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 ≥ 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
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.\(^{(10)}\)

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 ≥ 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.\(^{(11)}\) 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,\(^{(12-13)}\) two studies considered low quality,\(^{(14,15)}\) two studies considered moderate quality,\(^{(16-18)}\) and only one study considered high quality.\(^{(19)}\) 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.\(^{(12-19)}\) 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).
Additional records identified through other sources (including grey literature)
(n =8521)

Records identified through database searching
(n =7101)

Records after duplicates removed
Databases (n= 5106)
Grey Literature (n=9)

Records screened
(n= 5115)

Full-text articles assessed for eligibility
(n =191)

Studies included in qualitative synthesis
(n =8)

Records excluded
(n =4924)

Full-text articles excluded, with reasons
(n =183)
1. Not English= 14
2. No comparison group= 9
3. Not a study/ No data= 67
4. No full text article= 37
5. Systematic review = 10
6. Not a GEM nurse or not a
GEM nurse only = 36
7. Intervention took place
outside ED = 9
8. Non-geriatric population
studied = 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.\(^\text{(15)}\) 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.\(^\text{(13)}\) reported that the intervention trended towards reducing subsequent visits to the ED (0.26 vs. 0.39, \(p\) = .06). Mion et al.\(^\text{(12)}\) reported a more modest decline in ED visits (\(p\) = .01), but a high-quality follow-up study\(^\text{(19)}\) 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.\(^\text{(14)}\) 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.\(^\text{(15)}\) reported trends towards lower readmission rates from 10.2% to 4.7% at the end of the intervention period (\(p\) < .05). Hwang et al.\(^\text{(14)}\) 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.\(^\text{(19)}\) 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\(^\text{(16)}\) 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.\(^\text{(18)}\) 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 $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 $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 $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.\(^\text{(17)}\) In contrast, Mion et al.\(^\text{(19)}\) 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.\(^\text{(13)}\) 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.\(^\text{(20)}\) 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

<table>
<thead>
<tr>
<th>Author, Year and Country</th>
<th>Study Design</th>
<th>Sample Size and Setting</th>
<th>Intervention</th>
<th>Outcomes Measured</th>
<th>Results</th>
<th>Study Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic &amp; Conforti (2005)16</td>
<td>Randomized control trial</td>
<td>N=224 ED of a tertiary referral hospital</td>
<td>Geriatric assessment by an aged care nurse. Referrals to out of hospital services.</td>
<td>Hospital admission, length of stay (LOS) and functional decline during hospitalization.</td>
<td>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).</td>
<td>Moderate</td>
</tr>
<tr>
<td>Hegney et al. (2006)15</td>
<td>Before-and-after</td>
<td>N=2139 ED of a public hospital</td>
<td>Risk screening completed by a community nurse. Assess eligibility for and make referrals for community support services.</td>
<td>ED re-presentation, LOS and hospital admissions and re-admissions within 28 days.</td>
<td>ED re-presentations were significantly lower at the end of the post-intervention period (p &lt;0.001). Trends towards lower re-admission rates (p&lt;0.05) and decreased LOS were observed.</td>
<td>Low</td>
</tr>
<tr>
<td>Hwang et al. (2018)14</td>
<td>Quasi-experimental trial</td>
<td>N=11860 Three US EDs</td>
<td>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.</td>
<td>Hospital admission during index ED visit, 72-hour ED re-presentation and any hospitalization from 0-30 days.</td>
<td>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 to -7.47; site 2= -16.46%, 95% CI= -18.68 to -14.24; site 3= -4.72%, 95% CI= -7.47 to -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% to -5.25%; site 2= -13.82%, 95% CI= -16.07% to -11.58%).</td>
<td>Low</td>
</tr>
<tr>
<td>McCusker et al. (2001)17</td>
<td>Randomized control trial</td>
<td>N=388 Four university associated EDs</td>
<td>Risk screening. Standardized geriatric nursing assessment. Referrals to community services.</td>
<td>Functional decline, changes in depressive symptoms, changes in caregiver health status and patient/caregiver satisfaction with care.</td>
<td>The intervention was associated with reduced functional decline at 4 months (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).</td>
<td>Moderate</td>
</tr>
<tr>
<td>McCusker et al. (2003)18</td>
<td>Randomized control trial</td>
<td>N=388 Four university associated EDs</td>
<td>Risk screening. Standardized geriatric nursing assessment. Referrals to community services.</td>
<td>Cost effectiveness.</td>
<td>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.</td>
<td>Moderate</td>
</tr>
<tr>
<td>Miller et al. (1996)13</td>
<td>Non-randomized clinical trial</td>
<td>N=770 Urban teaching hospital ED</td>
<td>30-minute assessment completed by a geriatric nurse clinician. Referral to support services. Telephone follow up.</td>
<td>Patient mortality, health status, use of social/medical services, institutionalization, presence of an advance directive and quality of life at 3-month post discharge.</td>
<td>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%).</td>
<td>Very low</td>
</tr>
</tbody>
</table>

Note: ED = Emergency Department; LOS = Length of Stay.
### Table 1. Continued

<table>
<thead>
<tr>
<th>Author, Year and Country</th>
<th>Study Design</th>
<th>Sample Size and Setting</th>
<th>Intervention</th>
<th>Outcomes Measured</th>
<th>Results</th>
<th>Study Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mion et al. (2001)³</td>
<td>Before-and-after</td>
<td>N= 51546 Four hospital EDs</td>
<td>Screening done by triage or primary nurse. Assessment done by a geriatric clinical nurse specialist. Linkage to community services.</td>
<td>30 day repeat ED presentation.</td>
<td>The intervention was associated with a slight decline in repeat ED presentation (p=0.01).</td>
<td>Very low</td>
</tr>
<tr>
<td>Mion et al. (2003)¹⁹</td>
<td>Randomized control trial</td>
<td>N=650 Two urban EDs</td>
<td>Geriatric assessment completed by an advanced practice nurse. Referral to community services.</td>
<td>Service use (repeat ED visitation, hospitalizations, nursing home admissions), healthcare costs at 30 and 120 days and satisfaction with discharge care.</td>
<td>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).</td>
<td>High</td>
</tr>
</tbody>
</table>

*The two included studies by McCusker et al. involved the same study population but looking at different outcomes.

**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 fully assess the impact of GEM nurses on patient outcomes, their presence in the ED appears to improve both patient and health system outcomes in a cost-effective manner.

**Acknowledgements**

The authors declare that no conflicts of interest exist.

**Conflict of Interest Disclosures**

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APPENDICES

Appendix A. Search Strategies

Cochrane Central Register of Controlled Trials
1. Senior*,kw,tw.
2. aged*,kw,tw.
3. Elder*,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.
19. GEM Nurs*,kw,tw.
20. geriatric 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.
5. older adult*.kw,tw.
6. 1 or 2 or 3 or 4 or 5
7. emergency department*.kw,tw.
9. 7 or 8
10. emergency medicine nurs*.kw,tw.
12. GEM Nurs*.kw,tw.
13. geriatric 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 nurs-
ing”) 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.
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. emergency department*.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.
22. GEM Nurs*.kw,tw.
23. geriatric 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.
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.
14. exp Emergency Medical Services/
15. exp emergency service, hospital/
16. 12 or 13 or 14 or 15
17. Emergency medicine nurs*,kw,tw.
19. GEM nurs*,kw,tw.
20. Geriatric 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

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