

# The Impact of Geriatric Emergency Management Nurses on the Care of Frail Older Patients in the Emergency Department: a Systematic Review



Hannah Leaker<sup>1</sup>, Lorelee Fox, RN, MN, GNC(c)<sup>1</sup>, Jayna Holroyd-Leduc, MD, FRCPC<sup>2</sup>

<sup>1</sup>Faculty of Nursing, University of Calgary, Calgary, AB; <sup>2</sup>Department of Medicine and Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, AB

<https://doi.org/10.5770/cgj.23.408>

## ABSTRACT

### Background

Frail older adults are high users of emergency departments (EDs). Many Canadian EDs have hired Geriatric Emergency Management (GEM) nurses in an effort to improve care to older adults.

### Methods

We conducted a systematic review to determine the impact of GEM nurses on care provided to frail older adults. We searched MEDLINE, Embase, CINAHL, and Cochrane databases. A grey literature search was also conducted. Inclusion criteria were English-language, evaluation of GEM nurse or geriatric-trained nurse assessments of older adults (age  $\geq 65$  years) within the ED, and reported clinical and/or health system outcomes. The PRISMA statement was followed, and article quality was assessed using GRADE.

### Results

5,115 citations and 191 full text articles were screened; 8 articles from 7 different studies were included. Study quality varied between very low to high. Five included studies analyzed the effect of GEM nurses on ED revisits, with most finding they decreased revisits. Four included studies analyzed the effect of GEM nurses on hospital admissions/readmissions, demonstrating variable impact. One study looked at the cost-effectiveness and found the cost to be negligible. The impact on patient-specific outcomes was less clear.

### Conclusions

GEM nurses may be an effective option to help in the management of frail older adults in the ED.

**Key words:** geriatrics, geriatric emergency management nurses, emergency department

## INTRODUCTION

The Canadian population is rapidly aging, with one in four Canadians projected to be over 65 by 2030.<sup>(1)</sup> Approximately 25% of persons over 65 are frail.<sup>(2)</sup> Individuals living with frailty are more vulnerable to stressors and have less capability to overcome adverse health events.<sup>(3,4)</sup> The higher degree of complex comorbidity and frailty among older adults leads to them being the highest users of health-care services.<sup>(5)</sup> This is seen in the emergency department (ED) where older adults have the highest ED use, high rates of ED revisitation, and the longest length of ED stay.<sup>(6-8)</sup> The overall number of ED visits is expected to increase with the projected increase in older Canadians.

Frailty can be broadly defined as an increased risk of experiencing adverse outcomes compared to others of the same age. Frail older adults often have complex medical, functional and/or social issues, contributing to their increased risk for adverse outcomes.<sup>(9)</sup> Emergency department visits can be a sentinel event for these individuals, threatening loss of independence, health, and quality of life. Frailty identification, and the initiation of appropriate and timely care planning within the ED, have the potential to reduce adverse outcomes for both the frail older individual and the health-care system.

Many Canadian EDs have hired Geriatric Emergency Management (GEM) nurses to help identify, assess, and link frail older adults to appropriate services, in an effort to reduce adverse outcomes among this population by better meeting both their health and functional needs (<http://gem.rgp.toronto.on.ca>). The GEM nurse model is an attractive care model because it utilizes minimal human resources to help address the increasing ED utilization by the aging population. These skilled nurses conduct targeted geriatric assessments in the ED, and make relevant care recommendations and referrals to community services. Furthermore, these GEM nurses strive to foster and build elder-friendly attitudes, practices,

and programming within the ED, through collaboration and education. We conducted a systematic literature review to determine the impact of GEM nurses working within EDs on both patient and health system outcomes.

## METHODS

### Purpose and Registration

The purpose of this systematic review was to present findings regarding the impact of a GEM nurse on the care provided to frail older adults within the emergency department (ED). This systematic review is registered with PROSPERO international prospective register of systematic reviews (CRD Reg. No. 42018096059), and is reported in accordance with Preferred Reporting Items for Systematic Reviews and Meta Analyses.<sup>(10)</sup>

### PICOS (Population; Intervention; Comparison; Outcomes, Study Design) Question

Our PICOS question was: Population = persons 65 years or older; Intervention = assessment (broadly defined to include interventions) by a GEM nurse or geriatric-trained nurse within an ED; Comparison = any comparison group (e.g., usual care); Outcome = any relevant clinical and/or health system outcome (including cost); Study Design = any experimental or quasi-experimental study design.

### Data Sources and Search Strategy

With the support of an experienced librarian, we searched MEDLINE, Embase, CINAHL, Cochrane Register of Control Trials, and the Cochrane Database of Systematic Reviews databases from inception up until January 2020. The search strategy included terms such as “Aged”, “Emergency department”, “Geriatric Nursing” and “Nursing assessment” and other similar terms (Appendix A). A grey literature search was also conducted (by HL) of relevant websites using the CADTH grey matters tool (details available from the authors upon request; initial search: July 2018; updated: Feb 2020), using the search terms frail, older adult, and emergency nursing. Reference lists from relevant articles were searched for additional articles.

### Study Selection and Risk of Bias Assessment

Articles were included if they were written in the English-language, evaluated the impact of GEM nurse or geriatric-trained nurse assessments of older adults (mean/median age  $\geq$  65 years) within the ED, and reported relevant clinical and/or health system outcome data. We did not consider differences in the education or training of GEM nurses (e.g., registered nurses vs. nurse practitioners). Studies that looked at geriatric nurses working within a multidisciplinary geriatric team in the ED or studies where part of the intervention occurred outside the ED were excluded.

Two reviewers (HL, LF, and/or JHL) independently reviewed all citations generated from the search for inclusion. Full text articles were obtained if either reviewer deemed it

potentially relevant or if the citation provided insufficient evidence to determine relevance. Retrieved full-text articles were independently reviewed for study inclusion by two reviewers (HL, LF, and/or JHL). Disagreements were resolved through discussion.

The quality of included studies was assessed by two reviewers (HL, JHL) using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) scoring system.<sup>(11)</sup> The GRADE tool is a systematic approach to rate the risk of bias and strength of recommendations a study makes based on factors such as type of evidence, the directness of the evidence to the clinical question, and effect size.

### Data Extraction and Analysis

Data was extracted from included studies by a single reviewer (HL) using a standardized data abstraction form and then checked with a second reviewer (JHL). Information extracted included information about design, study size, characteristics of the intervention and comparison group, outcomes, results, and study conclusions. A meta-analysis was not conducted given the clinical heterogeneity across studies in terms of study design, methods, and outcomes. Instead, a qualitative descriptive summary of the literature is presented, including a table comparing the included studies.

## RESULTS

### Search Results and Screening Process

Overall, 7,101 citations were retrieved from the database search and 8,521 citations were identified through the grey literature search (Figure 1). After duplicates were removed, 5,115 titles and abstracts were screened. 191 full text articles were obtained based on abstract and title screen. Based on full text screen, 8 articles from 7 different studies met the inclusion criteria and were included in this systematic review (Table 1).

### Study Quality

Overall, quality of recommendations within included studies ranged from very low to high quality, with two studies considered very low quality,<sup>(12-13)</sup> two studies considered low quality,<sup>(14,15)</sup> two studies considered moderate quality,<sup>(16-18)</sup> and only one study considered high quality.<sup>(19)</sup> The study designs included before-and-after, quasi-experimental, non-randomized and randomized control trials, and varied in size between 224 to 51,546 older patients.

### Interventions and Studies

The GEM nurse interventions varied across studies (Table 1). Interventions included variations of geriatric nurse assessment within the ED, geriatric risk screening by nurses, referrals to community services, and telephone follow up.<sup>(12-19)</sup> The main outcomes assessed across most studies were repeat emergency department visits and hospital admissions. Other common outcomes assessed included cost effectiveness, length of stay in hospital, functional decline, mortality, quality of life, and patient/caregiver satisfaction with care provided (Table 1).

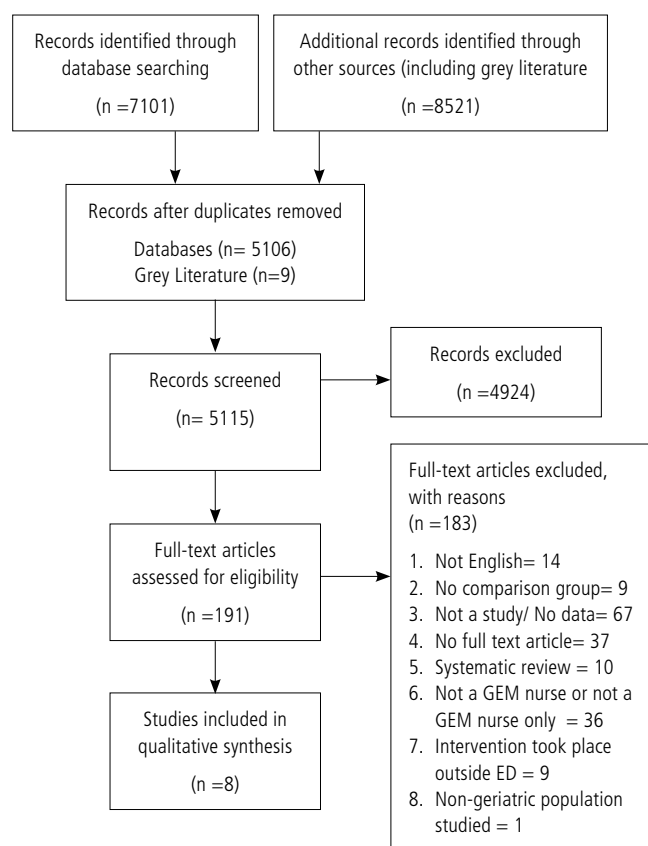


FIGURE 1. PRISMA diagram

### Emergency Department Visits

Five of the included studies analyzed the effect of GEM nurse interventions on emergency department (ED) revisitation, with most finding that GEM nurses decreased representation rates to the ED. Hegney *et al.*<sup>(15)</sup> reported the GEM intervention was successful in reducing ED revisits from 21% to 5% over the eight-month intervention period ( $p$  value < .001). Miller *et al.*<sup>(13)</sup> reported that the intervention trended towards reducing subsequent visits to the ED (0.26 vs. 0.39,  $p$  = .06). Mion *et al.*<sup>(12)</sup> reported a more modest decline in ED visits ( $p$  = .01), but a high-quality follow-up study<sup>(19)</sup> reported no reduction in ED visits 120 days after the intervention was implemented (OR = 0.90, 95% CI = 0.66-1.24). Finally, Hwang *et al.*<sup>(14)</sup> reported that the intervention was associated with a greater risk of 72-hour ED representation at two of the three sites where the intervention was implemented (site 1 = 1.49%, 95% CI = 0.65% to 2.33%; site 2 = 1.38%, 95% CI = 0.65% to 2.12%).

### Hospitalizations

Four of the included studies analyzed the effect of GEM nurse interventions on hospital admissions/readmissions, demonstrating variable impact of GEM nurses. Hegney *et al.*<sup>(15)</sup> reported trends towards lower readmission rates from 10.2% to 4.7% at the end of the intervention period ( $p$  < .05). Hwang *et al.*<sup>(14)</sup> found that there was a significant reduction in the risk of 30-day inpatient admission at two of the three sites where the intervention was implemented (site 1 = -7.79%, 95% CI =

-10.33%, to -5.25%; site 2 = -13.82%, 95% CI = -16.07% to -11.58%). Differing results were reported by Mion *et al.*<sup>(19)</sup> who found that the intervention was not associated with any significant reduction in hospital admissions at 120-day post-discharge (OR = 1.05, 95% CI = 0.75 to 1.49). Similarly, Basic and Conforti<sup>(16)</sup> reported that the intervention was not associated with reduced hospital admissions (OR = 0.7, 95% CI = 0.3 to 1.7).

### Other Outcomes

McCusker *et al.*<sup>(18)</sup> analyzed the cost effectiveness of GEM nurse interventions. The cost of the intervention was found to be negligible at just \$30CAN per person. Members of the intervention group experienced lower overall service use, which subsequently reduced overall societal costs by C\$387 per patient (\$3,737 vs. \$4,124, 95% CI = -1411 to 638). The cost for acute hospitalizations showed the largest difference in term of cost savings between the two groups at C\$285 in favour of the intervention group (\$1,154 vs. \$1,439, 95% CI = -1008 to 439). There were some areas in which costs were higher in the intervention group. The largest of this difference came from prescription drug costs, which was on average C\$165 higher per patient in the intervention group (\$934 vs. \$769, 95% CI = -15 to 345). Overall, the intervention represented a 9.4% reduction in costs when compared to the control group.

The presence of GEM nurses was associated with reduced functional decline at four months in one study that included risk screening, standardized geriatric nurse assessment, and community referrals, but there was no significant effect on depressive symptoms, caregiver health status or patient/caregiver satisfaction.<sup>(17)</sup> In contrast, Mion *et al.*<sup>(19)</sup> demonstrated higher patient satisfaction. Mion and colleagues also found that nursing home admissions were lower at 30 days, although there was no effect on overall service use. Miller *et al.*<sup>(13)</sup> found that more advanced directives were completed.

## DISCUSSION

GEM nurses working in the ED can have positive outcomes for the health-care system. Specifically, GEM nurses appear to have the potential to reduce repeat ED visits and hospital admissions in a cost-effective manner. Given the projected increase in ED visits as the Canadian population ages, this is an intervention that all EDs should consider implementing. Although comprehensive geriatric assessments commonly involve geriatrician-led multi-disciplinary teams, current budget constraints and the limited numbers of geriatricians within the Canadian health-care system makes the GEM nurse model an appealing and feasible option within Canadian EDs.

Community-based geriatric interventions may be more effective than those conducted in-hospital.<sup>(20)</sup> However, patients that end up accessing acute care are more likely to have problems accessing primary care and could have higher medical complexity and/or functional dependency, demonstrating the role for resources within the ED such as GEM nurses.

TABLE 1.  
Summary of findings from included studies

Author, Year and Country	Study Design	Sample Size and Setting	Intervention	Outcomes Measured	Results	Study Quality
Basic & Conforti (2005) <sup>16</sup> Australia	Randomized control trial	N=224 ED of a tertiary referral hospital	Geriatric assessment by an aged care nurse. Referrals to out of hospital services.	Hospital admission, length of stay (LOS) and functional decline during hospitalization.	The intervention had no significant effect on hospital admissions (OR=0.7; 95% CI= 0.3, 1.7), LOS (95% CI= 0.7, 1.5), or functional decline during hospital stay (OR=1.3; 95% CI=0.5, 3.3).	Moderate No blinding and missing data due to loss of follow up.
Hegney et al. (2006) <sup>15</sup> Australia	Before-and-after	N=2139 ED of a public hospital	Risk screening completed by a community nurse. Assess eligibility for and make referrals for community support services.	ED re-presentation, LOS and hospital admissions and re-admissions within 28 days.	ED re-presentations were significantly lower at the end of the post-intervention period (p <0.001). Trends towards lower re-admission rates (p<0.05) and decreased LOS were observed.	Low External factors may have influenced results of study.
Hwang et al. (2018) <sup>14</sup> United States	Quasi-experimental trial	N= 11860 Three US EDs	Geriatric evaluation carried out by emergency nurses trained to facilitate transitions of older adults. Initiation of ED geriatric care resources as required based on patient care need and resource availability.	Hospital admission during index ED visit, 72-hour ED re-presentation and any hospitalization from 0-30 days.	The intervention was associated with lower risk of admission during the index ED visit at all three sites (site 1= -9.9%, 95% CI=-12.31,-7.47; site 2= -16.46%, 95% CI=-18.68, -14.24; site 3= -4.72%, 95% CI= -7.47, -1.98). The intervention was associated with greater risk of 72- hour ED re-presentation (site 1= 1.49%, 95% CI= 0.65% to 2.33%; site 2 = 1.38%, 95% CI= 0.65% to 2.12%), and lower risk of any hospital admission within 30 days at two sites only (site 1= -7.79%, 95% CI= -10.33%, -5.25%; site 2= -13.82%, 95% CI= -16.07%, -11.58%).	Low Inconsistency in findings.
McCusker et al. <sup>a</sup> (2001) <sup>17</sup> Canada	Randomized control trial	N=388 Four university associated EDs	Risk screening. Standardized geriatric nursing assessment. Referrals to community services.	Functional decline, changes in depressive symptoms, changes in caregiver health status and patient/caregiver satisfaction with care.	The intervention was associated with reduced functional decline at 4 months (OR= 0.53; 95% CI=0.31, 0.91), but had no significant effect on depressive symptoms (OR= -0.48; 95% CI=-1.29, 0.33), caregiver health status (OR= 0.99; 95% CI= - 2.38, 4.37), 1 month patient satisfaction (OR=0.66; 95% CI= -0.24, 1.55) and one month caregiver satisfaction (OR= 0.71; 95% CI= -0.55, 1.97)	Moderate Lack of blinding.
McCusker et al. <sup>a</sup> (2003) <sup>18</sup> Canada	Randomized control trial	N=388 Four university associated EDs	Risk screening. Standardized geriatric nursing assessment. Referrals to community services.	Cost effectiveness.	Service use was lower for members of the intervention group (\$3737 vs \$4124, 95% CI= -1411 to 638). Overall the intervention represented a 9.4% reduction in costs when compared to the control group.	Moderate See above
Miller et al. (1996) <sup>13</sup> United States	Non-randomized clinical trial	N=770 Urban teaching hospital ED	30-minute assessment completed by a geriatric nurse clinician. Referral to support services. Telephone follow up.	Patient mortality, health status, use of social/medical services, institutionalization, presence of an advance directive and quality of life at 3-month post discharge.	The intervention had no significant effect on outcomes measured, however, trends towards reduced ED re-presentation (p=0.06) and increased presence of an advanced directive were observed (6.7% vs 2.9%)	Very low Under-matched controls, did not control for confounding



TABLE 1.  
Continued

Author, Year and Country	Study Design	Sample Size and Setting	Intervention	Outcomes Measured	Results	Study Quality
Mion et al. (2001) <sup>13</sup> United States	Before-and-after	N= 51546 Four hospital EDs	Screening done by triage or primary nurse. Assessment done by a geriatric clinical nurse specialist. Linkage to community services.	30 day repeat ED presentation.	The intervention was associated with a slight decline in repeat ED presentation (p=0.01).	Very low No matching except by age, no adjusting for confounding and no statistical comparison.
Mion et al. (2003) <sup>19</sup> United States	Randomized control trial	N=650 Two urban EDs	Geriatric assessment completed by an advanced practice nurse. Referral to community services.	Service use (repeat ED visitation, hospitalizations, nursing home admissions), healthcare costs at 30 and 120 days and satisfaction with discharge care.	At 30 days, the intervention was effective in reducing nursing home admission (OR=0.21; 95% CI= 0.05, 0.99), and increasing patient satisfaction (95% CI= 0.13, 0.62). At 120 days Hospitalization were not significantly different between intervention and control groups (OR=1.05, 95% CI= 0.75 to 1.49). ED re-visitation was not significantly affected at 120 days (OR=0.90, 95% CI= 0.66-1.24).	High

<sup>a</sup>The two included studies by McCusker et al. involved the same study population but looking at different outcomes.

Factors related to problems accessing primary care include limited primary care physician availability or lack of a family physician, as well as transportation challenges.<sup>(21)</sup>

Although the role for GEM nurses in helping to avoid repeat ED visits and hospital admissions can also be considered a positive outcome for older adults, the impact of GEM nurses on other patient outcomes is less clear. Specifically, the impact on outcomes commonly associated with acute illness and hospitalization, such as delirium and functional decline, is less clear. The patient and family perceptions of the GEM assessment is also not well-studied. Older patients' adherence to the follow-up appointments recommended by ED-based assessments appears to be variable.<sup>(22,23)</sup> The degree of frailty of the patients assessed by GEM nurses may be a factor in adherence to recommended community resources, as well as to overall effectiveness of GEM nurses. Determining the level of patient frailty to target for GEM nurse interventions should be explored further.

### Strengths and Limitations

A number of intervention studies were identified in this systematic review. However, there were only three randomized control trials identified in our search, with only one being of high quality. The strengths of this systematic review pertain to its rigour in searching the published and grey literature, the criteria-based selection of relevant evidence, and the rigorous appraisal of quality. Although the identification of a relatively small number of studies reporting comparable outcome measures precluded a visual assessment of potential publication bias via funnel plots, the comprehensive search strategy is likely to have identified most of the available literature on GEM nurses in the ED.

### CONCLUSIONS

This review helps to consolidate current knowledge regarding the impact of a GEM nurse within the ED, which supports the hypothesis that GEM nurses may be an effective option to help in the management of frail older adults presenting to the ED. Although further high-quality studies are required to more fully assess the impact of GEM nurses on patient outcomes, their presence in the ED appears to have the potential to improve both patient and health system outcomes in a cost-effective manner.

### ACKNOWLEDGEMENTS

H. Leaker was funded to conduct this research through an undergraduate summer research studentship from the Canadian Frailty Network. J. Holroyd-Leduc is the University of Calgary Brenda Strafford Foundation Chair in Geriatric Medicine.

### CONFLICT OF INTEREST DISCLOSURES

The authors declare that no conflicts of interest exist.

**APPENDICES**

## Appendix A. Search Strategies

**Cochrane Central Register of Controlled Trials**

1. Senior\*.kw,tw.
2. aged\*.kw,tw.
3. Elder\*.kw,tw.
4. Geri\*.kw,tw.
5. older adult\*.kw,tw.
6. Geriatrics/
7. Aged/
8. "Aged, 80 and over"/
9. Aging/
10. Frail Elderly/
11. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
12. emergency department\*.kw,tw.
13. emergency room\*.kw,tw.
14. Emergency Medical Services/
15. Emergency service, hospital/
16. 12 or 13 or 14 or 15
17. emergency medicine nurs\*.kw,tw.
18. Emergency Management nurs\*.kw,tw.
19. GEM Nurs\*.kw,tw.
20. geriatric nurs\*.kw,tw.
21. Gerontological nurs\*.kw,tw.
22. emergency room nurs\*.kw,tw.
23. nursing intervention\*.kw,tw.
24. Geriatric Nursing/
25. Geriatric Assessment/
26. Nursing Assessment/
27. Emergency Nursing/
28. Nurse Practitioners/
29. Health Services for the Aged/
30. 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
31. 11 and 16 and 30

**Cochrane Database of Systematic Reviews**

1. senior\*.kw,tw.
2. Aged\*.kw,tw.
3. Elder\*.kw,tw.
4. Geri\*.kw,tw.
5. older adult\*.kw,tw.
6. 1 or 2 or 3 or 4 or 5
7. emergency department\*.kw,tw.
8. Emergency room\*.kw,tw.
9. 7 or 8
10. emergency medicine nurs\*.kw,tw.
11. Emergency Management nurs\*.kw,tw.
12. GEM Nurs\*.kw,tw.
13. geriatric nurs\*.kw,tw.
14. Gerontological nurs\*.kw,tw.
15. emergency room nurs\*.kw,tw.
16. nursing intervention\*.kw,tw.
17. 10 or 11 or 12 or 13 or 14 or 15 or 16
18. 6 and 9 and 17

**CINAHL**

1. Senior\* or Aged\* or Elder\* or Geri\* Older Adult\*
2. (MH "aged") or (MH aged 80 and over), or (MH "frail elderly") or (MH "geriatrics") or (MH "aging")
3. 1 or 2
4. Emergency room\* or emergency department\*
5. (MH "emergency service") or (MH emergency medical services")
6. 4 or 5
7. emergency medicine nurs\* or emergency management nurs\* or GEM nurs\* or geriatric nurs\* or gerontological nurs\* or emergency room nurs\* or nursing intervention\*
8. (MH "gerontological nursing") or (MH "gerontologic nurse practitioners") or or (MH "emergency nursing") or (MH "emergency nurse practitioners") or (MH "geriatric assessment") or (MH "nursing assessment") or (MH "health services for the aged")
9. 7 or 8
10. 3 and 6 and 9

**EMBASE**

1. senior\*.kw,tw.
2. Aged\*.kw,tw.
3. Elder\*.kw,tw.
4. Geri\*.kw,tw.
5. older adult\*.kw,tw.
6. exp geriatrics/
7. aged/
8. exp aging/
9. exp very elderly/
10. exp geriatric patient/
11. exp frail elderly/
12. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 13
13. emergency department\*.kw,tw.
14. Emergency room\*.kw,tw.
15. exp emergency ward/
16. exp emergency health service/
17. exp emergency care/
18. exp hospital emergency service/
19. 13 or 14 or 15 or 16 or 17 or 18
20. emergency medicine nurs\*.kw,tw.
21. Emergency Management nurs\*.kw,tw.
22. GEM Nurs\*.kw,tw.
23. geriatric nurs\*.kw,tw.
24. Gerontological nurs\*.kw,tw.
25. emergency room nurs\*.kw,tw.
26. nursing intervention\*.kw,tw.
27. exp geriatric nursing/
28. exp emergency nursing/
29. exp nursing assessment/
30. exp geriatric assessment/
31. exp elderly care/
32. exp nurse practitioner/
33. 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31 or 32
34. 12 and 19 and 33

**Medline**

1. Senior\*.kw,tw.
2. Aged\*.kw,tw.
3. Elder\*.kw,tw.
4. geri\*.kw,tw.
5. older adult\*.kw,tw.
6. exp AGED/
7. exp “AGED, 80 AND OVER”/
8. exp AGING/
9. exp GERIATRICS/
10. exp Frail Elderly/
11. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10
12. emergency department\*.kw,tw.
13. Emergency room\*.kw,tw.
14. exp Emergency Medical Services/
15. exp emergency service, hospital/
16. 12 or 13 or 14 or 15
17. Emergency medicine nurs\*.kw,tw.
18. Emergency management nurs\*.kw,tw.
19. GEM nurs\*.kw,tw.
20. Geriatric nurs\*.kw,tw.
21. Gerontological nurs\*.kw,tw.
22. Emergency room nurs\*.kw,tw.
23. nursing intervention\*.kw,tw.
24. exp Geriatric Nursing/
25. exp Geriatric Assessment/
26. exp Nursing Assessment/
27. exp Emergency Nursing/
28. exp Health Services for the Aged/
29. exp Nurse Practitioners/
30. 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
31. 11 and 16 and 30

**REFERENCES**

1. Canadian Institute for Health Information. Health care in Canada. A focus on seniors and aging. Ottawa, ON: CIHI; 2011. Available from: [https://secure.cihi.ca/free\\_products/HCIC\\_2011\\_seniors\\_report\\_en.pdf](https://secure.cihi.ca/free_products/HCIC_2011_seniors_report_en.pdf)
2. Hoover M, Rotermann M, Sanmartin C, et al. Validation of an index to estimate the prevalence of frailty among community-dwelling seniors. *Health Rep.* 2013;24(9):10–17.
3. Buckinx F, Rolland Y, Reginster JY, et al. Burden of frailty in the elderly population: perspective for a public health challenge. *Arch Public Health.* 2015;73(1):1–7.
4. Muscedere J, Andrew MK, Bagshaw C, et al. Screening for Frailty in Canada’s health care system: a time for action. *Can J Aging.* 2016;35(3):281–97.
5. Physicians ACoF. Working together for healthy aging in Alberta: Seniors Forum recommendations. Edmonton, AB: Alberta College of Family Physicians; 2014.
6. Gruneir A, Silver MJ, Rochon PA. Emergency department use by older adults: a literature review on trends, appropriateness, and consequences of unmet health care needs. *Med Care Res Rev.* 2011;68(2):131–55.
7. Latham LP, Ackroyd-Stolarz S. Emergency department utilization by older adults: a descriptive study. *Can Geriatr J.* 2014;17(4):118–25.
8. Li G, Lau JT, McCarthy ML, et al. Emergency department utilization in the United States and Ontario, Canada. *Acad Emerg Med.* 2007;14(6):582–84.
9. Rockwood K, Howlett SE, MacKnight C, et al. Prevalence, attributes, and outcomes of fitness and frailty in community-dwelling older adults: report from the Canadian Study of Health and Aging. *J Gerontol A Biol Sci Med Sci.* 2004;59(12):1310–17.
10. Moher D, Liberati A, Tetzlaff J, et al. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med.* 2009;6(7):e100097.
11. GRADE Working Group. Grading quality of evidence and strength of recommendations. *BMJ.* 2004;328(7454):1490.
12. Mion LC, Palmer RM, Anetzberger J, et al. Establishing a case-finding and referral system for at-risk older individuals in the emergency department setting: the SIGNET model. *J Am Geri Soc.* 2001;49(10):1379–86.
13. Miller D, Lewis W, Nork J, et al. Controlled trial of a geriatric case-finding and liaison service in an emergency department. *J Am Geri Soc.* 1996;44(5):513–20.
14. Hwang U, Dresden S, Rosenberg M, et al. Geriatric emergency department innovations: transitional care nurses and hospital use. *J Am Geri Soc.* 2018;66(3):459–66.
15. Hegney D, Buikstra E, Chamberlain C, et al. Nurse discharge planning in the emergency department: a Toowoomba, Australia, study. *J Clin Nurs.* 2006;15(8):1033–44.
16. Basic D, Conforti D. (2005). A prospective, randomised controlled trial of an aged care nurse intervention within the Emergency Department. *Australian Health Rev.* 2005;29(1):51–59
17. McCusker J, Verdon J, Tousignant P, et al. Rapid emergency department intervention for older people reduces risk of functional decline: results of a multicenter randomized trial. *J Am Geri Soc.* 2001;49(10):1272–81.
18. McCusker J, Jacobs P, Dendukuri N, et al. Cost-effectiveness of a brief two-stage emergency department intervention for high-risk elders: Results of a quasi-randomized controlled trial. *Ann Emerg Med.* 2003;41(1):45–56.
19. Mion LC, Palmer RM, Meldon SW, et al. Case finding and referral model for emergency department elders: a randomized clinical trial. *Ann Emerg Med.* 2003;41(1):57–68.
20. McCusker J, Verdon J. Do geriatric interventions reduce emergency department visits? A systematic review. *J Gerontol A Biol Sci Med Sci.* 2006;61(1):53–62.
21. McCusker J, Karp I, Cardin S, et al. Determinants of emergency department visits by older adults: a systematic review. *Acad Emerg Med.* 2003;10(12):1362–70.
22. Guttman A, Afilalo M, Guttman R, et al. An emergency department-based nurse discharge coordinator for elder patients: does it make a difference? *Acad Emerg Med.* 2004;11(12):1318–27.
23. McCusker J, Dendukuri N, Tousignant P, et al. Rapid two-stage emergency department intervention for seniors: impact on continuity of care. *Acad Emerg Med.* 2003;10(3):233–43.

**Correspondence to:** Jayna Holroyd-Leduc, Foothills Medical Centre, 1403 29th Street NW, Calgary, AB T2N 2T9  
**E-mail:** jayna.holroyd-leduc@ahs.ca