

Translating Falls Prevention Knowledge to Community-Dwelling Older PLWD: A Mixed-Method Systematic Review

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Purpose of the Study: Falls prevention evidence is strong, but little is known about uptake of strategies for people living with dementia (PLWD). This mixed-method systematic review aimed to integrate evidence of falls prevention efficacy with views/experiences of PLWD.

Design and Methods: Eight electronic databases were searched. Inclusion criteria included quantitative or qualitative studies examining knowledge translation of falls prevention strategies in community-dwelling PLWD and/or their caregiver. Study quality was assessed, and findings are narratively described.

Results: Six quantitative and five qualitative studies were included. Study quality was mixed. Quantitative studies showed limited evidence of effectiveness on reduction in falls risk, falls and hospitalization rates, nursing home admission, decline in activities of daily living, and adherence to strategies. Qualitative themes showed inclusion of caregiver and health professionals as key to program success, but many factors influence participation.

Implications: Synthesizing the findings generated a new understanding of falls prevention for this high-risk group. A focus upon health professional and caregiver involvement and accommodation of individual preferences may result in increased engagement with falls prevention strategies.

Key words: Dementia, Falls prevention, Knowledge translation

Introduction

In recent years, falls prevention among community-dwelling older people has been the focus of much research. Despite this increased focus, the rate and impact of falls

in community-dwelling older Australians remains relatively unchanged (AIHW, 2012b; Gillespie et al., 2012). Individually, 30%–40% of older people fall in a 12-month period (Moyer, 2012), approximately 5%–10% resulting in

serious injury, such as fracture or head injury (Rubenstein, Josephson, Rubenstein, & Josephson, 2006). At a system level, nearly three in four injury-related hospitalizations for older Australians result from falls, with approximately 20% of these resulting in direct admission to residential care (Bradley, 2012).

Strong evidence, gathered over 20 years, supports the efficacy of falls prevention for community-dwelling older people (AIHW, 2012b; Gillespie et al., 2012). A recent Cochrane review concluded several single and multifactorial falls prevention strategies effective in reducing falls, including exercises for strength/balance and cataract surgery (Gillespie et al., 2012). However, the evidence for education-based interventions, a hallmark of falls prevention programs, remains weak (Gillespie et al., 2012). Similarly, evidence from an overview of medicine use found passive forms of education and information provision, such as provision of information brochures in isolation, rarely had a major effect (Ryan et al., 2011).

Dementia is an umbrella term for over 100 different diseases impacting brain function (AIHW, 2012a). Dementia is recognized as a risk for falls (Allan et al., 2009), with people living with dementia (PLWD) experiencing a greater rate of falls than cognitively intact older adults (prevalence reported between 47% and 90%; Allan et al., 2009; Shaw, 2007). Cognitively intact older adults and PLWD share some falls risk factors (environmental hazards; previous falls), whereas others (decreased executive functioning; visuo-spatial difficulties) are more specific to PLWD (Whitney, Close, Jackson, & Lord, 2012). A strong link has been established between psychotropic medication use and increased risk of falls (Hill & Wee, 2012; Woolcott et al., 2009), including drugs commonly used to manage behavioral and psychological symptoms of dementia. Research is also underway, linking changes in brain executive functioning (e.g., planning and attention) to postural instability (Muir, Gopaul, & Montero Odasso, 2012). The impact of dementia on participation in falls prevention programs and adoption of strategies is less well understood. Escalating numbers of PLWD within Australia, with a higher falls rate than the wider community (AIHW, 2012a), drive a growing need for health professionals to understand participation of PLWD with falls prevention strategies.

Falls prevention programs are designed to utilize effective preventive strategies, often involve multidisciplinary health-care teams trained in evidence-based strategies, and include education to build risk awareness (World Health Organisation, 2012). Although an unfamiliar concept for many older adults (Managing Innovation Marketing Consultancy Network, 2000), falls prevention can be particularly challenging for PLWD and their caregivers. Possibly, this is related to limitations

of executive function making it more difficult to adapt knowledge to life context, or alternatively, perhaps, falls prevention programs are not designed for the specific needs of PLWD. PLWD have voiced their desire to remain involved in decision making and be included in their care (Beuscher & Grando, 2009). They also have the ability to learn and retain new information when appropriately presented (Small, 2012). Falls prevention programs commonly embed sharing of knowledge and encompass informed and active communication and participation although often not explicitly.

Enhancing engagement of PLWD may involve the informal caregiver. Caregivers, persons providing assistance to the PLWD for everyday activities (AIHW, 2012a), often act as gatekeepers for use of health services and implementing falls prevention strategies (Horton & Arber, 2004). Anxiety, fear of falling for the care recipient, and personal experience/attitudes may impact a caregiver's ability to implement falls prevention strategies for the care recipient (Buri & Dawson, 2000; Dow, Meyer, Moore, & Hill, in press; Horton & Arber, 2004).

Knowledge translation (KT) is required to narrow the research-to-practice gap (Ward, Smith, Foy, House, & Hamer, 2010). KT is defined as "a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve health" (Canadian Institutes of Health Research, 2012). Two taxonomies developed by the Cochrane Consumers and Communication Review Group (Hill, 2011), adapted and used throughout this review (Table 1), provide a useful and more specific KT framework to understand the complexity of falls prevention interventions and outcomes and particularly to disentangle the way in which KT may happen at the individual level. The interventions taxonomy emphasizes purposeful interventions for "communication and participation," strategies that "inform, educate, communicate with, support, skill, change behavior, engage and seek participation within individual or collective contexts" (Hill, Lowe, & Ryan, 2011). The outcomes relate to this range of purposes.

Strong evidence exists for falls prevention for community-dwelling older people, but there is limited evidence for effective approaches for PLWD (Gillespie et al., 2012). Indeed, most studies in the recent Cochrane fall prevention (community setting) review excluded this population group (Gillespie et al., 2012). This systematic review aims to critically evaluate and synthesize the literature concerning KT strategies for falls prevention for PLWD and/or their caregivers. This mixed-method review, chosen to provide a rich and practical understanding (Pluye, Gagnon, Griffiths, & Johnson-Lafleur, 2009), draws on evidence of effect of interventions and views/experiences of participants in

Table 1. Taxonomy of Interventions for Communication and Participation Between Health-Care Consumers and Providers, Adapted for Falls Prevention

Intervention categories	
Inform and educate	Strategies to educate, inform, or promote health/treatment (e.g., information brochure related to strategies to encourage eating in PLWD)
Support behavior change	Physical or psychological support in the adoption or promotion of health behaviors (e.g., provision of home visits to support a home exercise program)
Teach skills	Explicit instructions for skills relevant to daily living (e.g., techniques to manage behaviours of concern while undertaking a home exercise program)
Facilitate communication and/or decision making	Strategies to involve the participants in decision making about their health or in changes to their environment (e.g., home-based vs. center-based services)
Identify perceptions of and/or meaning attributed to falls/falls prevention (e.g., the concept of risk reduction)	
Outcome categories	
Falls-related outcomes	Includes rate of falls, injury, hospitalizations, emergency department presentation, general practitioner and other health professional presentation, residential care admission, risk of falls, and fear of falling
Knowledge and understanding	Reflecting whether knowledge has been transferred
Skill acquisition	Acquisition of skills relevant to daily living
Health status/well-being	Includes physical, emotional/psychological and social well-being
Health behavior	Adoption or promotion of health behaviors
Support	Assistance and encouragement for decision making or participation
Communication	Related to the optimisation of communication between key players, such as health professionals, PLWD and caregivers
Involvement in health care	

relation to falls prevention programs. The review has two objectives:

1. To identify the effects of interventions for transferring knowledge to PLWD and their caregivers on outcomes related to falls and/or communication and participation in falls prevention strategies.
2. To synthesize research on the views/experiences of PLWD and their caregivers related to communication of, and participation in, falls prevention programs.

Method

Search Strategy and Selection Criteria

Searching included retrieval of electronic documents and hand searching of reference lists of relevant articles. Electronic databases searched were Ageline, AMED, CINAHL, EMBASE, Medline, Proquest, Psychinfo, and PUBMED searched January 1990–July 2012, published in English.

This review included randomized-controlled trials (RCT), quasi-RCTs, uncontrolled evaluations, and qualitative

research to address the two objectives. Descriptive and opinion pieces were not included. The remaining inclusion criteria are outlined below. Quantitative articles had to meet all inclusion criteria, whereas qualitative studies only had to meet the first two items. The adapted falls prevention taxonomy was used to identify and categorize interventions/outcomes of relevance.

Inclusion criteria:

1. **Population**—community-dwelling PLWD and/or their caregivers, addressed directly or specific sub-analysis undertaken. Dementia was identified by validated tests: Mini-Mental State Examination (MMSE), Clinical Dementia Rating Scale, National Institute of Neurological and Communicative Disorders and Stroke, Alzheimer's Disease and Related Disorders Association (NINCDS-ADRDA) Alzheimer's Criteria, or doctor/specialist diagnosis.
2. **Intervention/s**—translation of knowledge within a falls prevention intervention, categorized according to the adapted taxonomy (Table 1).

3. **Comparison**—using a control group of usual care or no intervention (RCTs only).
4. **Outcomes**—related to falls, communication, and/or participation, again categorized according to the adapted taxonomy (Table 1). Adherence to falls prevention strategies was included as health behavior and involvement in care (quantitative studies only).
5. **Context** of intervention—delivery method and enablers/barriers of impact.

The initial search strategy of items 1–15 (Table 2) yielded numbers beyond the scope of this review. A revised strategy (items 14 and 15) was used, with final terms narrowed to “falls” (language adapted to individual database) and “community.” Full-text articles were manually searched for “knowledge translation” to ensure no KT activity was missed and for inclusion of PLWD and/or their caregivers.

The first author (C. M.) applied the above criteria to title/abstract of identified articles. Full-text article was retrieved if a decision could not be made on title/abstract alone.

Quality Assessment

Methodological quality of included studies was assessed using a tool adapted by the authors, combining the Critical

Appraisal Skills Programme tools (Critical Appraisal Skills Programme UK, 2012) and a quality assessment process adapted from Imms (Imms, 2008) by Shields (Shields, Synnot, & Barr, 2011). For quantitative articles, criteria included sample, measure, and analysis (Table 3). For qualitative articles, criteria included methodological rigor, interpretive rigor, and transferability/relevance (Table 3). Each criterion was scored according to evidence of the article meeting most or all criteria (good), some evidence of meeting criteria (fair), or no evidence of meeting criteria (poor).

Two reviewers (C. M. plus A. S., K. H., or B. D.) independently assessed included articles for quality. Discrepancies were resolved through discussion until consensus reached. Where agreement could not be reached, a third reviewer (S. H.) made the final decision. Authors of this review did not undertake quality assessment for any self-authored articles.

Data Extraction

Information extracted included country of origin, participant details, study design, method of data collection and analysis, intervention design, methodological quality, and outcome measures/results.

Analysis

Intervention effects for quantitative studies were described narratively, accounting for each outcome category. Content analysis of qualitative themes within articles was undertaken to gain a new thematic understanding. Subsequently, a mixed-method synthesis was undertaken, using the qualitative synthesis to examine and question the intervention findings (Gough, Oliver, & Thomas, 2012).

Results

In this section, the main findings of the review are reported, including sections detailing aspects of included studies (design, sample size, setting, participants, interventions, outcomes investigated, study quality, and results of studies). Interventions and outcomes in the quantitative articles were categorized according to the taxonomies in Table 1. This section concludes with a synthesis integrating qualitative and quantitative findings in the context of KT in falls prevention, grouped according to themes identified in the qualitative literature as important for PLWD and their caregivers.

Search Results

The original search strategy for KT identified up to 470,000 articles in each database. Individually, dementia and falls

Table 2. Search Strategy (According to Medline Terminology)

1	(knowledge) and (application or broke* or creation or diffus* or exchange* or management or mobilis* or translat* or transfer* or uptak* or utili*).ti.ab.
2	(research) and (application or broke* or creation or diffus* or exchange* or management or mobilis* or translat* or transfer* or uptak* or utili*).ti.ab.
3	(evidence) and (application or broke* or creation or diffus* or exchange* or management or mobilis* or translat* or transfer* or uptak* or utili*).ti.ab.
4	education.ti.ab
5	research findings into action or research to action or research into action or evidence into action or evidence to practice or evidence into practice or research to practice or research into practice.ti.ab.
6	Diffusion of innovation).ti.ab.
7	implement* or disseminat*.ti.ab
8	Knowledge
9	self-efficacy or self efficacy
10	(health) and (behaviour* or behavior* or promoti* or coach* or communicat*)
11	behaviour change or behaviour change
12	Or/1–11
13	Dement* or Alzheimer* or cogniti* or senil*.ti.ab.
14	Accidental fall* (MESH) or fall* prevention.ti.ab.
15	(community* or home) not (nursing home).ti.ab.
16	14 and 15 (limiting to English language and 1990 current)

Table 3. Summary of Included Articles

Study	Year	Quality assessment	Study design	Target audience	Sample size	Age	Gender	MMSE score or rating of dementia	Number of falls in past year
(Buri & Dawson, 2000)	2000	Methodological rigor—good+ Interpretive rigor—good Transferability/ relevance—good	Focus groups Semistructured interviews	Caregivers of persons with dementia	Focus group (<i>n</i> = 7) Interviews (<i>n</i> = 6)	Not reported	For interviews: Female (<i>n</i> = 3) Male (<i>n</i> = 3)	Mean MMSE score = 12	Not reported
(Faes et al., 2010)	2010	Methodological rigor—good Interpretive rigor—good Transferability/ relevance—good	Semistructured interviews	Frail older adults with a caregiver	Caregiver and care recipient dyads (<i>n</i> = 10)	Care recipient 70–80 years (<i>n</i> = 6) 81–90 years (<i>n</i> = 4) Caregiver 40–60 years (<i>n</i> = 4) 61–80 years (<i>n</i> = 3) 81–90 years (<i>n</i> = 3)	Care recipient Female (<i>n</i> = 6) Male (<i>n</i> = 4) Caregiver Female (<i>n</i> = 5) Male (<i>n</i> = 5)	MMSE score: 15–20 (<i>n</i> = 2) 21–27 (<i>n</i> = 5) 28–30 (<i>n</i> = 3)	1–5 (<i>n</i> = 4) 6–9 (<i>n</i> = 3) >9 (<i>n</i> = 3)
(Lach & Chang, 2007)	2007	Methodological rigor—good Interpretive rigor—fair Transferability/ relevance—good	Focus groups	Caregivers of persons with dementia	<i>n</i> = 39	Age of caregiver not reported Mean age of care recipient 71.7 years	Female 71.8% Male 28.2%	Clinical Dementia Rating 0.5 (<i>n</i> = 15) 1.0 (<i>n</i> = 15) 2.0 (<i>n</i> = 11)	Not reported
(McIntyre & Reynolds, 2012)	2012	Methodological rigor—good Interpretive rigor—fair Transferability/ relevance—fair	Semistructured interviews Focus groups	Interview: Persons with dementia reporting a fall and their caregiver Focus group: Persons with memory problems and their caregivers	Interview (<i>n</i> = 9) Focus group (<i>n</i> = 21)	For interviewees: Range = 76–87 years Not reported for focus group participants	Persons with dementia for interview Female (<i>n</i> = 6) Male (<i>n</i> = 3) Caregivers for interview Female (<i>n</i> = 4) Male (<i>n</i> = 6) (discrepancy—one person had 2 carers) Female (<i>n</i> = 21) Male (<i>n</i> = 43)	For interview: MMSE 28 (<i>n</i> = 2) MMSE 23 (<i>n</i> = 3) MMSE 14 (<i>n</i> = 2) MMSE 12 (<i>n</i> = 1) MMSE unknown (<i>n</i> = 1)	Not reported, but had at least one
(Mackintosh & Sheppard, 2005)	2005	Sample—good Measure—good Analysis—good	Pre-post test	Persons with dementia	<i>n</i> = 64	Mean age 79.6 years (range 53–93)		Mean MMSE score = 13.0 (range 0–27)	One or more falls in last 12 months <i>n</i> = 32 Two or more falls in last 12 months <i>n</i> = 22 (of 32)
(Mahoney et al., 2007)	2007	Sample—good Measure—good Analysis—good	Randomized-controlled trial	Persons over 65 years living with a caregiver (subanalysis conducted)	<i>n</i> = 349	Intervention group: Mean age 79.6 years Control group: Mean age 80.3 years	Intervention group: Female (<i>n</i> = 137) Control group: Female (<i>n</i> = 137)	Intervention group: Mean MMSE score = 26.9 Control group: Mean MMSE score = 27.3	Intervention group: No. of falls in past year = 2.4 Control group: No. of falls in past year = 2.4

Table 3. Continued

Study	Year	Quality assessment	Study design	Target audience	Sample size	Age	Gender	MMSE score or rating of dementia	Number of falls in past year
(Shaw et al., 2003)	2003	Sample—good Measure—fair Analysis—fair	Randomized-controlled trial	Persons with cognitive impairment presenting to an emergency department	<i>n</i> = 274	Intervention group: Mean age 84 years Control group: Mean age 84 years	Intervention group: Female (<i>n</i> = 101) Control group: Female (<i>n</i> = 118)	Intervention group: Mean MMSE score = 14 Control group: Mean MMSE score = 12	Intervention group: No. of falls in past 6 months = 2 Control group: No. of falls in past 6 months = 2
(Surtanon et al., 2012b)	2012	Methodological rigor—good Interpretive rigor—fair Transferability/relevance—fair	Semistructured interview	Persons with mild to moderate Alzheimer's disease (AD) and their caregivers	Persons with mild to moderate AD (<i>n</i> = 10) Caregivers (<i>n</i> = 9) (one person with mild AD had only community supports)	Persons with mild to moderate AD: Mean age 81.6 years Caregivers: Mean age 71.9 years	Persons with mild to moderate AD: Female (<i>n</i> = 7) Male (<i>n</i> = 3) Caregivers: Female (<i>n</i> = 6) Male (<i>n</i> = 3)	Mean MMSE score 23.4 (range 16–28)	Not reported
(Surtanon et al., 2012a)	2012	Sample—good Measure—good Analysis—good	Randomized-controlled trial	Persons with mild to moderate Alzheimer's disease (AD) and their caregivers	Persons with dementia (<i>n</i> = 40)	Intervention group: Mean age 83.4 years Control group: Mean age 80.5 years	Intervention group: Female (<i>n</i> = 13) Male (<i>n</i> = 6) Control group: Female (<i>n</i> = 12) Male (<i>n</i> = 9)	Intervention group: Mean MMSE score = 20.9 Control group: Mean MMSE score = 21.7	Not reported
(Teri et al., 1998)	1998	Sample—fair Measure—good Analysis—poor	Pre-post test	Persons with dementia and their caregivers	Persons with dementia (<i>n</i> = 30)	Persons with dementia: Mean 78.7 years Caregivers: Mean 69.7 years	Persons with dementia: Female 27% Male 73% Caregivers: Female 83% Male 17%	Mean MMSE score 17.8 (range 0–26)	Not reported
(Teri et al., 2003)	2003	Sample—good Measure—good Analysis—good	Randomized-controlled trial	Persons with Alzheimer's disease and their caregivers	Persons with dementia (<i>n</i> = 153)	Intervention group: Mean age 78 years Control group: Mean age 78 years	Intervention group: Female 37% Control group: Female 45%	Intervention group: Mean MMSE score = 17.6 Control group: Mean MMSE score = 15.9	Not reported

Note: MMSE = Mini-Mental State Examination.
*see Table 5 for more detail of quality assessment criteria.

prevention with their derivatives also yielded large numbers (Table 2). Despite using a broad range of terms, the authors felt KT activity may not be clearly defined in the abstract and PLWD may be “hidden” in the sample. The revised search strategy that used only the terms “falls” and “community” yielded 14,312 articles before review, excluding duplicates (Figure 1). Of these, 14,126 were excluded by title/abstract. Retrieved in full text were 186 articles, with another 22 identified through hand-searching reference lists. Of the 208 articles, 197 were excluded due to the following: PLWD and/or caregiver not clearly included in sample ($n = 32$), PLWD and/or caregiver included in sample, but no separate analysis undertaken ($n = 151$), and articles unrelated to falls prevention KT ($n = 14$). Eleven studies were included in the review.

Included Studies

Design

Four of the 11 studies were RCTs, with participants individually randomized (Mahoney et al., 2007; Shaw et al., 2003; Suttanon et al., 2012a; Teri et al., 2003) and two

studies were of pretest post-test design (Mackintosh & Sheppard, 2005; Teri et al., 1998). One study compared the effectiveness of multifactorial assessment and intervention with conventional care in those presenting postfall to an emergency department (Shaw et al., 2003). Another study combined a home-based exercise program with caregiver training in behavioral management techniques (Teri et al., 2003). One tested the efficacy of an intermediate-intensity-individualized multifactorial falls prevention program (Mahoney et al., 2007) and another compared an individualized home-based exercise program to a control education program (Suttanon et al., 2012a). Of the pre-post design studies, one described an activity program and adherence to exercise (Teri et al., 1998), whereas the other conducted a center-based falls prevention program for those of predominantly Italian background (Mackintosh & Sheppard, 2005).

Five studies used qualitative methodology: two with grounded theory (Buri & Dawson, 2000; Faes et al., 2010), two with a phenomenological approach (McIntyre & Reynolds, 2012; Suttanon, Hill, Said, Byrne, & Dodd, 2012b), and one with an unspecified approach (Lach &

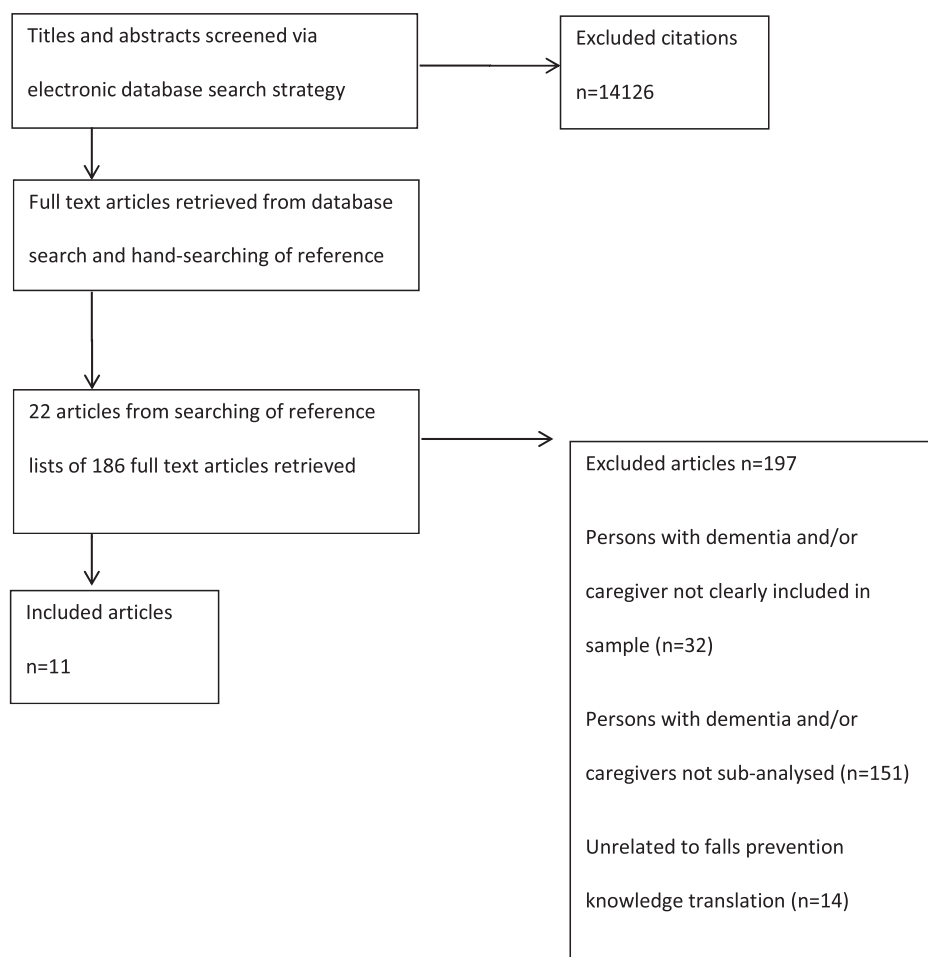


Figure 1. Study selection flow chart.

Chang, 2007). Two studies used interviews (Faes et al., 2010; Suttanon et al., 2012b), one used focus groups (Lach & Chang, 2007), and two used both (Buri & Dawson, 2000; McIntyre & Reynolds, 2012). The five qualitative studies addressed perceptions of, and meaning attributed to, communicating fall prevention strategies. Three of these focused on the fall event for caregiver and the PLWD, identifying themes regarding potential causes of the fall and its emotional/physical/social consequences (Buri & Dawson, 2000; Faes et al., 2010; McIntyre & Reynolds, 2012). The remaining two studies explored exercise to improve balance (Suttanon et al., 2012b) and home safety (Lach & Chang, 2007). Suttanon et al. (2012b) identified factors that supported or impeded the decision to commence, and then adhere, to a home-based exercise program. Lach & Chang (2007) used the barriers and facilitators identified for safety in the home to highlight stages of behavior change in caregivers.

Sample Size

This review included 940 participants (910 PLWD and 30 caregivers) from 6 quantitative studies and 110 participants (29 PLWD and 81 caregivers) from 5 qualitative studies. In one study (Mahoney et al., 2007) only the subgroup of participants with MMSE scores less than 28 (*n* = 131/349) was included.

Setting

Included studies were conducted in the United Kingdom (Buri & Dawson, 2000; McIntyre & Reynolds, 2012; Shaw et al., 2003), the Netherlands (Faes et al., 2010), Australia (Mackintosh & Sheppard, 2005; Suttanon et al., 2012a, 2012b), and the United States (Lach & Chang, 2007; Mahoney et al., 2007; Teri et al., 1998, 2003).

Participants

There was a mix of men and women in all studies (PLWD: 178 female, 79 male; caregivers: 629 female, 310 male; Table 4). Cognitive impairment was identified by MMSE (Buri & Dawson, 2000; Faes et al., 2010; Mahoney et al., 2007; McIntyre & Reynolds, 2012; Shaw et al., 2003), Clinical Dementia Rating Scale (Lach & Chang, 2007), NINCDS-ADRDA criteria (Teri et al., 1998, 2003), and diagnosis by doctor, specialist, or Memory Clinic (Mackintosh & Sheppard, 2005; Suttanon et al., 2012a, 2012b). Three studies included the PLWD (Mackintosh & Sheppard, 2005; Mahoney et al., 2007; Shaw et al., 2003). Two studies focused exclusively on caregivers of PLWD (Buri & Dawson, 2000; Lach & Chang, 2007), whereas six studies considered the PLWD-caregiver dyad (Faes et al., 2010; McIntyre & Reynolds, 2012; Suttanon et al., 2012a, 2012b; Teri et al., 1998, 2003).

Table 4. Knowledge Translation Interventions for Included Studies (*n* = 11)

	McIntyre & Reynolds, 2012	Shaw et al., 2003	Faes et al., 2010	Lach & Chang, 2007	Teri et al., 1998	Teri et al., 2003	Mahoney et al., 2007	Suttanon et al., 2012b	Mackintosh & Sheppard, 2005	Suttanon et al., 2012a	Buri & Dawson, 2000
Intervention/s											
Inform and educate		✓			✓	✓			✓	✓	
Support behavior change		✓			✓	✓			✓		
Teach skills		✓			✓	✓					
Facilitate communication and/or decision making										✓	
Identify perceptions of, and meaning attributed to, communicating falls strategies	✓		✓	✓							✓

PLWD were identified as having a history of falls (Mahoney et al., 2007; McIntyre & Reynolds, 2012; Shaw et al., 2003); balance/mobility impairments using standardized testing (Mackintosh & Sheppard, 2005; Suttanon et al., 2012a, 2012b; Teri et al., 1998, 2003); safety concerns, including falls (Lach & Chang, 2007); or as frail with previous falls (Faes et al., 2010). One study focused on the risk of falls (Buri & Dawson, 2000).

Interventions (Quantitative Articles)

Five articles displayed characteristics of *inform and educate* (Mackintosh & Sheppard, 2005; Mahoney et al., 2007; Shaw et al., 2003; Teri et al., 1998, 2003), including education about cognitive impairment and behavior management (Teri et al. 1998, 2003); advice such as avoiding precipitants of orthostatic hypotension and syncope and appropriate footwear (Shaw et al., 2003); families consulted, for example, regarding medication and vision (Mackintosh & Sheppard, 2005); and recommendations/referrals following falls risk assessment (Mahoney et al., 2007; Table 4).

Supporting behavior change was evidenced in four articles (Shaw et al., 2003; Suttanon et al., 2012a; Teri et al., 1998, 2003). Participants in both studies by Teri et al. (1998, 2003) were supported by regular home visits over 12 weeks, with the former study adding further sessions over 3 months. One study incorporated a supervised 3-month home-based exercise program by physiotherapists (Shaw et al., 2003) with the other similar, but over 6 months (Suttanon et al., 2012a).

Teaching skills (for assisting people in their daily lives) were incorporated in three studies (Shaw et al., 2003; Teri et al., 1998, 2003). Teaching skills included skills for the caregiver to identify/modify precipitants of distress in the PLWD (Teri et al., 1998), refined by Teri et al. (2003), and transfer/mobility considerations (Shaw et al., 2003).

Facilitating communication and/or decision making included interventions designed to optimize communication and/or encourage expression of values and preferences (Hill, 2011). Teri et al. (2003) included teaching caregivers how to modulate their own responses to challenging behaviors and identifying pleasurable activities for the PLWD. Another study used home visits and phone calls to offer reassurance and answer questions (Suttanon et al., 2012a).

Outcomes (Quantitative Articles)

Five studies used *falls-related* outcome measures: number of falls (Mackintosh & Sheppard, 2005; Mahoney et al., 2007; Shaw et al., 2003; Suttanon et al., 2012a; Teri et al., 2003), injury rates (Shaw et al., 2003), hospitalization rates (Mahoney et al., 2007; Shaw et al., 2003; Teri et al., 2003),

nursing home admission rates (Mahoney et al., 2007), and mortality (Shaw et al., 2003).

Four articles reported measures of *health status/well-being*: measures of gait and balance (Mackintosh & Sheppard, 2005; Suttanon et al., 2012a; Teri et al., 2003); activity levels (Suttanon et al., 2012a; Teri et al., 2003), depression (Mahoney et al., 2007; Teri et al., 2003), quality of life (Suttanon et al., 2012a), carer burden (Suttanon et al., 2012a), and sickness impact (Teri et al., 2003).

Three articles reported measures of adherence, fulfilling outcome categories of *health behavior and involvement in care* (Mahoney et al., 2007; Suttanon et al., 2012a; Teri et al., 1998).

No article reported outcomes for *knowledge and understanding, skill acquisition, support provided, communication, or evaluation of care*.

Objectives/Scope of Qualitative Articles

Two studies focused on the experiences of caregivers of PLWD: one, the meaning attributed to falls risk (Buri & Dawson, 2000) and the other, the adoption of safety behaviors (Lach & Chang, 2007). The other three articles focused on PLWD-caregiver dyad: Two explored the experience of falling (Faes et al., 2010; McIntyre & Reynolds, 2012), whereas one identified factors for commencement/adherence to an exercise program (Suttanon et al., 2012b).

Quality Assessment

Quantitative Articles

The six quantitative articles were of mixed-methodological quality (Tables 3 and 5).

Three articles met the full criteria for sample, measure, and analysis (Mackintosh & Sheppard, 2005; Mahoney et al., 2007; Teri et al., 2003). Teri et al. (1998) met the full criteria for measure, partially met criteria for sample (no adequate follow-up), and rated poorly for analysis with no criteria met. Shaw et al. (2003) met full criteria for sample but only partially met criteria for measure and analysis (inadequate blinding). Suttanon et al. (2012a) met criteria for measure and analysis but only partially met criteria for sample (insufficient size and representation).

Qualitative Articles

The five qualitative articles (Buri & Dawson, 2000; Faes et al., 2010; Lach & Chang, 2007; McIntyre & Reynolds, 2012; Suttanon et al., 2012b) were also of mixed-methodological quality.

Three articles were rated good quality in categories of methodological rigor, interpretive rigor, and transferability/relevance (Buri & Dawson, 2000; Faes et al., 2010; Suttanon et al., 2012b).

Table 5. Quality Assessment Process

Study design	Criteria for quality assessment	Quality satisfied if
Quantitative	Sample	Representative sample (representative of entire population from which participants were drawn)
	Good (meets 3 or 4 criteria)	Appropriate allocation to intervention and control groups (if applicable)
	Fair (meets 1 or 2 criteria)	Participant characteristics adequately reported
	Poor (meets no criteria)	Sufficient size of the participant numbers (power)
	Measure (for randomized-controlled trials)	Adequate blinding of participants and study personnel (if appropriate)
	Measure (for pre-post design)	Outcome measures valid and reliable
	Good (meets 2 or 3 criteria)	All participants followed up in the same manner
	Fair (meets 1 criteria)	Adequate use of appropriate outcome measures
	Poor (meets no criteria)	Use of standard procedures for all participants
	Analysis	Adequate follow-up
	Good (meets 5–7 criteria)	Appropriate analyses conducted
	Fair (meets 1–4 criteria)	Statistical significance reported
Poor (meets no criteria)	Precision of results reported	
Qualitative	Methodological rigor	Confounders accounted for
	Good (meets 5 or 6 criteria)	Account of all participants who entered the study
	Fair (meets 1–4 criteria)	How meaningful are the results (within the context of the research)?
	Poor (meets no criteria)	Importance of the outcomes discussed
	Interpretive rigor	A theoretical perspective was identified and “fits” the research issue
	Good (meets 3 or 4 criteria)	Appropriate methods chosen and described
	Fair (meets 1 or 2 criteria)	Suitable sampling strategies used
	Poor (meets no criteria)	Sufficient selection and description of participants
	Transferability/relevance	Clear explanation of data collection methods, analysis and interpretation
	Good (meets 2 criteria)	Triangulation used to enhance trustworthiness, by source of information, methods used, multiple researchers, or use of various theories
	Fair (meets 1 criteria)	Authentic representation between data and findings
	Poor (meets no criteria)	Adequate discussion of conflicting and corroborating evidence
	Inclusion of participants in interpretive process	
	Transparency of the researcher’s role	
	Consideration of the contribution of the research to existing knowledge	
	Transferability of findings to other clients and contexts	

Two articles met full criteria for at least one component and partially for other components of quality. [McIntyre et al. \(2012\)](#) exhibited good methodological rigor, partially met criteria for interpretive rigor (lack of inclusion of participants in interpretive process and transparency of researcher’s role), and partially met transferability/relevance (lacking clear transferability of findings to other clients/contexts). [Lach et al. \(2007\)](#) had good methodological rigor and transferability/relevance, partially meeting criteria for interpretive rigor (as for [McIntyre et al., 2012](#)).

Effect of Interventions (Quantitative Articles)

The four RCTs ([Mahoney et al., 2007](#); [Shaw et al., 2003](#); [Suttanon et al., 2012a](#); [Teri et al., 2003](#)) and two pre-post design articles ([Mackintosh & Sheppard, 2005](#); [Teri et al., 1998](#)) were too heterogeneous to meaningfully combine their results using meta-analysis. Hence, a narrative synthesis is presented. Fall-related outcomes were considered in all six articles, but falls rates were measured over variable time periods. At 6 months, two studies reported a nonsignificant reduction in falls: measured

as a reduction in number of fallers after a center-based program (Mackintosh & Sheppard, 2005) and a reduction in number of falls after a home-based exercise program (Suttanon et al., 2012a), yet Suttanon et al. (2012a) also reported a significant reduction in falls risk. An emergency department intervention (Shaw et al., 2003) and an intermediate-intensity referral/recommendations intervention (no exercise intervention) reported falls rates over 12 months (Mahoney et al., 2007), both finding a nonsignificant difference in falls rates between intervention and control groups. Importantly, however, a subanalysis of one study, participants with MMSE < 28 who lived with someone, had a statistically significant decrease in falls, hospitalization and nursing home admission rate compared with those who did not (Mahoney et al., 2007). Shaw et al. (2003) measured time to first fall, injury rates, admission to emergency department or hospital as a result of a fall, and mortality between intervention and control groups, reporting no significant findings. None of the six quantitative articles measured fear of falling.

Health and well-being status was measured in six articles (Mackintosh & Sheppard, 2005; Mahoney et al., 2007; Shaw et al., 2003; Suttanon et al., 2012a; Teri et al., 1998, 2003). One article failed to report health and well-being measures postintervention (Teri et al., 1998), whereas another reported no significant differences in mortality between groups (Shaw et al., 2003). Mahoney et al. (2007) identified a significantly lower decline in activities of daily living for participants with MMSE < 28. Other articles reported statistically significant decreased restricted activity and increased numbers of those exercising for more than or equal to 60 min/week (Teri et al., 2003), statistically significant improvement in depression at 3 months, but not 24 months (Teri et al., 2003), and statistically significant improvement in functional reach distance (Suttanon et al., 2012a). Only one study reported outcome measures for the caregiver, showing a nonsignificant change for burden and quality of life (Suttanon et al., 2012a).

The only evidence of health behavior change was adherence to exercise programs, measured in three articles (Mahoney et al., 2007; Suttanon et al., 2012a; Teri et al., 1998). Adherence was categorized under health behavior and involvement in care, a complex phenomenon relying on individual's changing behavior while taking an active role in their health care. One article showed all participants at least partially completing their recommended program, with more than a third of participants completing all exercises (Teri et al., 1998). Another article showed adherence to strategies at 4 months ranging from 32% (podiatry) to 93% (assistive devices), with improvements in podiatry, ophthalmology visits, and psychotropic medication use at 12 months (Mahoney et al., 2007). Suttanon et al. (2012a)

recorded adherence of 82.96% for the 58% of the sample completing exercise intervention.

Findings (Qualitative Articles)

Themes identified from the qualitative literature included impact of health professionals on the PLWD-caregiver dyad, including need for appropriate information (Buri & Dawson, 2000; Lach & Chang, 2007; McIntyre & Reynolds, 2012; Suttanon et al., 2012b); attitudes of nihilism and fatalism toward falls/falls prevention (Buri & Dawson, 2000; Faes et al., 2010); positive attitude and prior experience (Suttanon et al., 2012b); accommodation of individual preferences (Buri & Dawson, 2000; McIntyre & Reynolds, 2012; Suttanon et al., 2012b); need for caregivers to control/normalize the falls situation (Buri & Dawson, 2000; McIntyre & Reynolds, 2012); variability in coping strategies and consequences of falls (Buri & Dawson, 2000; Faes et al., 2010; McIntyre & Reynolds, 2012); and needs of the PLWD-caregiver dyad (Buri & Dawson, 2000; Faes et al., 2010; McIntyre & Reynolds, 2012; Suttanon et al., 2012b).

Synthesis of Qualitative and Quantitative Findings

Synthesis of this review aimed to explore the most effective falls prevention KT strategies and understand the meaning attributed to falls prevention, for PLWD and their caregivers. This synthesis showed whether themes identified by PLWD and their caregivers through the qualitative work were congruent with the interventions reported in quantitative articles (Table 6).

Impact of the health professional was an identified theme. Included were positive impacts of providing helpful support, advice and resources (Lach & Chang, 2007; Suttanon et al., 2012b) and negative impacts of caregiver

Table 6. Synthesis of Qualitative Themes and Quantitative Articles

Views of people living with dementia and/or their caregivers	Number of quantitative articles that coincidentally considered these views
Health professional involvement	6
Home-based versus center-based intervention	5
Inclusion of the caregiving dyad	4
Accommodation of individual preferences	1
Controlling falls/maintaining order	0
Reports of nihilism and fatalism	0
Previous experiences and attitudes	0

frustration (Buri & Dawson, 2000) and feeling “nobody was interested” (McIntyre & Reynolds, 2012). All quantitative studies included health professional involvement, through tailored home programs (Mahoney et al., 2007; Suttanon et al., 2012a; Teri et al., 1998, 2003) or providing/supervising center-based programs (Mackintosh & Sheppard, 2005; Shaw et al., 2003). Home-based programs were preferable (Mackintosh & Sheppard, 2005; Suttanon et al., 2012b). Traveling and inclement weather presented a barrier to center-based program commitment (Suttanon et al., 2012b), mitigated by transport provision (Mackintosh & Sheppard, 2005). More positive results occurred where health professionals worked together with caregivers (Mahoney et al., 2007; Suttanon et al., 2012a; Teri et al., 2003).

Including the caregiver in a falls prevention program was another identified theme, utilizing strategies to cope with falls (Buri & Dawson, 2000; Faes et al., 2010; McIntyre & Reynolds, 2012) or working directly with the PLWD (McIntyre & Reynolds, 2012). Identified strategies included reducing caregiver burden (Faes et al., 2010); utilizing a problem, emotion, or avoidance-oriented approach (Faes et al., 2010); controlling and normalizing the falls situation (Buri & Dawson, 2000); and alteration of the caregiver-PLWD relationship (Buri & Dawson, 2000; McIntyre & Reynolds, 2012). Focus needed to be on the health, commitments, and self-identity of the caregiver, with the caregiver and PLWD on a journey of “learning as they went along” (McIntyre & Reynolds, 2012). Others needed assistance with decision making (Lach & Chang, 2007) and preserving independence (Buri & Dawson, 2000). The dyad navigated the unpredictability of falls, using strategies of enhanced supervision (Buri & Dawson, 2000; Faes et al., 2010), change of environment, or moving house (Lach & Chang, 2007).

Four intervention studies (Mahoney et al., 2007; Suttanon et al., 2012a; Teri et al., 1998, 2003) included caregivers as an integral part of the falls prevention program, including a caregiver-supervised exercise program (Suttanon et al., 2012a; Teri et al., 2003), training to identify/modify behavioral concerns for the PLWD (Teri et al., 2003), and their presence significant for a referral and recommendations intervention (Mahoney et al., 2007). For more successful programs, including adherence to exercise programs, their role was important for support, encouragement, and supervision (Mahoney et al., 2007; Suttanon et al., 2012a; Teri et al., 2003).

The qualitative literature suggested that prevailing attitudes and previous experiences affect uptake of falls prevention strategies. Attitudes of nihilism and fatalism, of falls being inevitable and unpredictable, were reported in two articles (Buri & Dawson, 2000; Faes et al., 2010) but

were not explored quantitatively. Positive attitudes of prior exercise experience, a sense of commitment to both exercise and research (Suttanon et al., 2012b), and a desire to preserve memory (Buri & Dawson, 2000) encouraged the uptake of falls prevention strategies. In contrast, commitment to strategies waned with a dislike for structured exercise or deterioration in health (Suttanon et al., 2012b) or a change in social or recreational activities and being resistant to change (Lach & Chang, 2007). Accommodating individual preferences and differences, expressed through the qualitative studies, while touched on in Teri et al. (2003) study, was poorly addressed. There was little consideration of attitudes/experiences (either positive or negative) and individual preferences for the PLWD in any of the quantitative studies.

Discussion

This mixed-method review explored existing falls prevention KT strategies for PLWD and their caregivers. By synthesizing both the quantitative and qualitative findings, it provides a new understanding of translating falls prevention knowledge for community-dwelling PLWD. To successfully translate knowledge, it needs to be relevant, pertinent, and meaningful to those who are to be informed. This review shows that questions being researched through the quantitative literature are not always identical to those questions of importance to PLWD and their caregivers.

The strength of this review is that it used a systematic and accountable method (Gough et al., 2012), including a thorough search strategy and predefined eligibility criteria. To the best of the authors' knowledge, no review addressing this question has been undertaken. The main limitations of this review were the omission of gray literature and the exclusion of non-English language studies. It is acknowledged that this represents a potential publication bias.

The four RCTs, two pre-post design studies and five qualitative studies included in the review, were of mixed quality but provided a preliminary understanding of opportunities for practice and gaps for further research. A consistent nonsignificant trend toward a reduction in falls rates in intervention groups, with limited evidence to suggest an effect on health and well-being measures was shown. Qualitative themes suggest caregiver and health professional involvement are key to program success; attitudes of nihilism and fatalism prevail; consideration be given to previous experiences, accommodation of individual preferences, and to the variability of participant needs.

To reduce an individual's falls risk, health professionals commonly use falls prevention programs and strategies. No matter how effective an intervention, success will only be optimized with high levels of program participation and

adoption of recommended strategies (Nyman & Victor, 2012), the key to which continues to elude researchers. The effective translation of falls prevention knowledge has potential for encouraging adoption of strategies, but, as described earlier, passive forms of education and information provision alone are insufficient for behavior change. A key weakness identified by this review is the lack of evidence that KT is actually a stated or recognizable purpose of falls prevention programs. Thus, the process of categorizing interventions and outcomes is subjective, and we may have overstated its effects. The principles of Graham et al. (2006) regarding the cyclical process of moving knowledge into action with consideration of individual context and barriers/opportunities for participation has merit when considering falls prevention programs for PLWD.

Cognitive impairment affects executive function, impacting memory, planning, and attention (Liu-Ambrose et al., 2008), possibly affecting a person's ability to implement falls prevention strategies. It therefore should not be presumed that falls prevention KT strategies for the wider older adult population will work for PLWD. This may partially explain why the studies by Shaw et al. (2003; replicating a previously successful RCT with cognitively intact older adults) and Mackintosh and Sheppard (2005; exhibiting common elements of falls prevention programs of exercise, foot health and referral to general practitioner) showed no statistically significant findings. PLWD, however, have the ability to learn and retain new information when appropriately presented (Small, 2012), and this must be a consideration for future falls prevention programs targeting this group.

Multidisciplinary health professional involvement was incorporated in all included studies, both at home and in center-based programs. The involvement of health professionals at a person's home, in contrast to a center, is consistent with home being an important source of comfort and familiarity, supporting the personhood of the PLWD (Gitlin & Corcoran, 2000). The unfamiliar environment of a center may pose difficulty for processing visual and auditory cues (Gitlin & Corcoran, 2000), thus drawing finite attentional resources away from falls prevention information being delivered.

Presence of a caregiver was another factor strongly identified in the qualitative literature, where caregivers provided support, assisted with exercises, and drew on health professionals for information and decision making. Teri et al. (2003) supported the work in the broader literature, particularly the REACH studies where caregivers were instructed in problem solving and skill building while caring for the PLWD (Gitlin, Corcoran, Winter, Boyce, & Hauck, 2001; Gitlin, Winter, Dennis, Hodgson, & Hauck, 2010). Drawing on involvement of the caregiver for KT has

potential to assist with uptake of falls prevention strategies, yet care needs to be exercised to build capacity and prevent further burden. Throughout this review, it was noted that caregivers struggled with the burden of falls, yet saw rewards in caregiving and their frustrations with services, yet their determination to obtain information, seek assistance for decision making, and attempt to control their situation. McIntyre & Reynolds (2012) acknowledged the difficulty of isolating the falls experience from the wider dynamic of the caring relationship and, supported by Buri et al. (2000), the need to restructure both individual and relationship identities. Falls prevention programs offer opportunity to work with the caregiving dyad, drawing on their knowledge and expertise, and addressing concerns for both.

Accommodation of individual differences and preferences is a tenet of human rights. The PLWD has the right to be treated with respect be provided choice in health care (Australian Human Rights Commission, 2012), acknowledging their ongoing personhood and existing capacities (Moore & Hollett, 2003). This applies equally to falls prevention programs whereby the skills of communication and participation within a care partnership may enhance the adoption of strategies.

Strikingly absent in studies of this review was an explicit exploration of the evaluation of KT strategies implicit within falls prevention programs. Outcome evaluation focused on fall-related outcomes and change in health status, yet these outcome measures were highly variable. Missing altogether is reflection upon (a) the impact of informing and educating regarding falls prevention, (b) supporting behavior change through regular home visits and phone calls, (3) whether skills have been taught effectively, and (4) decision-making opportunities. Cognitive impairment affects executive functioning, with limitations in attention and strategy formation potentially affecting successful implementation of falls prevention strategies. Variability exists among PLWD, yet there is potential to draw on preferences and current abilities to enhance adoption of falls prevention strategies and reduce the fatalistic views of the inevitability of falls. There is an urgency to rigorously evaluate falls prevention programs for PLWD, to ensure that they are well defined with outcome measures specifically and consistently addressing falls and falls risk and the uptake of falls prevention strategies.

This systematic mixed-method review adds to the growing body of knowledge of translating knowledge for falls prevention in PLWD, adding to the understanding of what may be effective while accounting for individual preferences. These findings, however, are somewhat speculative given there are few high-quality studies, making it difficult for clinicians and policy makers to determine how the

balance of evidence will influence their practice/decisions. Further research is required to evaluate the content of falls prevention knowledge; effective delivery methods; receipt of information; and adoption of strategies, accounting for health problems of the PLWD.

Conclusion

A mixed-method synthesis allowed a new understanding of the uptake of falls prevention strategies for PLWD to be generated. Strikingly absent in studies within this review was an exploration of KT strategies as a goal or outcome, despite an implicit understanding that knowledge needs to be shared during falls prevention programs. However, renewed focus upon health professional involvement, inclusion of the caregiving dyad, and accommodation of individual preferences and differences may see increased engagement with falls prevention strategies with this important high-risk population.

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