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Maintaining older patient's independence: A clinical scoping review on Emergency Department, transitional, and community health services after an injury or a fall

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ABSTRACT

Objective: To describe acute elder care interventions and community services that help pre-frail independent seniors restore their autonomy in activities of daily living following a minor injury or a fall.

Design: A scoping review on Emergency Department (ED) transition services and community health services to prevent functional decline in injured independent seniors discharged home.

Setting: Literature published from inception to October 2015 in PubMed, EMBASE, and Grey literature websites was searched. A single author first screened titles of 2919 retrieved studies; two independent reviewers screened 127 abstracts/full-text for eligibility. Documents were included if their population was 60 years or older, living in the community, had a history of minor injury or a fall, visited a primary care setting (ED or other), and described care transition strategies.

Results: A total of 22 documents were included and half of them were from grey literature. Included studies were describing ED strategies and transitions strategies (n=10), such as discharge plan, follow up and community referrals, community services were aiming at fall prevention interventions (n=12) such as multifactorial risk assessment, exercises and home adaptation. In selected papers, assessed interventions/modalities were performed in numerous environments and by various health professionals (paramedic to the community).

Conclusion: There is limited evidence on effective care transition strategies following ED discharge of the potentially frail injured elders, but tends to favor comprehensive geriatric assessment, exercise programs, medication revision and targeted referrals to community services tailored to individual needs of injured seniors. Improving coordination along the continuum of care and emergency professional continuing education should be given special attention to implement efficient discharge strategies to maintain independence of seniors after an injury or a fall.

Strengths and limitations of the study

- The grey literature search added important information to the systematic search of published articles.
- The scoping review had a narrative quality appraisal of the included articles.
- Evidence classification was based on clinical key concepts to guide care to the elders.
- Grey literature inclusion prevented adequate quantitative analyses of the outcome.
- A rigorous process of retrieving and selecting pertinent published peer-reviewed article and grey literature reports was achieved.

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INTRODUCTION

Appropriate Emergency Department (ED) and post-ED management is often not undertaken (1, 2) for community-dwelling seniors sustaining injuries. Those injuries are mostly minor as they do not threat life, but they could limit mobility and normal activities and lead to frailty. It was recently confirmed that minor injuries trigger a downward spiral of mobility decline in 16% of previously independent seniors (3-5) up to 6 months post-injury, unmask early signs of impairments (6-8) and a pre-frail/frail status.(9, 10).

Currently, management from ED back to community following injuries is minimal; only 9%-32% are referred to their physician and 1%-24% to physiotherapy (11, 12). In elders discharged home, rate of health service utilization increases from 24% to 44% (13) patients return to ED within three to six months, and up to 25% are hospitalized (14). Favorable outcomes depend not only on the care received in the ED, but also on the successful high-quality transitional care for independent, pre-frail and frail seniors. It requires the coordination of necessary resources, education of the patient and family, and communication among health professionals, which is currently missing (15).

The aim of this scoping review was to describe the nature and extent of research and grey literature reporting on evaluations of interventions designed to restore or maintain functional independence of older adults presenting to the emergency department following an injury or a fall.

METHODS

A scoping review was conducted based on the framework proposed by Arksey and O' Malley (16, 17). First**, the research question** "what are interventions designed to restore or maintain functional independence of older adults presenting to the emergency department following an injury or a fall? " was **identified with a brief consultation of literature and** a panel of ED clinicians, patient's representatives, stakeholders and researchers. Second, **we searched relevant studies using** two research strategies performed by two different research assistants on PubMed and EMBASE databases from inception to October 2015 (see Appendix 1). Bibliographies of retrieved articles were examined for additional references. Manual search on international associations, organizations or health institutes websites were done to retrieve grey literature documents (guidelines, government reports, consensus reports, etc.). Grey literature is defined by literature that is "produced on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers".(18).

Third, the **selection of studies** was done by two authors (GT and NAB). They screened the titles of 2919 identified studies to select potentially relevant articles, leaving 127 abstracts and full-text to be assessed for eligibility by two independent reviewers (BLBK and GT). Two disagreements were referred to a third reviewer (ME) and resolved by consensus. We contacted two authors for additional information on eligibility, but we end-up excluding the two papers due to lack of response. The selection of 22 final articles included in this scoping review was based on the following inclusion and exclusion criteria. Inclusion criteria were: i) included community-dwelling independent participants aged 60 years and older; ii) history of minor injury and/or fall; iii) visit to an emergency room or other walk-in clinics setting; iv) describing care transition strategies and interventions that take place in or from the ED to maintain the independent functional status of patients discharged home. Exclusion criteria were studies that: i) included patients admitted to hospital, ii) included long-term care patients or residing in nursing homes, iii) described specific health related problems (i.e.: osteoporosis, chronic diseases, cardiac condition, specific orthopedic treatment, etc.) and iv) reported no intervention.

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Fourth, we **extracted data** on intervention type and comparator, duration of the intervention, setting, study populations (carer group; care recipient group), aims of the study, methodology, outcome measures and important results in a standardized fashion.
Fifth, we analyzed, compiled and organized evidence into category-specific tables describing type of interventions intended for elder adults discharged from ED. Categories were carbon-copied on the continuum of acute clinical care. These synthesis tables hold in similar interventions. Main results reported in retrieved documents were gathered together. We were then able to identify dominant trends and gaps in the literature.

RESULTS
The **original protocol is** summarized in the PRISMA-P figure in the supplementary date. A total of 22 included publications met our selection criteria: 6 systematic reviews, 4 with and 2 without meta-analysis, 3 observational studies, 3 descriptive reviews and 10 grey literature documents. Seventeen original randomized controlled studies (RCT) or observational studies included in previously selected systematic reviews were not retained from this scoping review to avoid duplicates (Table 1). Overlap analyses of the 22 included publications is provided in Figure 1.

This clinical review highlighted **two key concepts of interventions;** one based on **ED and transitions care strategies** during older patients discharge process (n=10) and the other centered **on fall-prevention** strategies (community interventions/treatment/management) (n=12). Very little literature treats the transition services, improved access to community resources. They show mixed results. The conceptual model in Figure 2 illustrate the continuum of interventions beginning from their visit to ED and ending after their return home. We categorized included studies according to type of interventions reported (Table 2) and we summarized the most frequently cited interventions in Table 3.

Included studies on ED-based interventions with improved access to community resources have had mixed results. Most of them demonstrate little effect of these interventions on either ED utilization or prevention of complication. However, they also show that clinically transitions of care are required to ensure outpatient care and maintain autonomy following ED discharge.

Key concept 1: Emergency Department and Transition strategies
Emergency Department
Direct Paramedic referral (n=1) (19):.Paramedics refer patients who had a fall, but are not transportated to hospital directly to a fall-prevention service. Comans et al.(19) showed that paramedic to community falls prevention services was not successful. Authors suggested that it could be effective with dedicated trained falls prevention staff within paramedic's services.

Brief-risk screening tool (n=3) (20-22): Practical difficulties of a brief-risk screening tool implementation of this instrument were uncovered.(20) The prospective cohort study of Launay et al.(21) from geriatric (medical only) or gerontological (combination of medical and social) recommendations based on brief-geriatric assessment provided by a mobile geriatric team, only geriatric recommendations, defined as medical recommendations only (recommendations for the diagnosis and treatment of polymorbid older adults with disabilities), were related with rapid discharge (i.e. less than 24 hours) from the ED. Other studies(22) used a screening tool to discriminate between low risk and high risk patients, but authors did not examine the effect of this specific modality on effectiveness of care transitions.

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Comprehensive geriatric assessment (CGA) (n=6) (20, 22-26): Conroy et al. showed no clear benefit of hospital or home-base CGA in terms of mortality, readmission, institutionalization, functional ability, quality of life or cognition(25), while 71% of patients needed community-based referrals.(26, 27) CGA could detect geriatric syndromes, increase community referrals and avoid hospital admissions, but not ED return visits (20) . Grey literature reported benefits of comprehensive geriatric assessment in the ED, primary care or acute care units. CGA should be done in the presence of one or more frailty syndrome (pain, depression, delirium, incontinence, dementia, etc.).(23) CGA can improve patient function and quality of life and reduce hospital stay, readmission rates and institutionalisation. Acute medical units are suitable to complete CGA and initiate appropriate interventions. CGA is the gold standard for the management of frailty in older people,(24) but because it is a relatively long process, it is not feasible to administrate to every older adult with frailty.

Geriatric consultation service (n=2) (26, 28) showed a higher rate of hospitalization, long-term institutionalization and mortality, but results are inconstant for reduction of patient's admissions.(28)

Transition strategies

General practitioner liaison (n=2)(22, 29) : Lowthian et al.(22) reported 3 studies(30-32) in which liaison with general practitioner (GP) was assessed. These studies showed positive effects on patient functional outcomes, but GP liaison was used along with several other community transition strategies. Caplan et al.(30) tested an hospital in the home approach showing a improvement in the functional patient outcomes (see details in Table 3). Emergency Nurse Association (ENA) cited one study that showed a decrease in ED readmissions when using a combination of interventions that include a procedure for sending discharge summaries directly to the primary care physician after patient discharge. (28)

Discharge planning/Care coordination/management (n=6) (20, 23, 26, 28, 29, 33): ENA (29) recommended a geriatric-care coordinator to ease transitions of care. Banerjee et al.(23) suggested that seniors should only be discharged from hospital with adequate support and with respect for their preferences and should be offered details of local voluntary sector organisations, other sources of information, practical and emotional support including information on accessing financial support and rehabilitation services. Furthermore, Geriatric ED should maintain relationships and resources in the community that can be used by patients on discharge to facilitate care, such as a case manager to assist with compliance of follow up; as stated in expert consensus-based Geriatric Emergency Department Guidelines.(28) Hastings et al.(26) identified one study(34) that showed overall reduction of ED return rates with implementation of multidisciplinary care coordination teams in ED, but outcomes were not specifically reported for the intervention group. Aminzadeh and Dalziel (20) described studies that used discharge planning, case management and follow up strategies and reported mixed results on ED return visits. Conclusions on effectiveness of care coordination are hard to formulate due to heterogeneity of interventions, population, setting and outcomes of retrieved articles. However, Agency for Healthcare Research and Quality (AHRQ)(33) cited one systematic review(35) that evaluated care coordination models for older adults and authors identified 8 common characteristics of studies showing encouraging results: 1) Evidence-based practice, 2) Nursing clinical delivery, 3) Screening for high risk, 4) Focused geriatric assessment, 5) Initiation of care and disposition planning in the ED, 6)

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Inter-professional and capacity-building work practices, 7) Post-ED discharge follow-up with patients, and 8) Establishment of evaluation and monitoring processes.

Community referrals (n=4) (22, 26, 33): Lowthian et al(22) and Hastings et al.(26) cited studies that describe community referrals intervention, but they were no data on specific effectiveness of them (they are always used in combination with other interventions). AHRQ(33) cited one case report (no control group) in which acute home care referrals was judged successful to reduce hospital admission. In three selected systematic reviews,(20, 22, 26) quick response initiatives showed reduced need for hospital admission, but no evidence on patient outcomes have been exposed.

Discharge instructions/education (n=3) (28, 29, 33) : Guidelines proposed to provide written discharge instructions that underline condition-specific symptoms and potential complications or red-flags to monitor(29) in a format best suited for older patients.(36) AHRQ reported that simplified computerized instructions increased patient understanding and follow-up adherence, especially in geriatric population (medication knowledge 43% for experimental group vs 17% for control group). In one study on older adults (2) cited in AHRQ,(33) authors reported an increased satisfaction with discharge instructions (87% vs 76%).

Prescription assistance (n=2) (29, 33): Publications did not show results on effectiveness of this single modality, but it was suggested that medication reconciliation is one strategy to use in combination with others in order to reduce readmissions.(29)

Transportation Assistance (n=1) (33) was not assess alone in older adults.

ED-made follow up appointments (n=2) (29, 33) studies cited in AHRQ report(33) showed higher adherence with outpatient follow-up if an appointment is made in the ED. EMA (29) cited one study that successfully decreased readmission rates when nurses were planning follow-up appointments after discharge of patient in combination with other interventions.

Telephone follow-up (n=5) (20, 22, 26, 28, 33): Studies evaluating telephone follow-up in AHRQ report(33) found that follow-up phone calls were effective and that, compared with emails, telephone calls were more effective at reaching patients. It is recommended(28) that ED should have a process in place that will effectively provide appropriate outpatient follow-up either via provider-to-patient communication or the provision of direct follow up clinical evaluation such as telephone follow up or telemedicine. Telephone follow up was used in the only two trials(22) that individually showed a significant decrease in early ED re-attendance and nursing home admission; but details of implementation are uncertain.

Health visitors (n=3) (20, 22, 26): Studies reported this elder support group to improved the rates of independence in Instrumental Activities of Daily Living (IADLs) and increased community services utilization.

Group appointments (n=1) (33) study cited in AHRQ document,(33) showed a decrease in ED use (from 0.58 visit to 0.23. ($p<0.001$)) and hospital charges in adults who are frequent users of ED with no health insurance.

Care bundles (n=1) (33): In one study on older adults (2) cited in AHRQ(33), authors reported an increased perceived well-being by patients (64% vs 59%) with a care bundle including a nurse care coordinator, discharge education, coordination of appointments and

telephone follow-up. However, this study showed no effect on 14-day ED return (RR: 0.79, 95% CI 0.62-1.02).

Key concept 2: Community interventions for Fall-prevention.

Multifactorial risk assessment (n=7) (37-43) shows slight benefits on effectiveness to limit falls and injuries in elders. One studies showed an increase in surgery's attendance, but no clear effect was found on number of fallers, fall-related injuries, recurrent falls, death or institutionalization. Some(43) reported preliminary results on positive effects for reducing ED re-attendance and hospitalization, but not statistically significant. Older adults should receive a multifactorial risk assessment followed by targeted intervention described in the Center for disease Control and prevention (CDC) Compendium of effective fall prevention interventions as recommended by American Geriatric Society (AGS) and British Geriatric Society (BGS) for identified risk factors because it is the most consistently effective strategy to prevent falls in literature they cited (RR 0.82 (95 percent CI, 0.72 to 0.94), NNT = 11 for prevention of falls).(37, 40, 44) Nevertheless, United States Preventive Task Force (USPSTF)(39) does not automatically recommend to perform it in all community-dwelling adults 65 years and older. According to authors, to determine when to perform a multifactorial assessment, physicians should consider the balance of benefits and harms of previous falls, co-morbid medical conditions and patient values. Ndegwa (41) identified numerous Canadian initiatives on healthy aging that include fall risk assessment or comprehensive assessment, such as Falls Prevention Clinic in Vancouver General Hospital, Specialized Senior's Clinic in Fraser Health in British Columbia, Day Hospital Services in Alberta, Geriatric Day Program in Saskatoon or South Shore Health in Nova Scotia. Soriano et al. described an example of a form, proposed by Assessing Care of Vulnerable Elders (ACOVE) project.(42)

M when nurses were planning follow-up appointments multifactorial interventions (n=9) (19, 37, 38, 41, 42, 44-47): Gates et al.(37) studied the effect of multifactorial assessment and multifactorial intervention programs to prevent falls, but no clear effect was shown on number of fallers, injuries, recurrent falls, readmissions to ED, hospitalization or institutionalization. Most of studies cited in Gates et al. include assessment of gait and balance (n=13), drug review (n=13) and home environment assessment (n=16) in association with an extensive range of prevention interventions such as referral to general practitioner or hospital consultants, exercise, drugs, or surgery. In systematic review of Gillespie et al.,(48) multifactorial interventions have been shown to reduce the rate of falls (RaR 0.76; 95% Ci 0.67-0.86; 19 trials, 9503 participants), but not the risk of falling (RR 0.93; 95% CI 0.86-1.02; 34 trials; 13 617 participants). Comans et al.(19) described a paramedic referral pathway to a multifactorial fall prevention program, but no outcome was reported. Hosseini et al.(38) suggest the development of multifactorial fall prevention programs in the community because combined interventions are more effective than single modality alone. Soriano et al. explained that several randomized trials have shown, with systematic reviews and meta-analyses support, that multi-intervention strategies can prevent falls in community-dwelling, cognitively intact elderly adults by 20%–45% at both high and low risk for falls, but the content of each multifactorial intervention program varies considerably between studies and according to individual needs of participants. Gagnon et al.(45) stated that although it is difficult to assess effectiveness of multifactorial programs because of the interventions heterogeneity, programs that encompasses at least home adaptation, medication review and exercises are

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generally effective. In CDC Compendium of effective fall interventions, Stevens and Burns(44) described several multifactorial interventions designed to prevent falls that have been shown to reduce falls among community-dwelling older adults. Health Quality Ontario(49) stated that multifactorial interventions in high-risk populations may be effective, but effect reported is only marginally significant, and quality of evidence available is low.

Multiple interventions (n=4): (41, 44-46) According to Gillespie et al.'s systematic review,(48) few multiple interventions studied were effective, but all but one that showed effectiveness comprise exercises. Gagnon et al.(45) proposed a checklist of multiple universal interventions to offer to all seniors with the aim of fall prevention. "Stepping on", "NoFalls Intervention" and "SAFE Health Behaviour and Exercise Intervention" are examples of multiple interventions that showed effectiveness in fall prevention as described in CDC Compendium on fall interventions(44). Different combinations of interventions were tested in the NoFalls intervention and the most effective association was group-based exercise with both vision improvement and home hazard modification that decrease likelihood of fall from one-third(44).

Education/knowledge (n=3) (39, 41, 46): Evidence for fall prevention effectiveness of education are lacking for this distinct intervention alone. Indeed, Gillespie et al.(48) and Moyer et al.(39) specified that evidence on provision of educational material alone is inconclusive, but combination of education with other interventions reached a significant reduction in rate of falls in some individual studies cited in Gillespie's review.(48)

Single interventions for Fall-prevention:

Exercises (n=8) (38-41, 44-47): Gillespie et al.(48) showed multiple categories of exercise were effective to reduce rate of falls and risk of falling either when delivered as group classes or when individually recommended at home. In their descriptive review on fall-prevention interventions, Rao et al.(40) reported exercises individually tailored for patient by a physical therapist can decrease the number of individuals experiencing a fall over one year when compared to a control group receiving no intervention (RR=0.86; 95% CI 0.75-0.99) and Moyer et al.(39) recommended the provision of exercise and physical therapy to community-dwelling older adults at increased risk of falling with a grade B evidence. Gagnon et al.(45) strongly recommended that physicians prescribed exercise as a fall prevention measure to every community-dwellers seniors, especially Tai Chi, fall-prevention group exercises program or individualized exercise programs for those at high-risk of falling. Authors reported a decrease of 13% (NNT= 15) in the number of fallers, with any of these type of exercises: muscle strengthening and balance exercises or Tai Chi, and a decrease of 24% (NNT= 11) in the number of fallers and 37% in the number of falls in the Tai Chi subgroup. Moreover, Health Quality Ontario(49) reported high-quality evidence that supports long-term exercise programs in seniors to reduce falls and possible fall-related injuries. Ndegwa (41) identified numerous Canadian programs that incorporates exercises (in group or at-home) to support healthy aging in community-dwelling elders. Home-based and community-based group exercises were also used as single interventions as described in CDC Compendium of effective fall prevention interventions(44).

Home environment modification/assistive technology (n=8) (38-41, 44, 45, 48, 49): Home safety interventions have been shown to reduce rate of falls and risk of falling and appear to be more effective when delivered by an Occupational Therapist (OT), as reported in Gillespie et al.. Hosseini et al.(38) suggested that home

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and environmental safety should be addressed by a home safety checklist and integrated in a community organization model. Rao et al.(40) reported two studies that showed effectiveness of home hazard assessment and modification by a trained health professional in reducing falls, of which one showed a 20% reduction compared with control group. Quebec's preliminary recommendations on fall prevention by Gagnon et al.(45) strongly recommended that physicians refer all seniors who have major visual impairment, who experience repeated falls or who have been discharged from a hospital or a rehabilitation centre to a healthcare professional for home environment assessment in order to promote functional autonomy and safety. However, in their 2012 Clinical Guidelines on fall prevention, U.S. Preventive Services Task Force(39) indicated that home hazard modification lack sufficient evidence for fall prevention for community-dwelling adults. More recently, (CDC)(44) identified 4 studies that showed effectiveness of home adaption for fall prevention. In all 4 studies, occupational therapists were performing the assessment, and one study reported a multidisciplinary team composed of nurse, physiotherapist (PT), OT and social worker. Evidence reported in Health Quality Ontario(49) showed that environmental modifications reduce the risk of falling in high-risk populations (RR, 0.66 [95% CI, 0.54–0.81]), but no effect was reported for seniors at low risk of falling (RR, 1.03 [95% CI, 0.65–1.41]). Health Quality Ontario (HQO)(49) also cited a meta-analysis of studies on mixed population that showed a minor reduction in risk of falling following a home modification program (RR, 0.85 [95% CI, 0.75–0.97]). Among numerous Canadian initiatives on healthy aging, Ndegwa(41) identified only one initiative, Falls Clinic in Nova Scotia, which explicitly include home safety assessment, walking aids and footwear adaptation to limit future falls in elders.

Medication (n=4) (40, 44-46): According to the systematic review of Gillespie et al.,(48) vitamin D supplementation does not decrease rate of falls or risk of falling, but withdrawal of psychotropic medication can reduced rate of falls without affecting risk of falling. This systematic review showed no effect of hormone replacement therapy (HRT) alone on rate of falls or risk of falling. Rao(40) recommended evaluation and withdrawal of medication that increase risk of falling, although risk reduction was not found to be statistically significant with this intervention (RR 0.61 (95 percent CI, 0.32 to 1.15), NNT = 7 for prevention of falls). Conversely, Gagnon et al.(45) reported that vitamin D supplements (doses of 700 or 800 IU a day), in combination with calcium supplements (> 500 mg a who fall by 27% (moderate quality of evidence) therefore authors recommended that physicians should review medications in collaboration with pharmacists when achieving periodic medical examination and should limit benzodiazepines prescriptions among seniors. Stevens et al.(44) described several individual studies concerning medication withdrawal or vitamin D with or without calcium supplementation that showed positive effects on fall prevention.

Vision assessment, correction or referral (n=5) (39, 44, 45, 48, 49) or surgery (n=4) (40, 44-46): Studies described in Health Quality Ontario(49) showed no significant reduction in the risk of falls with vision assessment. Vision correction interventions reported in Moyer et al.(39) has not revealed a reduction in risk of falling, but authors mentioned limited evidence for lessening fear of falling. Stevens et al.(44) described several fall prevention programs shown to be effective that include vision assessment as part of multifactorial assessment and intervention such as Australian "Stepping On" program or the New Zealand "VIP Trial". In three studies investigating interventions to improve vision reported in Gillespie et al. review,(48) there was

no significant reduction in rate of falls or risk of falling, moreover, one study even showed an increase in both rate of falls and number of seniors falling following vision intervention. However, considering the high prevalence of visual impairments among seniors and that visual screening followed by intervention is included in most multifactorial effective fall prevention interventions, Gagnon et al. (45) recommended that seniors have their eyesight tested periodically and have cataract surgery if needed, and that individuals with major visual impairment should benefit from home environment adaptation to prevent falls. Concerning intervention involving surgeries, cataract removal in the first eye in women and pacemaker installations for seniors with carotid sinus hypersensitivity have been shown to reduce rate of falls as reported in Gillespie et al..(48) In a meta-analysis based on two studies reported in HQO(49), no effect of cataract surgery was shown on fall reduction. However, these studies varied in population as one was only including first eye surgery and the other was studying second eye surgery. One study on cataract surgery(50) and one study on pacemaker(51) described in CDC Compendium of effective fall preventions interventions(44) showed positive results on fall prevention.

Fluid/Nutritional therapy (n=2) (45, 48): Nutritional therapy and supplementation has not been shown to reduce risk of falling in Gillespie's systematic review.(48) In preliminary recommendations on fall prevention of Gagnon et al.,(45) the expert committee suggested that physicians monitor under-nutrition indicators during periodic medical visits despite the uncertainty of nutrition intervention effectiveness to prevent falls.

Psychological intervention (n=2) (41, 46): No evidence of effect of psychological therapy on fall prevention has been reported in Gillespie et al..(48) Behavioural counseling is reported in Moyer et al.(39) with limited evidence of effectiveness on fall prevention. Despite the lack of clear evidence, Gagnon et al.(45) recommended that physicians evaluate fear of falling in seniors and propose directed interventions and screen for symptoms of anxiety or depression among those reporting fear of falling in order to propose appropriate interventions.

DISCUSSION

Our clinical scoping review had some strengths and limitations. We identified more than 25 modalities to improve ED and post-ED care of the injured elders, but the quality of all original researchs was not systematically assessed. The combination of grey and published literature increased the publications pool and added an extra layer of evidence to guide care. We believe this is an innovative and a significant benefit to identified literature gaps.

Health services interventions in the community are complex, tailored to the patient and to the cultural context, and compliance to the intervention plan varies from one patient to another. Therefore, study heterogeneity in their methodology and population was reported by many authors. Final outcomes measures vary greatly from one study to another, and studies with data about functional status and other important patient-related outcomes are rare. Of note, interventions described in literature are not mutually exclusive; it often encompasses different modalities to ease transitions from the ED to the community so it is difficult to evaluate the effectiveness of one single intervention. More studies with improved study design and methodology for the assessment of effectiveness of ED/post-ED interventions for community-dwelling seniors are needed to perform a meta-analysis.

Upon the actual standard for health intervention assessment, there is limited high-quality evidence on

optimal transition services to target pre-frail/frail elders following emergency department discharge after an injury or a fall. There is an important need to take into consideration the potential frailty state and the risk factors of ED older patients when we orient them. Though, our review identified a gap in comprehensive knowledge about this aspect. However, recommendations in favour of holistic geriatric assessment, discharge planning and care coordination, and referral to community services tailored to individual needs of injured seniors, such as multifactorial fall-prevention interventions were observed in literature. There is also a lack of clear evidence-based continuum of care for pre-frail or frail seniors discharged from ED following an injury or a fall. We think that risk assessment in EDs and targeted interventions should be the first steps towards improved ED discharge of seniors. Improved connections between interventions made in the ED and interventions available in the community to maintain or restore independence of seniors should also be given special attention.

In the reviewed literature, fall-prevention interventions were the third dominant theme in community services for seniors who suffered an injury or a fall. Fall- prevention strategies refer to interventions designed to reduce the incidence of falls in community-dwelling older adults or minimise their exposure to risk factors for falling.(46) Interventions for preventing falls comprise both single interventions and multiple component interventions as described by Gillespie et al..(48) Single interventions included risk assessment, exercises, education, medication optimization, environmental modification or assistive technology, fluid therapy, psychological therapy, vision assessment or surgery. Multiple component interventions can be either multifactorial, based on individual risk assessment, or multiple, which is described as a specific combination of single interventions. Strategies to prevent falls are most often included in community- based programs, and do not generally encompass strategies dispensed or supervised by ED staff, but patients can be referred to these services by ED health professionals.

In conclusion, this clinical scoping review will help ED clinicians, allied health care professionals, care coordinator, stakeholders and knowledge users to be aware of a broad range of potential post-ED interventions available for community-dwelling seniors to assist the recovery of their autonomy following ED discharge. We recommend that ED professionals should be taught of available community services to improve transitions from ED to community following an injury or a fall.

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Data sharing statement: Being a prospective observational multicentre study, this project includes other data results to be solely used by our research team. The data use is guided by a public funding agency - CFN.

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Table 1: Primary source studies included in previously selected reviews

Primary source studies	Systematic reviews					
	Aminzadeh *et al.* , 2002	Hastings *et al.* , 2005	Gates *et al.* , 2008	Conroy *et al.* , 2011	Gillespie *et al.* 2012	Lowthian *et al.* , 2015
Allen *et al.* 1997 (52)	•	•				
Arendts *et al.* 2013 (53)						•
Basic *et al.* 2002 (27)		•				
Black *et al.* 1997 (54)	•					
Brazil *et al.* 1998 (55)	•	•				
Bridges *et al.* 1999 (56)*		•				
Brookoff and Minniti-Hill, 1994 (57)	•	•				
Caplan *et al.* 2004 (30)*		•		•		•
Carpenter *et al.* 1990 (58)					•	
Ciaschini *et al.* 2009 (59)					•	
Close *et al.* 1999 (60)*			•	•	•	
Coleman *et al.* 1999 (61)			•		•	
Conroy *et al.* 2010 (62)					•	
Davidson *et al.* 2005 (63)			•	•	•	
Darby *et al.* 1992 (64)		•				
Dawson *et al.* 1992 (65)	•	•				
De Vries *et al.* 2010 (66)*					•	

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PUBLICATIONS

Primary source studies	Systematic reviews					
	Aminzadeh *et al.*, 2002	Hastings *et al.*, 2005	Gates *et al.*, 2008	Conroy *et al.*, 2011	Gillespie *et al.* 2012	Lowthian *et al.*, 2015
Elley *et al.* 2008 (67)	•	•			•	•
Fabacher *et al.* 1994 (68)			•		•	
Foo *et al.* 2012 (69)						•
Fox *et al.* 2010 (70)					•	
Freeman *et al.* 1994 (71)	•	•				
Fry 1996 (72)		•				
Gagnon *et al.* 1999 (73)	•	•				
Gallagher *et al.* 1996 (74)			•		•	
Gerson *et al.* 1995 (75)	•					
Gill *et al.* 2002 (76)			•			
Gill *et al.* 2008 (77)					•	
Gold and Bergman, 1997 (78)		•				
Guttman *et al.* 2004 (79)*		•				•
Hendricks *et al.* 2008 (80)*					•	
Hogan *et al.* 2001 (81)			•		•	
Hornbrook *et al.* 1994 (82)					•	
Huang *et al.* 2004 (83)			•		•	

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PUBLICATIONS

Primary source studies	Systematic reviews					
	Aminzadeh *et al.*, 2002	Hastings *et al.*, 2005	Gates *et al.*, 2008	Conroy *et al.*, 2011	Gillespie *et al.* 2012	Lowthian *et al.*, 2015
Huang *et al.* 2005 (84)					•	
Jitapunkul *et al.* 1998 (85)			•		•	
Jones *et al.* 1997 (86)*	•	•				
Khan *et al.* 1996 (87)	•					
Kingston *et al.* 2001 (88)					•	
Lee *et al.* 2001 (89)		•				
Lightbrody *et al.* 2002 (90)*			•		•	
Logan *et al.* 2010 (91)*					•	
Lord *et al.* 2005 (92)			•		•	
Mahoney *et al.* 2007 (93)					•	
Markle-Reid *et al.* 2010 (94)					•	
McCoy *et al.* 1992 (95)	•					
McCusker, Verdon *et al.* 2001 (96)		•				•
McCusker, Jacobs *et al.* 2003a (97)						•
McCusker, Dendukuri *et al.* 2003b (98)*				•		
McDonnell 1985 (99)		•				

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PUBLICATIONS

Primary source studies	Systematic reviews					
	Aminzadeh *et al.*, 2002	Hastings *et al.*, 2005	Gates *et al.*, 2008	Conroy *et al.*, 2011	Gillespie *et al.* 2012	Lowthian *et al.*, 2015
Meldon *et al.* 1999	•					
Miller *et al.* 1996 (100)*	•	•				
Mion *et al.* 2001 (101)						•
Mion *et al.* 2003 (31)*		•		•		•
Moss *et al.* 2002 (34)		•				
Newbury *et al.* 2001 (102)			•		•	
O'Grady *et al.* 1996 (103)*		•				
Pardessus *et al.* 2002 (104)			•			
Poncia *et al.* 2000 (105)		•				
Rajacich and Cameron, 1995 (106)	•	•				
Rubenstein *et al.* 1996 (107)	•					
Rubenstein *et al.* 2007 (108)*			•		•	
Runciman *et al.* 1996 (32)*	•	•				•
Russel *et al.* 2010 (109)*					•	
Salminen *et al.* 2009 (110)					•	
Schrijnemaekers *et al.* 1995 (111)					•	
Shaw *et al.* 2003 (112)			•			

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PUBLICATIONS

Primary source studies	Systematic reviews					
	Aminzadeh *et al.*, 2002	Hastings *et al.*, 2005	Gates *et al.*, 2008	Conroy *et al.*, 2011	Gillespie *et al.* 2012	Lowthian *et al.*, 2015
Shyu *et al.* 2010 (113)					•	
Sinclair and Ackroyd-Stolarz, 2000 (114)		•				
Sinoff *et al.* 1998 (115)	•	•				
Spice *et al.* 2009 (116)					•	
Suman *et al.* 2011 (117)					•	
Tinetti *et al.* 1994 (118)			•		•	
Townsend *et al.*1992 (119)	•					
Van Haastregt *et al.* 2000 (120)			•		•	
Van Roosum *et al.* 1993 (121)					•	
Vetter *et al.* 1992 (122)					•	
Vind *et al.* 2009 (123)*					•	
Wagner *et al.* 1994 (124)					•	
Weir *et al.* 1998 (125)			•		•	
Weir *et al.* 1999 (126)		•				
Whitehead *et al.* 2003 (127)		•				

PUBLICATIONS

Primary source studies	Systematic reviews					
	Aminzadeh *et al.*, 2002	Hastings *et al.*, 2005	Gates *et al.*, 2008	Conroy *et al.*, 2011	Gillespie *et al.* 2012	Lowthian *et al.*, 2015
Wyman *et al.* 2005 (128)			•		•	
Yim *et al.* 2011 (129)					•	
Vetter *et al.* 1992 (122)						•
Number of studies	19	27	19	5	40**	11

* Studies excluded from this knowledge synthesis because included in previously selected systematic reviews.

** Only studies reporting multifactorial interventions (n=40) are included in this table because they were the only studies overlapping with other SR's. Gillespie's *et al.* systematic review included a total of 159 studies.

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Table 2: Type of interventions described in selected studies (n=22)

Interventions	Systematic reviews						Observational studies				Descriptive reviews				Grey literature							
	Aminzadeh 2002 (n=19)	Hastings 2005 (n=27)	Gates 2008 (n=19)	Conroy 2011 (n=5)	Gillespie 2012 (n=40)	Lowthian 2015 (n=11)	Wong 2009	Comans 2013	Launay 2013	Rao 2005	Soriano 2007	Hosseini 2008	HQO 2008	Gagnon 2011	Ndegwa 2011	Moyer 2012	Banerjee 2012	ENA 2014	ACEP 2014	AHRQ 2014	BGS 2015	Stevens 2015
Post-ED interventions																						
Comprehensive geriatric assessment (CGA)	•	•		•		•											•				•	
ED appointments																		•		•		
Telephone follow-up	•	•				•													•	•		
Care bundles																				•		
Brief-risk screening tool	•					•			•													
Discharge instructions/education																		•	•	•		
Health visitor	•	•				•																
Prescription assistance																		•		•		
Geriatric consultation service		•																	•			
Discharge planning/case management/coordination	•	•															•	•	•	•		
Community Referrals	•	•				•														•		
GP liaison						•												•				
Transportation assistance																				•		
Group appointments																				•		
Fall-prevention strategies																						

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Interventions	Systematic reviews						Observational studies				Descriptive reviews				Grey literature							
	Aminzadeh 2002 (n=19)	Hastings 2005 (n=27)	Gates 2008 (n=19)	Conroy 2011 (n=5)	Gillespie 2012 (n=40)	Lowthian 2015 (n=11)	Wong 2009	Comans 2013	Launay 2013	Rao 2005	Soriano 2007	Hosseini 2008	HQO 2008	Gagnon 2011	Ndegwa 2011	Moyer 2012	Banerjee 2012	ENA 2014	ACEP 2014	AHRQ 2014	BGS 2015	Stevens 2015
Post-ED interventions																						
Multifactorial interventions			•		•			•			•	•	•	•	•							•
Exercises					•					•		•	•	•	•	•						•
Home environment/assistive technology					•					•		•	•	•	•	•						•
Multifactorial risk assessment			•				•			•	•				•	•						•
Vision assessment and correction or referral					•								•	•		•						•
Surgery					•								•	•								•
Medication					•					•				•								•
Multiple interventions					•									•	•							•
Education/knowledge					•										•	•						
Psychological interventions					•									•	•							
Fluid/nutritional therapy					•									•								
Paramedics referral pathway								•														
	6	6	2	1	10	6	1	2	1	4	2	3	5	9	7	5	2	5	4	9	1	8

PUBLICATIONS

Table 3: Description of interventions identified in selected studies and number of studies discussing these modalities

Post-ED interventions	
Comprehensive geriatric assessment (CGA) **n=6**	Comprehensive geriatric assessment (CGA) is a multidimensional interdisciplinary diagnostic process focussed on determining a frail older person's medication, psychological and functional capability in order to develop a coordinated and integrated plan for treatment and follow-up (130-132). It requires the assessment of patient by more than one health care professional to formulate a coordinated discharge care plan. In ED, this assessment can be led by a specially trained nurse or geriatric nurse practitioner (22, 26, 130) or a geriatrician (25). The resulting process of assessment is intended to provide a management plan which can include referrals to geriatricians or others specialists in the community such as geronto-psychatrists, therapists, specialist nurses, dieticians and podiatrists in the community.
Discharge planning/case management/coordination **n=6**	As described by AHRQ (33), discharge planning and care coordination involves a variety of interventions designed to help the patient transition from hospital to home environment. These interventions might include assistance with outpatient appointments, medical insurance, prescriptions, housing, and other needs. A care coordinator, sometimes referred to as a case manager, usually determines which interventions are appropriate for each patient. Care coordinator function often varies between nurse and social worker(29, 33). According to AHRQ (33), in some situations having both the nurse and social worker can be complementary. Care coordination team commonly use a referral model based on risk-assessment screening tool. More specifically, in emergency departments (ED), care coordination can include the incorporation of information from previous visits, ED-based educational services for continued care, post-ED treatment plan, and transfer of information from ED to continuing care provider (33).
Telephone follow-up **n=5**	Hastings et al. (26) and Aminzadeh and Dalziel (20) described studies in which telephone follow-up was made by a research nurse to clarify discharge and home care instructions.
Community Referrals **n=4**	Lowthian et al (22) and Hastings et al. (26) cited studies that describe community referrals as references made by ED professionals to appropriate primary care, home care programs or community services. A case manager or a nurse coordinator is usually responsible of making referrals. Rapid referrals to home-based services, known as quick response initiatives, are also reported in studies cited in three selected reviews (20, 22, 26).
Brief-risk screening tool **n=3**	One of the selected review (20) cited studies (32, 75) that described a brief-screening tool as a short questionnaire administrated to patient aged 75 years and older by emergency nurses or medical students. This tool is intended to detect functional, cognitive and social impairments among elderly patients presenting to ED to identify those at risk following discharge and propose appropriate interventions. Triage Risk Stratification Tool (TSRT), or Identification of Seniors at Risk (ISAR), to screened patients are examples of tools frequently used in selected studies to assess the risk of ED re attendance.

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Discharge instructions/education **n=3**	**According to Agency for Healthcare Research and Quality (AHRQ)(33), discharge education can encompasses various modalities of verbal or written discharge instructions and education about an acute medical condition. It can involve simplified computer-generated, diagnosis-specific discharge instructions or printed instructions and verbal reinforcement of recommendations.**
Health visitor **n=3**	As described in Hastings (26), Lowthian (22) and Aminzadeh and Daziel (20), health visitors are health professionals that visit, assess and plan community services for patient at home following ED discharge according to his needs. Depending on the study, interventions of health visitors can include chart screening for vulnerable seniors, telephone calls, home visits or referrals to appropriate services.
Prescription assistance **n=2**	Emergency Nurses Association (ENA) (29) and AHRQ (33) describe prescription assistance as dispensing medications before ED discharge, providing medication starters or giving vouchers to the patient to increase medication adherence.
Geriatric consultation service **n=2**	As described in Hastings et al. review (26), ED geriatric consultation service is delivered by a multidisciplinary team typically staffed by a geriatrician, a full-time nurse clinician, PT and OT that assess patient and formulate recommendations.
ED appointments **n=2**	This intervention is the arrangement, by ED staff, of a follow-up appointment with a specialist or another care service provider (33).
GP liaison **n=2**	Depending on studies cited, general practitioner liaison can consist of a formal discussion, generally led by an emergency nurse, with the patient's primary care physician (22) or of a report or summary of emergency visit sent to the GP (29).
Care bundles **n=1**	AHRQ (33) described care bundles as predetermined bundle of interventions to improve the ED discharge process. A bundle can include: nurse discharge plan coordinator (NDPC), discharge education, coordination of appointments and telephone follow-up.
Transportation assistance **n=1**	According to studies cited by AHRQ (33), transportation assistance includes transport assistance to pharmacy, to follow-up appointment or to other related destination by distribution of transportation vouchers or facility of transport service.
Group appointments **n=1**	As described in AHRQ's environmental scan report on ED discharge process (33), group appointments usually consist of 1-hour group meetings with a multidisciplinary team (family physician, nurse case manager, and behavioral health professional). Patients can attend the sessions when needed and receive additional one-on-one health sessions if necessary. They also have access to the nurse case manager through phone line if they need further assistance outside of scheduled meetings.

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Fall-prevention strategies	
Multifactorial interventions n=9	Fall-preventions interventions that comprises more than one type of intervention according to the patient's needs are called multifactorial (48). Participants receive different combinations of interventions based on an individual assessment to identify potential risk factors for falling. The initial assessment is usually done by one or more HPs. Finally, interventions and recommendations are given to the patient and referrals are made to appropriate fall-prevention services. Most of studies cited in Gates et al. (37) include assessment of gait and balance (n=13), drug review (n=13) and home environment assessment (n=16) in association with an extensive range of prevention interventions such as referral to general practitioner or hospital consultants, exercise, drugs, or surgery. Seniors' Community Health Team of South Shore Health, Nova, Scotia and Falls Clinic dispersed in Canada are examples of multifactorial fall-prevention program described by Ndegwa et al. (41)
Exercises n=8	As described in Hosseini et al. (38), type of exercises studied for fall prevention include gait, balance and functional training, strength or resistance training; 3D training (constant repetitive movement through three spatial planes, as Tai Chi or square stepping) or general physical activity (walking groups). Exercises interventions can also combine multiple type of physical activities. It can be group-delivered or performed individually at home. Exercises programs personalized for each participant by a health care professional, such as a physical therapist, were also reported in some studies cited in Gillespie et al. (48).
Home environment/assistive technology n=8	These modalities of intervention include adaptations to homes; aids for personal care and protection (hip protectors) and personal mobility (walking aids), aids for communication, information and signalling (eyeglasses, hearing aids, personal alarm system). It also includes home safety recommendations, environmental modifications to compensate visual impairment and footwear modification (increase grip or balance-enhancing insoles).
Multifactorial risk assessment n=7	This global assessment is intended to identify risk factors for falls in seniors. According to Gates et al.(37), it generally involves age, history of falls, balance, gait and mobility evaluation, visual impairment, medication use, cognitive functions, functional assessment, and environmental assessment. It is generally followed by individualized interventions aimed to limit individual risk factors of falls.
Vision assessment and correction or referral n=5	These interventions involved vision assessment and eye examination followed by targeted interventions if necessary (provision of new glasses, ophthalmologist referral, mobility training, home adaptation). It can also include a visual acuity test followed by referrals to eye care provider, GP or optometrist if needed (49).

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Surgery **n=4**	**Cataract surgery and pacemakers installation are two type of surgical treatment that have been studied for their potential to limit falls.**
Medication **n=4**	Interventions concerning medication include vitamin D (or analog) and calcium supplementation, hormone replacement therapy (HRT), medication review and/or withdrawal by a physician or pharmacist and patient (self-completed risk assessment tool related to medication).
Multiple interventions **n=4**	As described in Gillespie et al. (48), multiple interventions are fixed combinations of two or more major categories of single interventions delivered to all participants.
Education/knowledge **n=3**	These interventions describe modalities to increase knowledge related to fall prevention. Information and education sessions is often part of fall prevention programs described in Ndegwa report (41), such as Steady as you go (SAYGO) program in Alberta and Program of Integrated Managed-care of the Elderly (PRIME) in Manitoba.
Psychological interventions **n=3**	These interventions usually describe cognitive behavioural therapy interventions mostly focussed on fear of falling or on identification of anxiety or depression symptoms. Ndegwa et al. (41) described one Canadian pilot project in Saskatchewan that integrate behaviour modification interventions in seniors at risk of falling.
Fluid/nutritional therapy **n=2**	Interventions concerning nutrition involved evaluation of nutritional status of patient and targeted interventions, like nutritional supplementation if needed.
Paramedics referral pathway **n=1**	Paramedics refer patients who had a fall, but are not transported to hospital directly to a fall-prevention services (allied health rehabilitation team consisting of PT, OT and therapy assistants that offer multiple factor falls-prevention programme including comprehensive assessment of falls risk factors, exercises, education and home hazard identification and modification).

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