to complying with evidence and best practice recommendations included the following: medication reviews were undertaken annually by a pharmacist at 10 (76.9%) sites, as required at all 13 (100%) sites by visiting GPs and 10 (76.9%) sites also reported a nurse practitioner reviewed medications as requested. All 13 (100%) sites provided resident continence assessments with appropriate toileting programs. There was a 98% compliance rate for hip protector use in residents identified as suitable candidates for use (13.9%). Resident's feet condition was reviewed every 6 weeks at all 13 (100%) sites by a podiatrist, footwear was checked annually at four (30.8%) sites by the physiotherapist and a process for assessing sensory deficits and aids (visual and auditory) was in place at 10 (76.9%) sites. Low-low beds were used by residents across all sites identified as at risk of falls when attempting to get up from bed unassisted (14%) and surveillance measures were operational at 11 (84.6%) sites.

Table 1. Priority findings from the falls and falls injury prevention activity audit conducted by the community of practice (CoP)
Ax, assessment; RAC, residential aged care

Audit domain	Compliance measure	Recommendation/standard	Findings
Vitamin D supplementation	Mean (s.d.) proportion residents supplemented vitamin D 41.5% (23.7)	Improve provision of adequate vitamin D supplementation (>800 units/day) for all RAC sites	No CoP members ($n=20$) were aware of the Level I evidence regarding effectiveness of vitamin D supplementation in reducing falls rates
Staff education	6 (46.2%) sites	Falls prevention training provided for all RAC staff. Training should be interactive, experiential, risk factor focussed and explanatory of staff role.	No mandatory falls prevention training. Sites providing annual tutorial at staff meeting had non-standardised content, less than 50% of staff attended
Fall definition documented	2 (15.4%) sites	RAC facilities should adopt a consistent fall definition and process to ensure consistent uptake by all staff	Site definitions not standardised or clinically explained therefore subject to interpretation; impacts reliability of falls reporting
Falls prevention policy	0 (0%) sites	Multifactorial approach using standard falls prevention interventions should be routine care for all residents	Falls management policy (post fall) in place across all sites but multifactorial falls prevention not systematically addressed
Falls risk assessment on admission	12 (92.3%) sites	All older persons admitted to RAC receive falls risk Ax, on admission, post fall, after change in health condition and after change in built environment. Identified risk factors addressed with appropriate intervention	Falls risk assessment tool previously implemented by organisation covered 4/14 recognised falls risk factors with no clear alignment process to falls prevention strategies in resident care plan
Falls risk assessment after change in health condition	4 (30.8%) sites		
Falls risk assessment after change in environment	9 (69.2%) sites		
Falls risk assessment annually	2 (15.4%) sites		
Individualised balance exercise programs provided	7 (53.8%) sites	Supervised individual balance exercises, 2h per week cumulatively for improvement	Cumulative balance exercise duration range 5–60 min weekly. Duration dose delivered was suboptimal
Included exercises in standing position (ability dependent)	11 (84.6%) sites	Challenging resident limit of stability	No current psychometric measure of balance intensity. Difficult to determine if individual resident's limits of stability were challenged
Resident education	6 (46.2%) sites	Engaging older people integral to preventing falls. Continuous prompts and reminders required to execute falls prevention strategies.	Sites delivered <i>ad hoc</i> non-standardised resident falls prevention information. Methods for promoting resident engagement in falls prevention action not reflected in policy

Overall, existing falls prevention processes were perceived by staff to be working well at eight (61.5%) sites.

The CoP planned falls prevention activities and discussed barriers and facilitators to adoption at sites as shown in the Supplementary Material (provided as online Table S2). Priority falls prevention activities that were planned included improving the proportion of residents supplemented with vitamin D, designing a mandatory falls prevention staff education program, defining falls and developing a falls prevention policy.

Discussion

Meeting the criteria for effective clinical audit¹² was achievable by a CoP as members were able to share knowledge, discuss findings and action change in falls prevention activity. This aligns with the structure and purpose of CoPs described in the literature as models for collaboration and innovation.¹⁶ The CoP was able to overcome some of the barriers to audit reported in other studies through interaction.^{13–15} Lack of staff time, due to competing priorities, was partly overcome by the CoP sharing audit tasks with other site staff to reduce the burden. Lack of clinical leadership and interdisciplinary involvement was addressed in that CoP members provided audit leadership at their respective sites and were themselves multidisciplinary clinicians. The present study involved RAC staff in the audit process unlike a similar project conducted in RAC facilities that used external project officers as auditors.²¹ Involving workplace staff in quality improvement initiatives, such as clinical auditing, has been shown to be more successful than using external experts^{10,13} as staff will be the ones responsible for translating evidence into practice. The CoP was instrumental in contributing to the success of the A&F process as CoP members were RAC site staff with existing peer relationships. A&F is reported as being more effective for changing clinical practice when delivered by a peer or supervisor in both verbal and written formats.^{6,8,9} The establishment of the CoP across the RAC organisation to sustain clinical practice improvement fulfils an important recommended step in audit cycles.^{12,13}

The results of the falls prevention activity audit demonstrated there were gaps in practice, including lower levels of vitamin D supplementation and staff falls prevention training. Supplementing older people in RAC with vitamin D has been shown to reduce falls rates,^{3,22} with 89% of the population reported as having deficient or very low levels,²² but the present study found the mean proportion of residents supplemented was less than half this value. Staff education implemented as part of a multifactorial approach to falls prevention has delivered a 50% reduction in the number of resident falls.²³ However simply providing generic educational material in brochures or handouts, as identified at six (46.2%) RAC sites, is reported as having little effect on staff adopting falls prevention actions. Interactive, authentic education tailored to staff subgroups and accessible to all is recommended.^{24,25} Our results relating to lower levels of vitamin D supplementation and falls prevention training demonstrate that the process of evidence translation to practice was not complete.

Barriers to CoP-planned actions centred on an uncoordinated approach to falls prevention. This finding may have contributed to the variation in compliance with best practice recommendations

seen across the RAC sites. Facilitators to CoP actions centred on access to external experts, which suggests that research institutions should permanently align themselves with RAC organisations and take a more active role in the translation of evidence into practice.^{21,26}

A key strength of this study was the inclusion of staff at all 13 sites, led by the CoP, in conducting the audit as opposed to solely using an external agency. The characteristics of a CoP include membership through shared practice across organisational boundaries, with a common topic of focus. Members engage in sharing knowledge and innovate for change through frequent interaction.¹⁶ Our CoP connected staff from all 13 RAC sites to address the topic of auditing falls prevention. CoP member access to frequent web-based communication enabled a coordinated, collaborative approach to clinical audit and the shared expertise of the membership fulfilled the multifactorial requirements of the falls prevention-activity audit enabling a more efficient and effective completion. As the CoP was established by the RAC organisation as a sustainable approach to falls prevention the CoP has the capacity to repeat this clinical audit process enabling continuous review of performance.^{4,12} Although the audit was cross-sectional, spending time identifying gaps in practice and barriers to implementing falls prevention activities was recommended to further enable the adoption of practice change.^{12,27}

Conclusions

A CoP was able to conduct an effective falls prevention activity audit at all 13 RAC sites included in the study. Audit findings and subsequent actions were informative for the RAC organisation for measuring falls prevention performance and planning improvement. Gaps in falls prevention practice highlighted that falls prevention evidence required more consistent translation across the RAC organisation. Similar RAC organisations may also benefit from undertaking this A&F process and action planning. We recommend the use of a workplace group of multidisciplinary staff with access to quality evidence, such as a CoP, to translate evidence into practice.

Competing interests

None declared.

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Appendix I:

CoP Member 24 Months Post CoP Operation Survey

Final Survey of Falls Prevention Community of Practice Members Nov 2015

PARTICIPANT INFORMATION

TITLE: Exploring and describing the experience of staff as members of a Falls Prevention Community of Practice in a residential aged care provider organisation

INVESTIGATOR(s): Jacqui Francis-Coad and Dr Anne-Marie Hill

By clicking on the link in the email sent to you by Debbie Nobre you have been brought to this site and are invited to take part in a follow up online survey. *Thank you :)*

What is the study about?

This study aims to explore and describe the experience of staff as members of a Falls Prevention Community of Practice in a residential aged care provider organisation. The findings from this survey will contribute to a larger research project that aims to investigate the impact of a falls prevention CoP in a residential aged care setting.

What will I be asked to do?

If you continue, you will be taken to the questionnaire. This questionnaire should take around thirty minutes of your time to complete.

Are there any risks associated with participating in this study?

There are no foreseeable risks associated with this study.

What are the benefits of the research study?

The study will explore staff experiences of CoP membership. The repeated measures for CoP member capability, opportunity and motivation to engage with ICT and perceived risk of falls, knowledge of falls and falls prevention strategies will also be compared with baseline data. Findings will inform sustainability of CoP operation and explanation of facility and organisational outcomes.

Can I withdraw from the study?

Participation in this survey is completely voluntary. If you agree to participate, you can withdraw from the survey at any time. However you cannot withdraw after you submit your survey, as surveys are non-identifiable.

Will my results remain confidential?

No one person will be identified in the survey results. The results will be presented collated/grouped from respondents. Responses will be stored securely in the School of Physiotherapy at The University of Notre Dame Australia for a period of five years.

Will I be able to find out the results of the survey?

We will email a summary of the survey to all those who receive this initial invite regardless of

participation.

Who do I contact if I have questions about the study?

Please feel free to contact Jacqui or Anne-Marie if you have any questions.

jacqui.francis-coad@nd.edu.au

anne-marie.hill@nd.edu.au

PARTICIPANT INFORMATION

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at The University of Notre Dame Australia (approval number). If participants have any complaint regarding the manner in which a research project is conducted, it should be directed to the Executive Officer of the Human Research Ethics Committee, Research Office, The University of Notre Dame Australia, PO Box 1225 Fremantle WA 6959, phone (08) 9433 0943, research@nd.edu.au

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

How do I begin?

By clicking the link to begin you are indicating your consent to be a part of this project.

Yours sincerely,

Jacqui Francis-Coad

Dr Anne-Marie Hill

Final Survey of Falls Prevention Community of Practice Members Nov 2015

Section 1 – Your details

* 1. Please state your personal identification Code number (eg F16) in the box below:

* 2. How long have you been a member of the falls prevention CoP?

Please state your answer in months

Final Survey of Falls Prevention Community of Practice Members Nov 2015

Section 2 - Falls Prevention Community of Practice Communication and Experience

* 3. I use the following technologies: (Tick as many as appropriate)

- Email
- Internet
- Social media (eg Facebook/Twitter etc)
- Other

Other (please specify)

* 4. I use the Brightwater intranet as part of my every day work practice (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 5. I have easy access (i.e. a computer that is available for your use) to the Brightwater intranet at my work site/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 6. I am confident to use the Brightwater intranet to communicate with other staff members (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 7. I have time to use the Brightwater intranet at my work site/facility for CoP participation (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

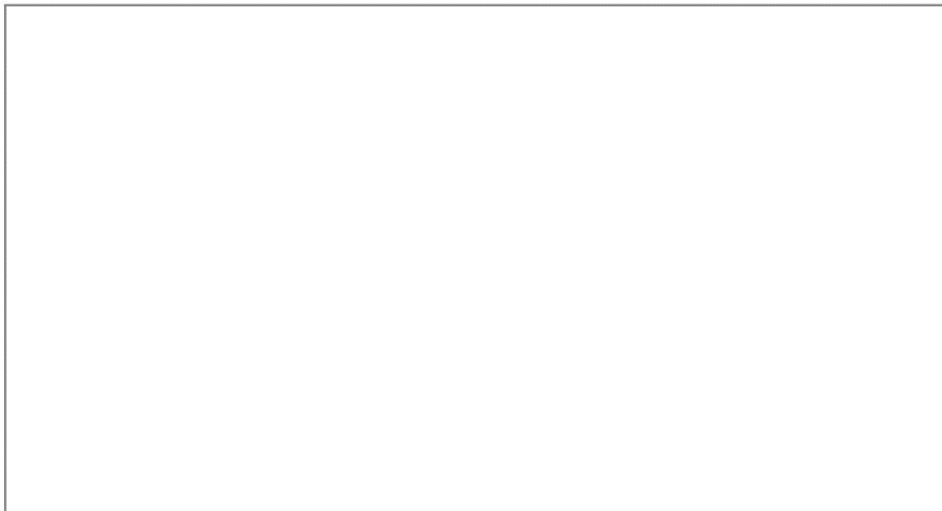
* 8. I feel confident to use the electronic discussion board for communicating with other CoP members (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

9. Were there any barriers in using the Brightwater intranet for CoP communication on which you would like to comment?



10. Is there anything you think would facilitate CoP communication using the Brightwater intranet on which you would like to comment?



* 11. What do you feel you have gained by participating in this CoP?



* 12. I have fully participated in CoP tasks / activities (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 13. My RAC facility has been represented in CoP discussions through my level of participation (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 14. Participating in the CoP gives me access to information demonstrating successes of falls prevention evidence-based practice (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 15. Participating in this CoP has resulted in my adopting evidence-based guidelines/practice in my work practice (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 16. Getting access to information that demonstrates falls prevention evidence-based practice makes it more likely that I would adopt evidence-based practice in my work (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 17. Participating in this CoP provided me with the opportunity to discuss falls-related problems in a non-judgemental environment (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 18. Participating in this CoP has provided me with access to experts in the field of falls prevention that I would otherwise have found difficult to obtain (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 19. Being a member of this CoP gives me access to a trusted colleague that I can turn to for advice or a second opinion, when needed (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 20. Getting access to multi-disciplinary relationships with other professionals through membership of the CoP helps me improve my work practice (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 21. Being a member of this CoP has impacted positively on my professional development (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 22. My Care Manager (or Manager) has fully supported my participation in the falls prevention CoP (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 23. In my opinion I have fulfilled my commitment as a RAC site representative on the falls prevention CoP (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 24. Lower levels of member participation in CoP discussions and tasks has inhibited CoP achievement (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 25. Attending the face-to-face meetings organised by the CoP helped me establish links with other clinicians involved in falls prevention (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 26. Being a member of this CoP has helped at least on one occasion in my ability to solve a work-related problem (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 27. Please list up to three definite examples of how your work/practice has changed as a result of your participation in CoP activities and/or accessing resources provided by the CoP

* 28. The work of this CoP has resulted in my RAC site successfully implementing evidence-based guidelines/practice (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 29. The work of this CoP has resulted in my RAC site developing a new program or process(es) to improve falls prevention (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 30. The work of this CoP has resulted in my RAC site achieving reduced falls or injurious falls (Tick one)
You can use your RAC site i-care falls incident data as a guide

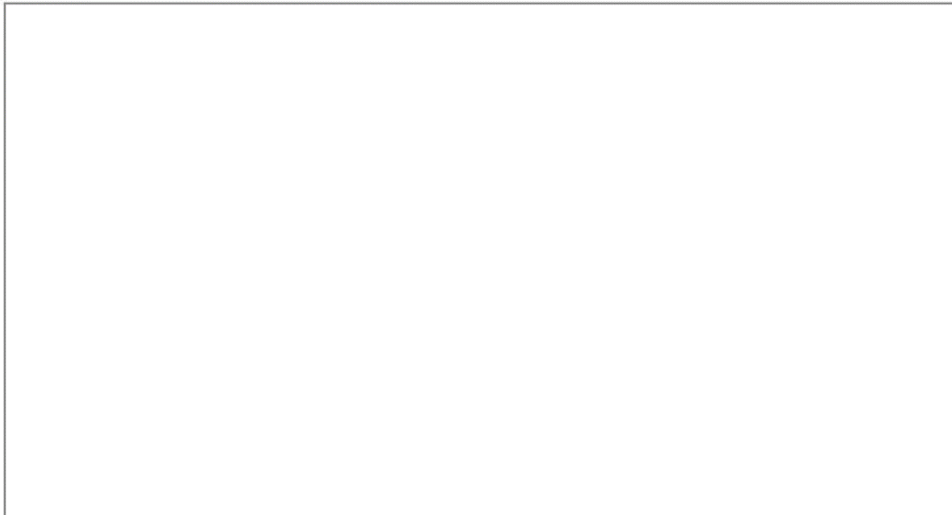
- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 31. Please tell us if you have suggested or changed anything in your RAC site environment to prevent falls?

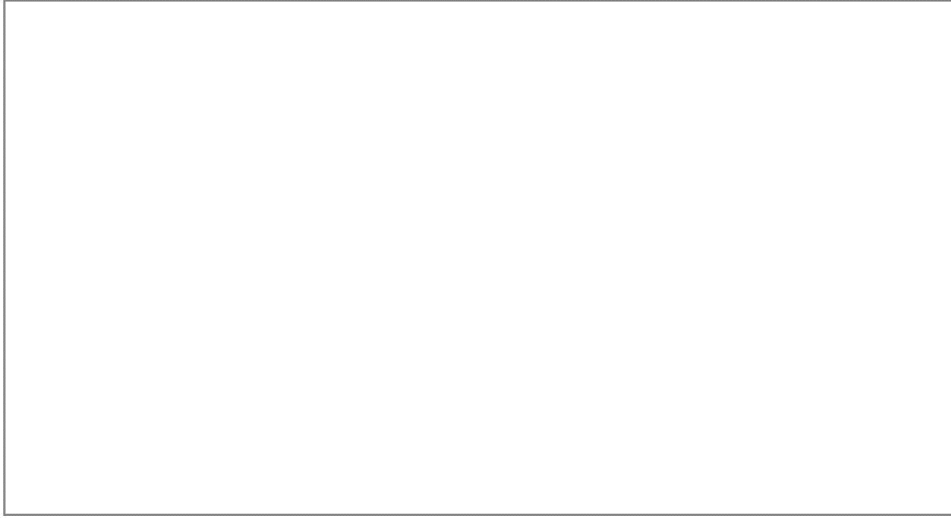
* 32. Please tell us if you have shared any falls prevention information with staff (eg at a staff meeting, handover or iCare message of the day) at your RAC site? and if so what information?



* 33. Please tell us if you have shared any falls prevention information with residents (eg at a resident meeting, group activity or treatment session) at your RAC site? and if so what information?



* 34. In your opinion what are the key factors in enabling CoP success?



* 35. In your opinion what are the key factors limiting CoP success?



Section 3 – Falls and Falls Prevention

* 36. How would you define 'a fall'?

* 37. Have you participated in any falls prevention training since joining the CoP? (Tick one)

- Yes
- No
- Unsure

38. If you answered 'Yes' to the previous question please briefly describe the training (eg Internal – at BW training centre / your site or External - conference or workshop)

* 39. State the falls prevention strategies that you are aware of for your residents:
(note – there is no minimum or maximum number required in this list)

* 40. From your answer to the previous question, which falls prevention strategy would you rate as most effective in residential aged care?

* 41. I am regularly informed (eg monthly reporting) of the number of falls or falls rates at my workplace/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 42. A "FALLS CHAMPION" is a person who assumes a leadership role in raising awareness, actioning and evaluating falls prevention management in the work place.

I feel motivated as "falls champion" at my work site/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

* 43. I feel confident as "falls champion" at my work site/facility (Tick one)

- Strongly Disagree
- Disagree
- Undecided
- Agree
- Strongly Agree

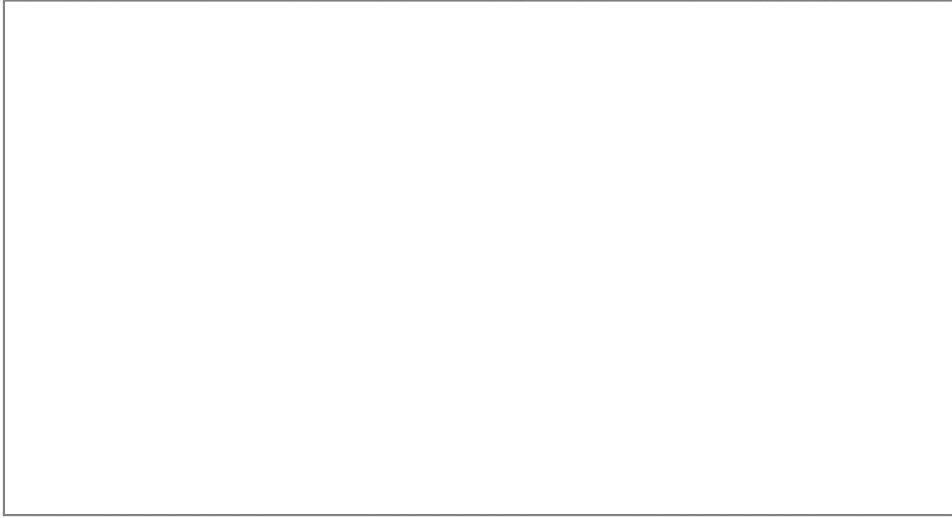
* 44. I think representatives from the following groups of people helped me action falls prevention management at my work site/facility (Tick one response in each row)

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
Care Managers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nurses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Personal Care Assistants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Physiotherapists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Occupational Therapists	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Therapy Assistants	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Kitchen staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cleaning staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laundry Staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Brightwater volunteers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Residents	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Resident' family members	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

* 45. Can you identify any difficulties to implementing falls prevention strategies at your RAC site?

46. Do you have any other comments in relation to falls prevention and your facility at Brightwater?

A large empty rectangular box with a thin black border, intended for the respondent to provide their comments on falls prevention and the facility at Brightwater.

You have now completed the questionnaire,

Thank you for your kind participation.

Appendix J:

Excerpt from Research Observation Journal

Researcher Observation Journal

February 2015

Turned up to speak at the staff meeting only to find it had been cancelled. Fortunately the DCM was able to round up carer staff at morning tea where JH was able to brief them about the survey. Left participant information sheets with DCM to be referred to at handovers to promote carer survey. Liaised with admin staff to assist in notifying when staff payslips arrive to organise stapling of questionnaire to payslip. Take stapler, pens, poster, collection box, lollies and cakes.

Practice point - phone RAC site the day before a meeting/event is scheduled as a REMINDER! So much is going on that things can easily be forgotten.

Testing care staff questionnaire at alternative site

Five staff completed the questionnaire around a table in the same room. The researcher was available for consultation if there were any queries or to clarify any mis-interpretation. Several small glitches were identified, most importantly the word STOP falls was perceived as stopping a resident who is starting to fall from ending up on the floor! This was replaced with PREVENT with the connotation that a resident could be stopped from having a fall (See hard copy of questionnaire with changes).

Grass roots falls festival Feb 19 & 20

This was an excellent local event with three CoP members attending (AE, AP & NB). Take away messages from CoP members for inclusion in CoP newsletter:

NB – Falls prevention being about good holistic patient care. Taking a Proactive approach to prevention (rather than Reactive, waiting for falls to occur) by having “Intentional Patient Rounding” check hourly (or 2):

Positioning (for comfort)? Pain? Hydration? Continence? Satisfaction (re-assurance that someone is there if they need them)? Environment (call bell and aids within reach, grip socks on or barefoot)

AE – Medication review with withdrawal of psychotropics etc. Risks outweighing benefits for Benzo’s in only resulting in 25mins more sleep/night but drowsiness/unsteadiness during daytime. Better balance program, TA’s must make resident’s ‘wobble’ ie challenge limits of stability.

AP – Traffic lights labelling (red, orange and green tape/ribbon) for walking aids quick visual guide indicating level of assistance resident requires.

Appendix K:

Care Staff Survey Conducted as Part of CoP Falls Prevention Activity



This questionnaire will assist us to find out more about falls prevention in residential aged care homes. Your responses will help to inform future training for staff in falls prevention.

This questionnaire will take approximately 15 to 20 minutes. All responses are anonymous and confidential. We appreciate your time to complete this survey.

Section 1 – Your details

1. Please state your gender: *(Please tick one)*
 - Male
 - Female

2. Which age group describes you based on your last birthday? *(Please tick one)*
 - 18-19 years
 - 20-29 years
 - 30-39 years
 - 40-49 years
 - 50-59 years
 - 60-65 years

3. What is the highest level of learning you have done? *(Please tick one)*
 - Left school before Year 10
 - Completed Year 10
 - Completed Year 12
 - TAFE (Certificate I to IV) (Please specify: _____)
 - Graduate Certificate (Please specify: _____)
 - Graduate Diploma (Please specify: _____)
 - Bachelor degree (Please specify: _____)
 - Master degree (Please specify: _____)
 - Other and / or overseas (Please specify: _____)



4. How long have you worked as a carer for older people either at this organisation or somewhere else? *(Please tick one)*

- more than 3 months but less than 6 months
- 6-12 months
- 1-2 years
- 3-5 years
- 6-10 years
- more than 11 years

5. How long have you worked at this organisation? *(Please tick one)*

- less than 6 months
- 6-12 months
- 1-2 years
- 3-5 years
- 6-10 years
- more than 11 years

6. What level(s) of care are you involved in delivering for the residents?
(Please tick all that apply)

- High level care
- Low level care
- Dementia specific care
- Unsure

7. What shift(s) do you work? *(Please tick all that apply)*

- Morning
- Afternoon
- Night

8. What language do you mainly speak at home? *(Please tick one)*

- English (please go to question 10)
- Other (Please specify: _____)



15. List any things you think could prevent residents **injuring** themselves if they fall.

16. When thinking of all the residents at your site (as a group), would you say they were: *(Please tick one)*

- At very high risk of falls
- At moderate risk of falls
- At low risk of falls
- Unsure

Section 3 – This section asks about how you think about falls prevention when you are completing your shifts. Please read the following statements and rate your response.

17. When working my rostered shift, I feel confident that I know what to do to prevent residents from falling. *(Please tick one)*

- Strongly agree
- Agree
- Undecided
- Disagree
- Strongly disagree

18. When working my rostered shift, I am keen to prevent residents from falling. *(Please tick one)*

- Strongly agree
- Agree
- Undecided
- Disagree
- Strongly disagree

19. When working my rostered shift, I am confident that I can complete actions that can prevent residents from falling. *(Please tick one)*

- Strongly agree
- Agree
- Undecided
- Disagree
- Strongly disagree

20. What percentage of older people do you think fall in residential aged care homes every year? *(Please tick one)*

- 10%
- 20%
- 50%



21. What would you do if a resident has fallen over during your shift? Briefly describe the actions you would take.

22. Do you get any information at work on how to prevent residents from having a fall? *(Please tick one)*

Yes No Unsure

23. Is there a falls prevention plan in the notes of the residents you are currently working with? *(Please tick one)*

Yes (Answer Q. 24) No (Go to Q. 25) Unsure (Go to Q. 25)

24. If you answered Yes to the question 23, could you tell us a bit about the plan to help you stop residents you care for falling?

25. Do you share information with other care staff at work about how to prevent falls for the residents you care for? *(Please tick one)*

Yes No Unsure

26. I work as part of a team (nurses, manager, physiotherapist, other organisational staff at facility) to prevent falls in my work place *(Please tick one)*

Strongly agree Agree Undecided
 Disagree Strongly disagree

27. I think falls are a serious problem in residential aged care homes.
(Please tick one)

Strongly agree Agree Undecided
 Disagree Strongly disagree



28. I think falls are a serious problem across this organisation.

(Please tick one)

- Strongly agree Agree Undecided
 Disagree Strongly disagree

Section 4 – This section asks you about how you think falls prevention training could be provided to care staff in this organisation

29. I think I have already had enough training about how to prevent falls.

(Please tick one)

- Strongly agree Agree Undecided
 Disagree Strongly disagree

30. If the organisation gave care staff training on preventing falls in the future, would you like training to be: *(Please tick one)*

- E-learning (using a computer to watch, read and comment on falls and falls prevention)
 Watching a DVD on falls and falls prevention
 Attending an 'In-service' training session on falls and falls prevention including listening to a talk, watching some video clips and having a discussion

31. Where would you like to attend training on preventing falls? *(Please tick one)*

- Organisation's central training centre
 Your facility
 No preference

32. Would you like reminders to help you know and use actions to prevent falls when you are at work? *(Please tick one)*

- Yes No Unsure

33. If you answered Yes to question 32, what type(s) of reminder would you like? *(Please tick one)*

- Written checklist in resident file
 Picture/photographic checklist in resident file
 Written checklist on the back of my name badge
 Posters around facility



34. What language(s) would you like the information on preventing falls to be available in? Please specify.

35. What do you think could make it difficult to carry out falls prevention actions during your shift?

36. Please tell us anything else you think would help make this questionnaire easier for other care staff to answer.

Thank you so much for your help.

Appendix L:

Resident Survey Conducted as Part
of CoP Falls Prevention Activity**Demographic information to be gathered from iCare pre-questionnaire administration:**

Age (at last birthday): years

Length of Stay (calculated from Admission date): months

MMSE score: /30 (check with site Occupational Therapist)

Please circle,

Gender: M F

Ambulant: Yes No

If ambulant,

Type of walking aid:

If non-ambulant,

Type of wheelchair:

Type of Transfer:

Faller : Yes No

If yes,

Number of falls:

RESIDENT QUESTIONNAIRE



Research assistant to administer. Please circle ALL closed responses.

Awareness of personal risk

1) I think that older people who live in care homes like this one are at risk of falling over.

Strongly agree Agree Undecided Disagree Strongly disagree

2) I think that if an older person who lives here falls over they are likely to get a serious injury (such as a sprain, broken bone or bumped head).

Strongly agree Agree Undecided Disagree Strongly disagree

3) I think that I will fall over at some time whilst living here.

Strongly agree Agree Undecided Disagree Strongly disagree

4) I think that if I were to fall over I would be likely to get a serious injury

Strongly agree Agree Undecided Disagree Strongly disagree

Knowledge

5) At a guess, if we talked to 100 older people living in care homes like this one, how many do you think fall over? (can prompt for a percentage or show resident the chart of 100 figures and ask them to point to the area representing their estimate)

Record number: /100

6) Why do you think older people fall over? (can prompt with "tell me the reasons")



7) (Non-faller) If you were to fall over whilst living here where would it most likely happen? **OR**
(Faller) If you have fallen whilst living here where did it happen?

bedroom / bathroom or toilet / kitchen / dining area / lounge area / corridors / outdoor area around this care home / other

8) Can you think of at least one thing that might be able to lower your risk of having a fall?

(more than one answer if possible, prompt "are there any others you can think of?")

Confidence

9) I am confident that I could _____
(insert the most important thing mentioned in Qu 8) to lower my risk of falling.

Strongly agree Agree Undecided Disagree Strongly disagree

10) Something that might make it difficult for me to do the strategy I mentioned (in Question 9) is...



Motivation

11) I am very keen to lower my risk of falling whilst living here by using these strategies (referring to the “most effective” strategy that the participant has just identified).

Strongly agree Agree Undecided Disagree Strongly disagree

12) I am very keen to maintain my mobility (or transfers) without help (or with minimal help) from the staff.

Strongly agree Agree Undecided Disagree Strongly disagree

13) I am very keen to maintain my independence with everyday tasks I can manage without help from the staff.

Strongly agree Agree Undecided Disagree Strongly disagree

Other

14) I have the opportunity to maintain my mobility (or transfers) whilst living here.

Strongly agree Agree Undecided Disagree Strongly disagree

15) I have the opportunity to maintain my independence with every day tasks I can manage whilst living here.

Strongly agree Agree Undecided Disagree Strongly disagree

16) What is the one thing you think could keep you safe from falling whilst living here?



17) Is there anything else the staff or Brightwater could do to help prevent you from having falls?

18) Are you doing any exercises here? If yes, in a group or individually, what type, how often for how long? (flexibility [joint movement] strength [using weights or resistance] balance [sitting/standing] or games like bowls etc)

19) Which falls prevention message do you think would be most effective? (Can prompt “dangers like breaking your hip”)

One that:

Highlights the dangers of falling **OR** Highlights your safety, health and wellbeing

20) If Brightwater were providing you with some safety and falls prevention information would you prefer to receive

a brochure / a poster for your room / something to watch on TV or a screen / other



21) Would you like your family to be provided with some safety and falls prevention information?

Yes No

Note if they say why not _____

22) Have you found any of these questions hard to understand? If so, which?

Research assistant to read back open responses to participant for verification.

Thank resident for their kind assistance and inform them that we will let them know the results of this survey in the Brightwater newsletter.

NOTES:

Appendix M:

Care Manager Feedback Survey on Perceptions of CoP Impact at Sites

Questions for Care Managers:

Please name the CoP member(s) at your site:

Do you think your CoP member(s) have influenced falls prevention at your site?

Please circle YES NO UNSURE

Is the CoP a standing agenda item at your site staff meetings?

Please circle YES NO UNSURE

Is the CoP newsletter distributed at your site?

Please circle YES NO UNSURE

Do you think the content of the CoP newsletters is useful?

Please circle YES NO UNSURE

In your opinion, what has been the main impact of the falls prevention CoP?

Thank you for your kind participation 😊

Appendix N:

Sample of Coding for Qualitative
Content Analysis using COM-B Model

Barriers to CoP web-based (intranet) participation

	Finding the time with many other things to do . If the questions and topics posted were simple and I could give a quick response I was more likely to reply. Another barrier was not knowing if something was posted . This was fixed by the introduction of email notifications .
FP24	
FP19	Time to read, analyse, contribute to the discussion.
FP10	NA
FP5	General time constraints.
FP22	
	I don't have any experience with the use of the intranet - some one showed me how to get into the intranet when I started but I never needed to now when I am in front of the computer I sit alone so no one to ask!
FP29	
	Some initial gitches which were rectified - i.e notifications received when something new on the discussion board. Time - although have daily access to the computer not always feasible to balance work load and participating in CoP
F23	
FP3	I think emails are working better than the intranet .
	Lack of spare time . Also, communication boards could be a bit simpler, quicker such "Black Board" at UNI. Even if there was access I have forgotten where it was and I was relying only on emails. Also busy day schedule , I felt guilty if any of my colleagues sees me doing anything other than daily tasks.
FP1	
FP25	Time to allow for routine checking for messages. This was assisted by alerts being set up. Not a user friendly interface - the intranet is boring and not dynamic. It is time consuming to navigate .
FP21	
FP20	Main barrier was time .
FP26	
	I would have benefited from a lesson in how to use the electronic discussion board as I have never used one before.
FP28	
	Sometimes felt that it was the same people commenting (mostly physio's) which seemed to limit the conversation , rather than it being very broad across disciplines. Was easier to know there was a new topic introduced with email alerts , otherwise you had to think of looking in your busy day
FP14	
F12	Unsure how to log in!!! Possibly the instructions were lost or given out whilst I was on leave.
FP7	Yes, I found it cumbersome to continually check the discussion board , being onsite only 2 days/week .

Code: Capability=Purple, Opportunity=Green, Operational Barriers=Turquoise, Operational Facilitators=Yellow

Appendix O:

CoP Member Confidence, Motivation and Opportunity to Engage in Intranet Usage and Lead Falls Prevention Activity

Table N.1 CoP Member Confidence, Motivation and Opportunity Data

Table N.1 CoP Member Confidence, Motivation and Opportunity Data

Item	SA *Pre / Post	A *Pre / Post	U *Pre / Post	D *Pre / Post	SD *Pre / Post	No Resp *Pre / Post	Median(IQR) *Pre / Post	p value
I use the intranet as part of my everyday work practice	9/7	7/10	0/1	2/0	0/0	0/0	4.5(2-5)/4(3-5)	0.957
I have easy access to the intranet at my RAC site	11//11	6/7	0/0	1/0	0/0	0/0	5(2-5)/5(4-5)	0.480
I am confident using the intranet for communication with CoP members	5/6	12/11	0/1	0/0	1/0	0/0	4(1-5)/4(3-5)	0.564
I have time to use the intranet at my work site for CoP participation	3/2	10/6	3/7	1/3	1/0	0/0	4(1-5)/3(2-5)	0.190
I feel confident using the intranet discussion board with CoP members	2/4	9/9	5/2	2/3	0/0	0/0	4(2-5)/4(2-5)	0.589
I am regularly informed of falls outcomes at my RAC site	6/6	7/8	2/3	2/1	1/0	0/0	4(1-5)/4(2-5)	0.317
I feel motivated to be a falls champion at my RAC site	3/6	10/5	3/6	1/1	1/0	0/0	4(1-5)/4(2-5)	0.763
I feel confident to be a falls champion at my RAC site	2/4	11/7	2/6	0/1	3/0	0/0	4(1-5)/4(2-5)	0.305

Note. x= no data reported, #homes participating/non-participating, parenthesis denote control home data, *number residents in both phases, Adj= adjusted

*Pre CoP membership / 24 months Post CoP operation

SA Strongly Agree, A Agree, U undecided, D Disagree, SD Strongly Disagree, CoP Community of Practice, RAC Residential Aged Care

Appendix P:

**Matrix of Frequency Counts of CoP
Discussion Board Participation
and Post Sharing**

	P 1	P 2	P 3	P 4	P 5	P 6	P 7	P 8	P 9	P 10	P 11	P 12	P 13	P 14	P 15	P 16	P 17	Res	P 18	P 19
P1		1	1	0	0	0	1	0	1	0	1	0	1	0	0	1	1	1	0	0
P2	1		5	5	5	3	6	4	6	2	6	0	5	2	2	6	6	5	0	0
P3	1	4		4	4	6	8	6	7	2	7	0	7	2	2	9	9	9	0	0
P4	0	4	4		4	3	4	3	3	1	3	0	3	1	1	5	5	4	0	0
P5	0	4	5	4		3	6	3	3	2	3	0	3	2	2	6	6	5	0	0
P6	0	3	4	4	3		6	4	3	2	3	0	3	2	2	8	8	7	0	0
P7	1	4	5	3	3	5		4	5	1	5	0	5	1	2	8	8	7	1	0
P8	0	4	6	4	4	5	6		6	1	6	0	6	1	1	8	8	8	0	0
P9	1	5	5	3	3	3	5	4		2	6	0	5	2	2	5	5	5	0	0
P10	0	1	1	1	1	1	1	1	1		1	0	1	1	1	1	1	1	0	0
P11	1	7	6	3	3	3	6	5	9	1		0	6	1	1	6	6	6	0	0
P12	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0
P13	1	3	4	2	2	2	4	3	4	1	4	0		1	1	4	4	4	0	0
P14	0	1	1	1	1	1	1	1	1	1	1	0	1		1	1	1	1	0	0
P15	0	1	1	1	1	1	2	1	1	1	1	0	1	1		2	2	2	1	0
P16	1	7	11	8	6	9	12	8	8	2	8	0	8	2	3		15	14	1	0
P17	4	9	13	7	6	9	15	7	10	2	10	0	10	2	4	18		17	1	0
Res	4	19	32	21	17	21	31	22	24	5	24	0	24	5	7	39	39		1	0
P18	0	1	1	1	1	1	3	1	1	1	1	0	1	1	3	3	3	3		0
P19	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	

P=Participating CoP member, Res=Researcher

Appendix Q:

Published Manuscript
(Geriatric Nursing)
of Care Staff Survey Pilot
Contributing to Chapter 6

Title

Assessing knowledge, motivation and perceptions about falls prevention among care staff in a residential aged care setting

Abstract

Falls are a serious problem in residential aged care settings. The aims of the study were to determine the feasibility of surveying care staff regarding falls prevention, and describe care staff levels of knowledge and awareness of residents' risk of falls, knowledge about falls prevention, motivation and confidence to implement falls prevention strategies in a RAC setting. A custom designed questionnaire was administered to care staff at one site of a large residential aged care provider organization in Australia. The survey response was 58.8%. Feedback from staff was used to inform the administration of the survey to the wider organization. Seven (29.2%) care staff reported they were unsure or thought residents were at low risk of falls. Only five (20.8%) care staff were able to suggest more than three prevention strategies and only 13 (54.2%) were able to describe the residents' falls prevention plans. These preliminary findings suggest that education to change care staff behavior regarding falls prevention should target improving care staff knowledge and awareness of falls.

Introduction

Falls are a serious problem in residential aged care (RAC) settings with studies demonstrating up to 50% of the residents fall over within 12 months of admission.^{1,2,4} Falls rates among this population have been found to be approximately 1.6 falls per bed per year.^{1,3} and these falls frequently result in injury and disability^{3,4,5} with an estimated incidence rate of hip fracture between 3% and 5% annually.^{3,6,7} Risk factors for falls among residents include a history of falls, use of walking aids, reduced balance and some categories of medication,^{8,9} but studies identify that in RAC and hospital settings environmental factors such as lighting, bed height and flooring are also strongly implicated in patient falls.^{1,8,10}

These frailer, older people are often restricted in activities of daily living (ADL) (81.3% have some form of disability) and it is estimated that 68% have a cognitive impairment, meaning they are potentially more vulnerable to falls.¹¹ Therefore undertaking falls prevention strategies independently, on a daily basis, may be beyond the physical and cognitive capabilities of the majority. Hence, care staff are important stakeholders in assisting residents to prevent falls in RAC settings.^{8,12} Care staff, also known as certified nursing assistants or care workers in Australia,¹³ are responsible for supporting nurses in providing patient care. They provide direct assistance to residents for ADL, but do not undertake university education and may only have undertaken informal workplace training.¹⁴ Previous studies have estimated that care staff in RAC spend approximately 45.4% of an eight hour shift on direct care¹⁴ as compared to allied health professionals, such as physiotherapists, who spend an average of 2.3% of an eight hour shift on direct care in this setting.¹⁵

RAC organizations in Australia are required to meet the accreditation standards set out by the Australian Aged Care Quality Agency (AACQA) to ensure high quality care is delivered to residents. This requires care staff to be equipped with knowledge and skills to perform their roles effectively.¹⁶ Care staff are required to directly undertake falls prevention strategies with residents and also complete indirect falls management procedures such as communicating care plan changes to other staff, informing new care staff about falls prevention strategies used for residents and translating new evidence into practice in a timely manner.¹⁷ Previous research has also found that care staffs' perceptions of falls and patient safety culture have an impact on falls prevention. Care staff awareness and knowledge of falls prevention strategies can improve adverse event reporting.^{10,18} A previous study surveyed nursing assistants to validate a scale that can be used to assess their perceived self-efficacy in preventing falls for the patients they cared for.¹⁰ Whilst care staff self-efficacy has been evaluated there is limited research regarding their knowledge and motivation to prevent falls in a RAC setting.

The aims of this study were to i) determine the feasibility of conducting a survey of care staff in RAC regarding falls and falls prevention; ii) describe care staff levels of knowledge and awareness of residents' falls risks, knowledge about falls prevention, and motivation and confidence to provide falls prevention strategies in a RAC setting.

Methods & Procedure

Study Design

This was a feasibility study using a cross-sectional survey. This research was approved by the University human research ethics committee and the RAC organization. Care staff were provided with information about the study and those who consented to participate completed the survey anonymously. This study was part of a larger study conducted within the RAC organization, which was evaluating how a group of staff leaders in falls prevention could translate falls prevention evidence into practice across the organization.¹⁹ All staff working in the organization were informed of the data collection period for the larger study. The larger study received ethical approval from the University human research ethics committee and the RAC organization.

Setting

This research was conducted at a selected site of a large RAC organization in Australia. There were 62 residents with differing care needs and functional ability, including residents with dementia living at the site. The site consisted of four residential wings, which were combined with communal living areas and gardens to form a single home like environment. This RAC site was one of the 13 sites operated by the RAC provider organization, which has a central corporate office providing on-going training and support for staff at all sites. New care staff receive two days orientation training including Occupational Health and Safety process and general manual handling for both care staff and residents' safety. Orientation does not include dedicated information on resident falls, falls risk factors or falls prevention strategies. The pilot site was one of six (46.2%) RAC sites within the organization which provided an annual tutorial for ongoing falls education for care staff at their site staff meeting. However falls education content varied in quality, was not standardized across different sites of the organization and was attended by limited numbers of staff.

Participants and Recruitment

Recruitment took place between January 1st and March 31st 2015. There were forty one care staff working at the site and all were invited to participate in the pilot study. Inclusion criteria were that the staff member had been working at the site for a minimum of 3 months, was aged over 18 years and was able to read and write English sufficiently to respond to the survey.

Questionnaire Development

A questionnaire was developed, using principles of questionnaire design²⁰ to describe and explore care staff knowledge, motivation, confidence and awareness regarding falls prevention at RAC sites.²¹ The questionnaire consisted of 36 items which used a mix of open and closed-ended responses to collect quantitative and qualitative data. The Likert scale was chosen to provide response options for closed ended items, as this is the most frequently used scale in psychology and education for rating beliefs, opinions and attitudes which cannot be measured precisely.²² Potential participants were care staff who had undertaken a variety of training, ranging from informal to certified technical college programs. Therefore questions were written using simple, clear and unambiguous language to ensure the questionnaire could be completed by participants with varying levels of literacy, such as those care staff who spoke English as a second language. The questionnaire was assessed using

the Flesch-Kincaid readability index program to ensure the questionnaire was at an appropriate English literacy of seventh-grade level.^{23,24}

The framework of the questionnaire was based on the COM-B model of behavioral change. This model explains that capability, opportunity and motivation are key determinants of engagement in health behaviors.²⁵ The questions were designed by the research team which included RAC site staff who operated a falls prevention community of practice (CoP). The questions were based on other validated questionnaires, which investigated knowledge and attitudes about falls prevention including falls awareness in residential aged care settings, self-efficacy of nursing assistants regarding falls prevention and knowledge about falls prevention.^{10,26,27,28,29} The domains covered in the questionnaire were care staff's perceptions about falls or near falls experience among the residents they cared for, translation of evidence based falls prevention strategies into practice during their rostered work shift, their previous experience of falls prevention training and the type of falls prevention training they would like to have in the future. Two open-ended questions asked care staff to list strategies they thought could help prevent residents they cared for from falling and briefly describe the actions they would take if a resident has fallen over during their shift. A final open ended question asked staff to provide any suggestions that would help to make the questionnaire easier for other care staff to answer. The questionnaire was then administered to five care staff at a RAC site separate to the site selected for the study using a "talk through" approach to validate the draft questions with care staff.^{20,30}

Procedure

The researchers attended a site staff meeting to provide information to staff about the study. Subsequently the questionnaire was stapled to the payslip of every care staff member and was advertised by the site managers using informative posters (researcher developed) attached to the announcement boards together with verbal reminders at staff meetings and handovers during each shift. Care staff consented to participate in the survey by completing the questionnaire, which contained a statement implying that submitting the questionnaire confirmed their consent to participate in the study. Completed questionnaires were placed in a sealed collection box in the staff room.

Statistical Analysis

All quantitative data were managed using IBM SPSS statistics for Windows (or mac) (SPSS 22). Quantitative data were summarized using descriptive statistics. Results were presented using frequency tables and percentages. All qualitative data obtained from open ended questions and verbal staff feedback were analyzed using content analysis.³¹ These data were entered verbatim onto a Microsoft Excel (2013) spreadsheet [Microsoft Corporation, Washington, USA] and coded using color highlights. Two researchers independently coded and grouped the data then met to discuss interpretation. Any disagreements were arbitrated by the third researcher. Responses were then organized using open coding, category creation and abstraction. Notes and headings were made in the text margins during reading to holistically describe the content. Multiple categories were generated from the headings copied onto coding sheets. These were then grouped under higher order headings to reduce the number of categories through the collapse of like and unlike categories. The abstraction

process involved applying content-specific words to each category. WORDLE™ was also used to triangulate generation of researchers' codes and categories in the open-ended questions.³² Subcategories with similarities were then described using a generic category and finally an overarching main category.

Results

Feasibility

There were 41 staff who were eligible to complete the survey with the response rate for survey completion by staff being n=24 (58.5%). Actions planned to improve the procedural feasibility of administering the questionnaire are presented in Table 1.³³

Findings from the survey

There were 20.8% (5) male and 79.2% (19) female participants who completed the questionnaire with 54.1% (13) of them being over 50 years old. Education levels ranged from a university degree [n=2, (8.3%)], to 20.8% (5) finishing year 10. Twenty-two (91.6%) care staff had more than a year of experience working at a RAC site with 50.0% (12) of them working both morning and afternoon shifts. Eight (33.3%) care staff did not speak English as their first language but only 12.5% (3) reported that they experienced difficulty in writing English and only one participant reported difficulty in reading English.

Only 20 care staff (83.3%) responded to the open ended question which asked them to describe a fall. Thirteen subcategories were identified and described under four generic categories. The generic category describing a fall as unexpected in nature (n=18) was identified using words such as sudden loss of balance during ambulation due to slip and falls. Other categories identified were the presence of resident risk factors (n=5), consequences of falls (n=3) and landing at a lower level (n=5).

Care staff responses to closed-ended questions are presented in Tables 2 and 3.

Open responses listing falls prevention strategies suggested by 21 (87.5%) care staff and the actions care staff would take after a resident had fallen are presented in Table 4 and 5 respectively.

Twenty care staff identified at least one barrier to carrying out falls prevention strategies in their workplace. These were grouped into four generic categories: lack of manpower (n=10), lack of information (n=5), non-compliant residents (n=2) and unsafe environment (n=2). Lack of manpower was explained as either time pressure to perform pre-existing duties (n=5) or a low staff to resident ratio (n=5).

While 18 (75.0%) care staff were aware of falls prevention plans for the residents they cared for, four (16.7%) were unsure if the residents they cared for had a falls prevention plan in place. When asked to describe the plan, 13 (54.2%) care staff responded but only 3 (12.5%) care staff identified more than three planned falls prevention strategies. Items sub-categories included assistance for mobility (n=3), having equipment such as sensor mats and alarm to prevent falls (n=3), the use of physical restraints (n=2), education to residents (n=2), medication (n=2) and the use of falls risk alert stickers (n=2).

Twenty (83.3%) care staff wanted reminders to carry out falls prevention strategies. A variety of reminders to action falls prevention strategies were requested by five (20.8%) care staff. Seventeen (70.8%) respondents stated a preference for posters displayed around the site, 54.2% (13) preferred a picture checklist in the resident's file while 50.0% (12) expressed a preference for a written checklist in the resident's file. Gaps in falls prevention training were identified in Table 2 and 3.

Discussion

This study provided some evidence that surveying care staff was a feasible means to evaluate their potential for behavior change around falls prevention. The response rate (58.8%) for this survey was within the acceptable range of survey response rates (30-60%) suggested in the literature,²¹ however modifications to the survey procedure and content were planned with the intent of improving future response rates. Researchers identified what actions the research team needed to take to potentially improve care staff participation in larger surveys of this kind and proposed actions that were framed around behavioral change techniques (BCTs) to address these.^{33, 34} Behavioral change techniques are defined as “an active component of an intervention designed to change behavior.”³⁴(p234) Specific consideration was given to the feedback provided by care staff regarding their participation in the survey and completing the questionnaire. While it appeared feasible to survey care staff, several potential facilitators to recruitment and completion were identified. For future research, we recommend questionnaires be distributed by a registered nurse at shift handover following a verbal explanation of questionnaire purpose to provide a more personal approach for facilitating recruitment and completion. As the RAC organization's expectation for completing questionnaires was during working hours, care staff found it challenging to prioritise the time to complete the questionnaire. Future participating RAC sites within the organization will be provided with suggested facilitators to maximise recruitment and response rate. Feedback from the staff who piloted the questionnaire included replacing words which were not easily comprehended and setting out the survey so it was more spacious and had larger tick boxes making it easier to complete as a paper copy. This feedback was incorporated into the final questionnaire design. (*The finalized questionnaire can be provided as an online Appendix*). A procedural guideline for administering the survey in future to other RAC sites was also developed (*This can be provided as an online appendix*).

Preliminary findings from this survey demonstrate that RAC care staff have low levels of capability (awareness and knowledge)²⁵ regarding falls and falls prevention, which may be attributed to the lack of mandatory education on falls prevention during orientation training and ongoing education. Even though older people living in RAC settings have been shown to be at a high risk of falls,^{3,4,6,35} over 75% of the care staff surveyed reported that they were unsure or thought that the residents were at moderate or low risk of falls, and only 70% were aware that residents had a falls prevention plan in place. Half of the care staff who responded were not aware that 50% of residents in a RAC setting fall annually.^{3,4,6} Since care staff spend the most time with residents,¹⁴ a low awareness of falls risk could mean they may not interpret resident cues that should prompt initiation of relevant falls prevention strategies.²⁵

Most care staff who responded to the survey indicated they were motivated to implement fall prevention strategies in a RAC setting. However, despite high levels of motivation, low levels of knowledge about falls prevention may limit the ability of care staff to effectively translate evidence into practice. Less than half of the care staff were able to describe the strategies contained in the residents' falls prevention plans. Concepts of health behavior change²⁴ explain that capability, opportunity and motivation are all required for RAC care staff to engage in falls prevention strategies with the residents they care for. Sixteen care staff matched only one component of a standardized definition of a fall and only one care staff provided a definition that totally matched the standardized definition.^{36,37} This may result in falls being underreported as shown in other studies, with strategies not being implemented that could prevent further falls.³⁸ Over 75% care staff suggested that extrinsic factors such as removing hazards could prevent falls, but only four respondents suggested that staff surveillance could be a useful falls prevention strategy.^{1,39} This may mean that care staff do not think that they should observe residents behavior, and report behavior which might pertain to the adverse effects of medication or medical illness, such as drowsiness or loss of balance.

Care staff identified that a key barrier to effective falls prevention was the low ratio of care staff to residents which has been supported by previous research.^{17,40} This lack of manpower and time pressure described by the care staff could limit their opportunity to engage in falls prevention strategies. Care staff also identified that locum care staff may have limited awareness of residents' capabilities which could increase the likelihood of falls in residents they provide care for. This finding was similar to that of Castle & Engberg (2007).⁴¹

Since the main finding identified by the survey was a low level of care staff capability to provide effective falls prevention strategies, one solution could be to provide education and training. Further education and training could enhance care staff falls knowledge and skills to prevent falls from occurring, as only half of the care staff responded that they had received falls prevention training. The RAC site could benefit from using recent Australian training guidelines in designing care staff training to include education about falls and falls prevention.^{42,43} Since care staff have limited formal health care training they may be unaware of how to self-assess their knowledge levels and require skills checklists and further training.^{43,44}

These findings provide insight that gaps in care staff education and training exist, however the findings should be considered judiciously in view of the small sample size (n=24) and single RAC setting. Future research will benefit by administering this questionnaire across a large number of RAC sites, as this could be one of the ways to identify the types of education programs needed by care staff in order to improve translation of falls prevention strategies into practice. Administering this survey to a larger number of sites and participants would allow reliability and validity to be established. Since this is a new area in falls prevention research, there is need for further exploration as care staff play such an important role in RAC settings.

Conclusion

This study established a feasible means of surveying staff about falls prevention within a RAC setting. These results may also be valuable to assist other RAC settings who wish to survey their own staff regarding falls prevention. Although care staff in RAC settings spend nearly half their time directly assisting residents, care

staff surveyed were found to have low levels of knowledge about falls prevention and a low level of awareness about residents' risk of falls. Improving care staff levels of knowledge (capability) in this area by providing education and training opportunities may be an important component in facilitating translation of falls prevention evidence into practice in a consistent manner across RAC settings. Future research should continue to assess care staff levels of knowledge, awareness, opportunity and motivation to undertake falls prevention action.

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Appendix R:

CoP Tales Newsletter Edition 4

Distributed to all RAC Sites

CoP TALES Your Community of Practice Newsletter 

Issue 4 December 2015



"Falls prevention is everybody's responsibility"

Your CoP has brought together Nurses, PTs, OTs & Care Managers from all residential aged care sites to work on falls prevention ...



Before you leave ...



- Call bell close
- Walking aid close
- Glasses/hearing aids on
- Supportive shoes on
- Lighting for day or night
- Drink of water
- Comfortable

The CoP would like to say a special thank you to the staff and residents at Edgewater for their wonderful participation and we wish them all the best

CoP spotlight:

Few of us fully witness a resident fall but video analysis research is enabling us to better understand the conditions and mechanisms involved. Recent studies reported many falls occurred because of an inability to weight shift correctly – our Physio programs can help with this. The CoP recommend staff invest 12 mins and watch the educational video produced by this research team "Evidence from real-life falls" ask your CoP member to share!

iCare training now has a new falls risk assessment linked directly to tailored prevention strategies in a management plan. The CoP consulted with all sites and staff groups in development over several months to produce documents that are both evidence reflective and user friendly. A special thanks to the CoP working party, especially Nicole Blackburn from The Oaks, for leading this project. We encourage everyone to trial these new forms and ask your CoP members for assistance.



'CoP achievements'

Organisational falls prevention policy completed

New FRAT with linked strategies & management plan in iCare for trial

Falls Prevention / Safety & Wellbeing poster checklist available for RAC sites

CoP establishment and operational feasibility paper presented at National Physiotherapy Conference

CoP surveys informing fall prevention education

Earlier this year the CoP conducted surveys with 147 care staff and 40 residents across 8 sites. The aim of the surveys was to find out what care staff and residents knew about falls and falls prevention to enable designing effective falls prevention education. Both groups demonstrated a greater awareness of extrinsic risk factors and perceived falls to be caused by things like mis-judging obstacles, slippery floors or not using a prescribed walking aid. This indicates our education should target raising awareness of intrinsic risk factors. 76.2% of care staff said they'd like reminders to help them take actions to prevent falls when at work. The most popular

reminder was a poster checklist (54.4%). Residents told us they would like to receive falls prevention messages in a way that highlighted safety and wellbeing (55%) and the most popular delivery was a poster for their room (27.5%). The CoP have worked to provide both groups with an A4 poster *safety/wellbeing* checklist (shown above) that can be displayed in residents rooms, on staff noticeboards or work stations. The caption "Before you leave ..." we hope reminds staff, residents, friends and family to apply these checks



We wish you a Merry Christmas and look forward to working with you on falls prevention in 2016!

