Provincial Geriatric Emergency Management Evaluation Report
June 2009

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Geriatric Emergency Management Evaluation 2008

Executive Summary

Seniors over the age of 75 years now have the highest Emergency Department (ED) visit rate of any segment of the population and this rate is rising. For staff working within the ED, frail seniors present a significant clinical challenge. Atypical presentation of disease, superimposed on complex medical and psychosocial comorbidities create demands on the ED system for which it was not designed. There is accumulating evidence from Canada and abroad that supports the efficacy of case-finding in the ED and linkage of frail seniors to services in the community. This evidence has been applied in the current implementation of Geriatric Emergency Management (GEM) in Ontario. The goals of the Ontario program are to deliver targeted geriatric assessment to high-risk seniors in the ED and to build capacity through knowledge transfer among ED staff and other health care partners.

This evaluation focused on the effect of eight GEM nurses deployed in eight EDs in Ontario. Using a retrospective cohort design, this observational study examined the association between GEM intervention and outcomes such as return visit to an ED, admission to hospital and new admission to a long-term care home. Secondary outcomes included physician office visits and average length of stay of hospitalizations. We also examined stakeholder satisfaction with GEM services.

Between April 1, 2005 and March 31, 2006, the eight GEM nurses saw 2,770 frail seniors. Over one third (34%) of GEM-intervened subjects were 85 years of age or older. Almost two-thirds (63%) of the patients were female. Fifty-eight percent of the GEM patients were admitted to the emergency department with CTAS level of 3, or an urgent rating. Over one third (38%) of the patients seen by GEM nurses across the eight hospitals were admitted to hospital. We attempted to match the 2,006 seniors seen by GEM who were eligible for the study with 7,871 seniors who were not seen by GEM. Matching variables included: age, gender, Canadian Triage Acuity Score (CTAS), mode of arrival and admission status immediately following the ED encounter.

There were no significant differences in repeat visits to the emergency department at 7 days or readmission rates to hospital at 7, 30 or 180 days. There were significantly more ED visits at 30 and 180 days among GEM-intervened patients (p<.01). There were significantly more new long-term care admission for patients seen by the GEM nurse (p<0.01). There were no statistically significant differences in secondary outcomes. Mortality was significantly higher in the GEM-intervened subjects at 180 days compared to non GEM-intervened subjects (16.1% vs. 13.4%, p<0.01)
There are several important considerations to bear in mind when interpreting these results.

**Selection Bias:** Despite best efforts to match and control for confounding variables, selection bias cannot be completely overcome in an observational study. The increased death rate in the GEM group suggests that more complicated and sicker seniors are being referred to GEM.

**Temporal trends in ED use and health system changes:** Increasing numbers of seniors are creating increased demand on the health care system. The use of a historical comparator group (in 2003-2004) may have limited our ability to detect a change in our outcome measures.

**Consultative model:** Our GEM service was primarily a one-time, consultative model and GEM nurses did not have direct control over the implementation of recommendations or follow-up.

**Heightened awareness and adequacy of support services:** A GEM nurse heightens awareness of treatable geriatric issues. As a result, patients and families may seek out health services more actively. Variation in the availability of geriatric services in Ontario may have had an effect on the implementation of GEM nursing recommendations.

**A hospital admission is an appropriate disposition for some patients seen by GEM:** The GEM intervention may identify unrecognized medical issues and advocate for admission to hospital. Admission to hospital should not be considered a negative outcome but an appropriate disposition.

**Frail seniors have acute as well as chronic health needs:** Seniors are not seeking medical attention in the EDs inappropriately. Consistent with reports in the literature, our experience is that ED visits by seniors are due to urgent medical need, not frivolous complaints.

Evidence of the positive impact of GEM has been published elsewhere. In studies from Canada, USA and Australia, GEM has been shown to be effective at reducing repeat ED visits (1, 2), nursing home admissions (3) and the rates of functional decline (4), especially when closely linked with follow-up geriatric intervention in the community (5). Stakeholders view the GEM services very positively. Vivid patient narratives and clinical case reports affirm the value of GEM in addressing the unmet needs of frail seniors in the ED setting. Overwhelming support from opinion leaders in the ED, clinicians and other partners and positive stakeholder satisfaction data confirm the benefits of GEM services. Through our experience with GEM, we have refined our intervention models and identified systemic issues that can enhance anticipated outcomes and build system capacity as indicated by the addition of more than 40 GEM nurses serving frail seniors in EDs across Ontario since this project was initiated.
Geriatric Emergency Management
Evaluation Final Report

Introduction

A GEM Case Vignette

GEM identifies previously unrecognized problems and stops a cycle of ED recidivism

A 75-year old woman came to the ED with right-sided chest pain of five days duration. During the five days she had made two ED visits. Because she had no evidence of recent injury or cardiac event, acetaminophen with codeine (Tylenol # 2) was prescribed and she was sent home.

Her third ED visit was to a GEM-enhanced ED where an assessment by the GEM nurse revealed several important issues. The patient lived alone, was disengaged from her family and had recently refused home support services. Consultation with the patient’s community pharmacist revealed that until recently she had returned her dosette empty at the end of each week but had not taken her medications regularly over the previous few weeks. She had stopped taking acetaminophen with codeine, for example, because it made her feel “fuzzy-headed” and it became apparent that she was unable to read her medication instructions. She reported poor appetite and weight loss. Fluid intake consisted primarily of caffeinated beverages and meals consisted of toast and frozen dinners. On a cognitive screen the patient scored 22/30. Investigations revealed an untreated urinary tract infection. A diagnostic formulation included delirium associated with urinary tract infection and pain secondary to fibromyalgia.

A treatment plan included antibiotics for the urinary tract infection and discontinuation of the acetaminophen with codeine in favour of regularly scheduled plain acetaminophen. The patient was discharged home from the ED with nursing visits provided by CCAC to monitor medication adherence. Family members were found and agreed to assist. In consultation with the patient's family physician, referrals were initiated for an outpatient geriatric assessment and an eye examination. The GEM nurse provided telephone follow-up and the cycle of ED readmissions appeared to have stopped.

This case study illustrates:

- The value of GEM intervention in identifying previously unrecognized problems
- Through the GEM medication review, inappropriate narcotics were replaced with safer, better tolerated medication to control pain
- A cycle of ED recidivism was stopped
- Appropriate community services were re-instated
Seniors over the age of 75 years now have the highest Emergency Department (ED) visit rate of any segment of the population and this rate is rising (6). They are more likely to arrive at the ED by ambulance (7). Their medical conditions are more complex than younger ED users (8). Their length of stay in the ED is longer (9) and their rates of admission into hospital from the ED is already more than twice the rate of other age groups (10) and may be rising (8).

If discharged home from the ED, as many as 30% of seniors are readmitted within 14 days (11). Aminzadeh & Dalziel report that 24% are readmitted and 10% will die within three months of an ED visit (10). Wilber & Gerson found that 44% are readmitted within six months (12). Despite this and notwithstanding system issues such as the access to primary care physicians and the availability of long term care beds, seniors, like ED users in other age groups, use the ED appropriately and will do so with increasing frequency as the baby boom demographic doubles the number of seniors between now and the year 2020 (6).

For staff working within the ED, frail seniors present a significant clinical challenge. In addition to clinical complexity, common diseases present atypically, co-morbidity may confound standard approaches, polypharmacy is widespread and cognitive abilities must be considered. Common diagnostic tests may have different normal values, patient’s sensory function may be impaired, their physiologic reserve depleted, and social support systems may be compromised (13). Not surprisingly, there are significant gaps in the educational experience of ED staff (14, 15). Many ED physicians find seniors more difficult and time-consuming to assess than younger adults (8, 14, 16). Seniors and staff in our EDs need help and several interventions have been examined to respond to this need.

Accumulating evidence supports the efficacy of case-finding in the ED and linkage of frail seniors to services in the community. In a randomized, controlled trial conducted in Australia, geriatric emergency assessment and referral intervention resulted in a beneficial effect on functional decline and a reduction in hospital admission and repeat ED visits (5). In a Canadian study, screening and targeted assessment of high risk seniors reduced the rate of functional decline, and increased communication and linkage with community resources (4). In the United States, Mion et al, demonstrated a reduction in nursing home admissions with a targeted geriatric nursing assessment in the ED (3).

Stakeholders, both patients and health professionals, consistently report value in the Geriatric Emergency Management (GEM) service. The GEM nursing program has continued to grow and now, some 40 GEM nurses are deployed in EDs across Ontario. In British Columbia, the Geriatric Emergency Nurse Initiative (GENI) brings geriatric nursing expertise into the ED with a focus on capacity building with ED staff. In one urban hospital, GENI is estimated to have saved 1,170 inpatient days over a 4 month period (17).

The present evaluation focused on eight GEM nurses deployed in eight EDs across Ontario. Guided by earlier research, the service combined clinical service with capacity building. The clinical service was directed towards frail and at risk seniors; while capacity building included knowledge transfer activities in the ED, hospital, and in long-term care homes (LTCH), as well as more systemic interventions such as risk notification to primary care.
Methods

Eight EDs in Ontario participated in this evaluation and hosted a full-time GEM nurse. The nurses participated in a week long GEM training and network building institute. Supported by the RGP of Ontario, the GEM nursing network met bimonthly and developed a number of valuable program resources, including: A GEM practice model and algorithm, a capacity building framework, and a targeted clinical assessment framework. The nurses compiled, adopted and adapted a variety of assessment tools and models of best practice to inform the delivery of the GEM service. Details of the formative work of the RGP of Ontario and GEM nursing network are available in the GEM Progress Reports at www.rgp.toronto.on.ca/gem.

Potential subjects were referred to the on-site GEM nurse by the attending ED staff. A high risk screening tool was used by ED staff to assist in the identification of appropriate referrals (18, 19). This tool identified older adults at risk of repeat ED visits, hospitalization, and subsequent LTCH placement. The GEM nurse performed a targeted geriatric assessment, made recommendations for care and linked the patient to appropriate resources. Otherwise, usual care was delivered to the subjects as per the judgment of the clinicians involved, including the GEM nurse.

This is a retrospective cohort study evaluating the GEM intervention. Subjects were over 75 years of age, assessed in person by the GEM nurse and discharged from the ED alive. At one inner city site, subjects over 60 years of age were eligible for the GEM intervention due to the number of homeless and marginalized people with issues typically associated with older age presenting at a younger age. The first recorded GEM assessment in the study fiscal year was considered the index encounter. Repeat GEM assessments were not included in the analysis.

To evaluate the outcomes of interest, administrative datasets housed at the Institute of Clinical Evaluative Studies (ICES) were linked to data collected for the GEM program. For each GEM-intervened subject, four comparator subjects, not intervened by GEM, were selected from among the patients seen in the ED of the same institution one year prior to the implementation of the GEM program. These non-GEM-intervened subjects were matched to each GEM-intervened subject on the following variables: age (+/-2yrs), gender, mode of arrival, admission status after the GEM encounter, and Canadian Triage Acuity Scale (CTAS) rating. This historical comparator group was assembled from the same hospital in a “pre-post” model in order to limit the confounding of local practice patterns and available specialty resources at differing hospitals. Subjects were followed for 180 days post discharge (from ED index encounter or from hospital, if applicable) and were assessed for return ED visits, acute hospital admissions, LTCH admissions, and physician office visits.

The profile of the cohort was described, including: demographic data (age, gender), CTAS level, admission status, resident of long-term care home, and mode of arrival to emergency, and Adjusted Clinical Group (ACG) scoring system. The ACG system is used to measure patients’ comorbidity based on health service utilization in the year prior to the index encounter. The ACG is a patient case-mix adjustment system that provides a relative measure of an individual's expected consumption of health services (20-23).
Outcomes:
The primary outcomes included return visit to an emergency department or admission to hospital(s) or new admission to long-term care home at 7, 30 and 180 days after the index encounter.

Secondary outcomes included the number of physician office visits at 7, 30 and 180 days post discharge and average length of stay of the hospitalizations in the follow-up period. As well, an online survey of stakeholder satisfaction was undertaken.

Statistical analysis
For each outcome, the effect of the GEM intervention was expressed as a relative risk (RR). RRs were calculated using a generalized estimating equation and a Poisson distribution to account for the matched design and expressed with a 95% confidence interval.

Funding, Ethics and Privacy
This evaluation was funded by the Ministry of Health and Long-term Care (MOHLTC). The protocol was approved by the Research Ethics Board (REB) at each participating site. A Privacy Impact Assessment was approved by ICES. All data handling was conducted in compliance with the ICES Privacy, Confidentially and Data Security Handbook and local REB requirements.

Results
Among eight GEM hospital sites, there were 2,770 GEM encounters representing patients seen between April 1, 2005 and March 31, 2006. Seven hundred and sixty four records were excluded from the analyses for the following reasons: duplicate GEM intervention (303); National Ambulatory Care Reporting System (NACRS) record was not found (312); patients died in hospital (131); matched non GEM-intervened subjects could not be identified (14); and age below 50 years (4). Table 1 summarizes the demographic characteristics of the GEM-intervened and non GEM-intervened cohort groups. Age, gender, CTAS level, mode of arrival, and admission were matching variables.

Over one third (34%) of GEM patients were 85 years of age or older. Almost two-thirds (63%) of the patients were female. Fifty-eight percent of the GEM patients were admitted to the emergency department with CTAS level of 3, or an urgent rating. Over one third (38%) of the patients seen by GEM nurses across the eight hospitals were admitted to hospital.

1 The Credit Valley Hospital, Humber River Regional Hospital, Kingston General Hospital, London Health Sciences Centre, Rouge Valley Health System, St. Joseph’s Health Centre (Hamilton), St. Michael’s Hospital, and York Central Hospital.
<table>
<thead>
<tr>
<th></th>
<th>GEM-Intervened N=2,006</th>
<th>Non GEM-Intervened N=7,871</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mean Age</strong> (years)</td>
<td>81.5</td>
<td>81.3</td>
</tr>
<tr>
<td><strong>No. of subjects in age group (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-64</td>
<td>43 (2.1%)</td>
<td>171 (2.2%)</td>
</tr>
<tr>
<td>65-69</td>
<td>68 (3.4%)</td>
<td>268 (3.4%)</td>
</tr>
<tr>
<td>70-74</td>
<td>180 (9%)</td>
<td>713 (9.1%)</td>
</tr>
<tr>
<td>75-79</td>
<td>435 (21.7%)</td>
<td>1,752 (22.3%)</td>
</tr>
<tr>
<td>80-84</td>
<td>594 (29.6%)</td>
<td>2,374 (30.2%)</td>
</tr>
<tr>
<td>85-89</td>
<td>410 (20.4%)</td>
<td>1,611 (20.5%)</td>
</tr>
<tr>
<td>90+</td>
<td>276 (13.8%)</td>
<td>982 (12.5%)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Female (%)</td>
<td>1,272 (63.4%)</td>
<td>5,005 (63.6%)</td>
</tr>
<tr>
<td>No. of Male (%)</td>
<td>734 (36.6%)</td>
<td>2,866 (36.4%)</td>
</tr>
<tr>
<td><em><em>No. of subjects in CTAS</em> category (%)</em>*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTAS 1-2</td>
<td>335 (16.7%)</td>
<td>1,289 (16.4%)</td>
</tr>
<tr>
<td>CTAS 3</td>
<td>1,164 (58%)</td>
<td>4,627 (58.8%)</td>
</tr>
<tr>
<td>CTAS 4</td>
<td>444 (22.1%)</td>
<td>1,724 (21.9%)</td>
</tr>
<tr>
<td>CTAS 5</td>
<td>63 (3.1%)</td>
<td>231 (2.9%)</td>
</tr>
<tr>
<td><strong>Admitted to hospital directly after index encounter</strong></td>
<td>763 (38.0%)</td>
<td>2,969 (37.7%)</td>
</tr>
<tr>
<td><strong>No. of Adjusted Clinical Group (ACG) Comorbidities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>34 (1.7%)</td>
<td>75 (1%)</td>
</tr>
<tr>
<td>1-3</td>
<td>264 (13.2%)</td>
<td>979 (12.4%)</td>
</tr>
<tr>
<td>4-5</td>
<td>362 (18%)</td>
<td>1,427 (18.1%)</td>
</tr>
<tr>
<td>6-9</td>
<td>734 (36.6%)</td>
<td>2,988 (38%)</td>
</tr>
<tr>
<td>10-13</td>
<td>528 (26.3%)</td>
<td>2,015 (25.6%)</td>
</tr>
<tr>
<td>14+</td>
<td>84 (4.2%)</td>
<td>387 (4.9%)</td>
</tr>
</tbody>
</table>

Note: * Matching variable; No.: number
Table 2 provides data on mode of arrival and compares mode of arrival by triage and acuity level.

**Table 2: Mode of Arrival by CTAS level**

<table>
<thead>
<tr>
<th></th>
<th>GEM-Intervened</th>
<th>Non GEM-Intervened</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#Pts.</td>
<td>%</td>
</tr>
<tr>
<td>Arrival via*:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambulance</td>
<td>1,160</td>
<td>(57.8%)</td>
</tr>
<tr>
<td>Self</td>
<td>846</td>
<td>(42.2%)</td>
</tr>
<tr>
<td>Arrival via ambulance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTAS level 1-2</td>
<td>202</td>
<td>(10.1%)</td>
</tr>
<tr>
<td>CTAS level 3</td>
<td>694</td>
<td>(34.6%)</td>
</tr>
<tr>
<td>CTAS level 4</td>
<td>250</td>
<td>(12.5%)</td>
</tr>
<tr>
<td>CTAS level 5</td>
<td>14</td>
<td>(0.7%)</td>
</tr>
<tr>
<td>Arrival via Self</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CTAS level 1-2</td>
<td>133</td>
<td>(6.6%)</td>
</tr>
<tr>
<td>CTAS level 3</td>
<td>470</td>
<td>(23.4%)</td>
</tr>
<tr>
<td>CTAS level 4</td>
<td>194</td>
<td>(9.7%)</td>
</tr>
<tr>
<td>CTAS level 5</td>
<td>49</td>
<td>(2.4%)</td>
</tr>
</tbody>
</table>

* Matching variable
Table 3 provides a summary of the top ten discharge diagnoses using ICD-10 coding (24) for the GEM-intervened and non-GEM intervened subjects. There are numerous diagnoses common to both groups; however cachexia, unspecified disorientation and falling are unique to the most frequent diagnoses in the GEM group. These non-specific diagnostic syndromes are the hallmark of frailty. They are an expression of the unique issues facing frail seniors, which are the domain of geriatric practice rather than disease and organ-focused care.

### Table 3: Top 10 Diagnoses using ICD-10 coding

<table>
<thead>
<tr>
<th>GEM-Intervened (n=2,006)</th>
<th>Non GEM-Intervened (n=7,871)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICD10</td>
<td>Description</td>
</tr>
<tr>
<td>N390</td>
<td>Urinary tract infection, site not specified</td>
</tr>
<tr>
<td>I500</td>
<td>Congestive heart failure</td>
</tr>
<tr>
<td>R53</td>
<td>Malaise and fatigue</td>
</tr>
<tr>
<td>R074</td>
<td>Chest pain, unspecified</td>
</tr>
<tr>
<td>R64</td>
<td>Cachexia</td>
</tr>
<tr>
<td>R410</td>
<td>Disorientation, unspecified</td>
</tr>
<tr>
<td>R42</td>
<td>Dizziness and giddiness</td>
</tr>
<tr>
<td>R104</td>
<td>Other and unspecified abdominal pain</td>
</tr>
<tr>
<td>J189</td>
<td>Pneumonia, unspecified</td>
</tr>
<tr>
<td>R2681</td>
<td>Falling</td>
</tr>
</tbody>
</table>
Table 4 provides a summary of the primary outcomes of the study. There were no significant differences in repeat visits to the ED at 7 days or readmission rates to hospital at 7, 30 or 180 days. There were significantly more ED visits at 30 and 180 days among GEM-intervened patients (p<.01) There were significantly more new long-term care admissions for patients seen by the GEM nurse versus those not seen by GEM (p<.01).

Table 4: Primary Study Outcomes

<table>
<thead>
<tr>
<th></th>
<th>No. of GEM-Intervened Subjects (%)</th>
<th>No. of Non GEM-Intervened Subjects (%)</th>
<th>RR (95% CI)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ED visits, 7d</td>
<td>226 (11.4%)</td>
<td>774 (10%)</td>
<td>1.17 (0.99, 1.38)</td>
<td>0.07</td>
</tr>
<tr>
<td>Hosp., 7d</td>
<td>106 (5.4%)</td>
<td>389 (5%)</td>
<td>1.05 (0.85, 1.29)</td>
<td>0.65</td>
</tr>
<tr>
<td>New LTC Admit, 7d</td>
<td>45 (2.3%)</td>
<td>50 (0.6%)</td>
<td>3.59 (2.42, 5.33)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>ED visits, 30 d</td>
<td>447 (23.3%)</td>
<td>1567 (20.8%)</td>
<td>1.27 (1.07, 1.50)</td>
<td>0.01</td>
</tr>
<tr>
<td>Hosp., 30 d</td>
<td>227 (11.9%)</td>
<td>883 (11.7%)</td>
<td>0.99 (0.86, 1.14)</td>
<td>0.88</td>
</tr>
<tr>
<td>New LTCH Admit, 30 d</td>
<td>71 (3.7%)</td>
<td>116 (1.5%)</td>
<td>2.46 (1.83, 3.31)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>ED visits, 180 d</td>
<td>842 (50%)</td>
<td>3050 (44.7%)</td>
<td>1.46 (1.24, 1.72)</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Hosp., 180 d</td>
<td>484 (28.7%)</td>
<td>1844 (27%)</td>
<td>1.07 (0.97, 1.19)</td>
<td>0.19</td>
</tr>
<tr>
<td>New LTCH Admit, 180 d</td>
<td>177 (10.5%)</td>
<td>370 (5.4%)</td>
<td>2.4 (1.69, 2.46)</td>
<td>&lt;.01</td>
</tr>
</tbody>
</table>

Note: ED: emergency department; d: day; CI: confidence interval; Hosp: hospital; LTCH: long-term care home; Admit: admission

There were no significant differences in length of stay of hospital admissions, time to next hospitalization post discharge, or the number of physician office visits at 7, 30, and 180 days (Table 5). Physician office visits would not include visits made by a physician to a subject if they were admitted to a hospital or LTC home.

Table 5: Secondary Study Outcomes

<table>
<thead>
<tr>
<th></th>
<th>GEM-Intervened</th>
<th>Non GEM-Intervened</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. Pts. Mean</td>
<td>Median</td>
</tr>
<tr>
<td>LOS for hospital admissions (days)</td>
<td>763 12.7 9</td>
<td></td>
</tr>
<tr>
<td>Time to next hosp (days)</td>
<td>262 11.4 10</td>
<td></td>
</tr>
<tr>
<td>No. of Physician Visits, 7d</td>
<td>1,978 0.5 0</td>
<td></td>
</tr>
<tr>
<td>No. of Physician Visits, 30d</td>
<td>1,915 1.6 1</td>
<td></td>
</tr>
<tr>
<td>No. of Physician Visits, 180d</td>
<td>1,684 7.3 6</td>
<td></td>
</tr>
</tbody>
</table>

Note: LOS: length of stay; No: number; d: day
There was no difference in mortality at 7 and 30 days of follow up. Significantly more GEM-intervened patients died by 180 days post intervention than non GEM-intervened (Table 6). The number of deaths increased with time for both groups.

**Table 6: Mortality at 7, 30 and 180 days**

<table>
<thead>
<tr>
<th></th>
<th>GEM-Intervened Cases</th>
<th>Non GEM-Intervened</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No. Pts.</strong></td>
<td><strong>%</strong></td>
<td><strong>No. Pts.</strong></td>
</tr>
<tr>
<td>Died by day 7</td>
<td>28 (1.4%)</td>
<td>98 (1.2%)</td>
</tr>
<tr>
<td>Died by day 30</td>
<td>91 (4.5%)</td>
<td>329 (4.2%)</td>
</tr>
<tr>
<td>Died by day 180*</td>
<td>322 (16.1%)</td>
<td>1,052 (13.4%)</td>
</tr>
</tbody>
</table>

* p= <0.01, chi-squared test

**Stakeholder satisfaction survey results**

Each GEM service was asked to identify 10 health professionals whom they considered stakeholders in the GEM process. Each identified stakeholder received an explanatory email providing access to an online survey comprised of rating scales and open-ended queries. Of the 80 potential respondents, 58 surveys were completed representing a 72.5% response rate.

Respondents included ED, hospital, Community Care Access Centre (CCAC) and LTCH administrators, physician and other staff. All respondents indicated that they were aware of the GEM service in their community; 72% indicated that “quite a few of their patients had been seen by GEM”; and an additional 16% indicated that “a few patients had been seen”.

Ratings of the quality of referrals or recommendations received from the GEM nurse in their community are presented in Table 7. Stakeholders rated the GEM nurse’s referrals and recommendations as clinically appropriate and practical, fitting well into their own practice.

**Table 7: Respondent ratings: Quality of referrals and recommendations received from the GEM nurse**

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>How clinically appropriate were the referrals recommendations?</td>
<td>56</td>
<td>8.5</td>
<td>2.2</td>
</tr>
<tr>
<td>How practically achievable were the referrals recommendations?</td>
<td>56</td>
<td>8.1</td>
<td>2.2</td>
</tr>
<tr>
<td>How well would the recommendations fit in your practice?</td>
<td>56</td>
<td>8.3</td>
<td>2.2</td>
</tr>
</tbody>
</table>

*Note: (1= not at all, 5= fair and 10 = excellent)*

When asked to provide more focused perceptions of elements of their GEM services, respondents agreed that GEM identifies seniors at risk, improves the chances of patient recovery, enhances knowledge and the ability to identify seniors at risk, improves the quality of patient care after ED discharge, increases overall satisfaction with ED care, and improves communication of patient needs and follow-up. They disagreed with the statement that GEM has
little or no effect on patients, and felt that GEM did not delay or hamper patient care in the ED. Seventy-two percent anticipated increased future use of GEM services.

As seen in Table 8, respondent stakeholders were satisfied with the patient information received and the ease and speed with which they could reach the GEM nurse.

Table 8: Respondent Rating regarding Satisfaction with GEM Services

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were you satisfied with the patient information you received from the GEM nurse?</td>
<td>55</td>
<td>1.3</td>
<td>0.6</td>
</tr>
<tr>
<td>Were you satisfied with the feedback you received after the patients ED discharge?</td>
<td>37</td>
<td>1.6</td>
<td>0.8</td>
</tr>
<tr>
<td>Were you satisfied with the ease and speed with which you could reach the GEM nurse?</td>
<td>57</td>
<td>1.4</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Note: (1= very satisfied, 2= somewhat satisfied and 3= not satisfied)

While the stakeholder feedback is very positive, there were three concerns expressed in the survey’s open-ended questions:

1. the limited availability of GEM nurses on night shifts and over weekends;
2. the volume of seniors at risk; and
3. the need to focus each GEM nurse on providing service in only one ED site (for those hospital stakeholders whose organization had two or more EDs).

Comments also suggested the need to clarify the role relationships between GEM nurses and discharge planners. Despite these perceived barriers, 93% of the respondent stakeholders stated that they would use the GEM service again. In addition, strong letters of support from ED Directors and hospital executives speak to the value and positive impact of the GEM program in host organizations (http://www.rgp.toronto.on.ca/PDFfiles/gemsupportletters.pdf).
Discussion

A province-wide implementation of a GEM program was initiated in 2004. Throughout the implementation, the Regional Geriatric Programs (RGPs) of Ontario have been conducting formative evaluation of the process and program. Reports of the formative evaluations are available at www.rgp.toronto.on.ca/GEM. In this report, we focus on the impact of the GEM intervention on hospital and ED recidivism using an observational, retrospective cohort study design. We matched each GEM-intervened subject on selected variables to four non GEM-intervened subjects. Administrative datasets housed at ICES were linked to data collected for this study to evaluate the outcomes of interest. The primary outcomes of repeat ED visits and hospital admissions were not affected by the GEM intervention. There are however several important limitations to the analysis which must be considered when interpreting these results. We suspect that inadequate matching of the comparator group was the most significant issue in this analysis.

Selection bias

Patients referred to GEM were identified as being at increased risk for ED recidivism and hospital admission based on the use of two screening tools, the Identification of Seniors at Risk (ISAR) tool (25) the Triage Risk Screening Tool (TRST) high risk screening tool (18). There was case selection of subjects to receive the GEM intervention. In the current evaluation, we were not able to match on this important variable. We did match the control subjects by age, gender, CTAS, mode of arrival and admission status. Based on the ACG profile, the subjects and controls were comparable. However, these methods of matching and comparison could not confirm whether the subjects were similar with regard to other variables known to be important determinants of health care utilization and adverse health outcomes (26, 27). Due to limitations of the administrative datasets used, we were unable to analyze the subjects with respect to their level of mobility, falls risk, functional status, cognitive status, degree of social isolation, caregiver support or their degree of engagement with community support services or primary care. The limitation of our methodology is suggested by the higher mortality rate among GEM cases (16.1% at 180 days vs. 13.4% of controls). In addition, falls, cachexia, and disorientation (unspecified) appear among the top ten diagnoses reported for GEM-intervened subjects, but not the comparator subjects. These non-specific, geriatric syndromes represent hallmarks for frailty.

The number of patients identified through the high-risk screening process exceeded the direct service capacity of GEM. From those patients identified as eligible, the ED staff would select those perceived as having the highest need as a priority for the GEM nursing assessment. This channeling bias would result in the GEM nurse seeing the most difficult and complex cases. Despite our attempt to match subjects in our comparator sample, selection bias likely had a significant negative impact on our evaluation, underestimating the effect of the GEM intervention. Only a randomized, controlled study design would be able to address the issue of selection bias. It is noteworthy that trials published in the literature have reported statistically significant positive effects of GEM on repeat ED visits (1, 2), functional decline (4) and nursing home admissions (3), especially when closely linked with follow-up geriatric intervention in the community (5). Evaluation of clinical outcomes such as admission rates is best determined in randomized controlled trials. An evaluation of the effectiveness, implementation of an intervention in a practice setting should focus on process evaluation, quality and satisfaction.
Temporal trends in ED use and changes in health system
The use of a historical comparator group may have adversely affected our ability to detect favourable outcomes associated with the GEM intervention. A review of ED utilization in the United States reported consistent upward temporal trend in utilization (29). While there was an increase in the volume of ED visits made by seniors, the rate of hospital admissions remained constant. The number of visits that generated at least three medication prescriptions increased by 44%. These key observations suggest that the increasing volume of ED visits made by seniors is not related to frivolous complaints; the visits are not less urgent or emergent. In addition the majority of increased visits were related to the category of “other or undefined” diagnosis. This speaks to the complex and atypical presentation of geriatric patients to the ED.

Two and a half years elapsed between inclusion of the first non GEM-intervened comparator subjects and the end of the follow up period of GEM-intervened subjects. During this time, system-wide changes in the health care system, may have affected our outcome measures. New programs to support frail seniors may have been introduced and other programs may have been downsized or discontinued. We were unable to control for these system changes. Time of presentation to the ED is another variable which may affect access to support systems. We did not collect data on time of presentation and GEM nurses were generally only available during weekday hours.

Consultative model and follow-up
The GEM intervention is a one-time intervention that takes place in the emergency department. The nurse provides a targeted geriatric assessment, identifies geriatric issues requiring further assessment or support and connects the patient to the appropriate resources. After a patient is discharged from the emergency department, much of the work that would potentially support a senior patient in the community and potentially impact on the outcomes we measured would no longer be under the direct influence of the GEM nurse Although there are exceptions, the GEM nurse is operating in a consultative model with limited follow up with the patient. Other studies have found that compliance with recommendations has a significant impact on the outcomes achieved through consultative interventions (30, 31). Studies in which resources are adequate to support systematic follow up and case management of frail seniors after geriatric assessment achieve the most dramatic results (5). Future development of the GEM program should include enhancement of the linkage and integration with the continuum of services frail seniors require to remain in their homes.

Heightened awareness and adequacy of support services
As a result of the process of geriatric assessment, the patient and family may be more aware of issues that warrant attention and further management. This heightened awareness may prompt patients to seek attention for changes in health status that they might otherwise have overlooked. Ideally, this need for attention should be directed at primary care. Unfortunately, the needs of some frail seniors may not be adequately served by their primary care supports. System-related fluctuations in service availability may have had an adverse impact on this evaluation.
Throughout Ontario, there is variance in the availability of community resources to support seniors in the community and differing eligibility criteria for access. The GEM practice deployed in this program was flexible and accommodated the unique characteristics of the participating EDs and their communities (i.e. urban, rural, inner city, well developed or relatively scant specialized geriatric services, and cultural diversity). The desire to be responsive to local needs meant that the GEM program in Ontario is heterogeneous in both the characteristics of the intervention and the context of its implementation. This was a positive aspect of the real-world implementation of the GEM program, but may have compromised our ability to detect an effect on the outcomes selected in this evaluation.

**GEM role in advocating for hospital admission**

The GEM nursing assessment is, in some instances, identifying issues that may have been overlooked by the ED staff and could have warranted hospital admission. Advocating for an appropriate hospital admission was frequently identified as an important, patient-focused role of the GEM nurse. The admission of a patient to hospital after a GEM assessment should not be interpreted as a negative patient outcome, but an appropriate discharge plan that met the acute needs of the patient. Similarly, there may be instances where the GEM nurse may suggest admission, but a decision is made to discharge home. In such a circumstance, it would not be appropriate to attribute a repeat ED visit or “bounce back” as a negative outcome for the GEM intervention.

The GEM intervened subjects had a higher rate of admission to LTC than non GEM-intervened subjects. This may reflect a selection bias of more complex and frail seniors being seen by the GEM nurses. The higher death rate among GEM patients suggests that this might indeed be the case. If comprehensive assessment does not reveal further opportunity for improvement and maximal supports have been applied, then admission to LTC may be the most appropriate plan for a frail senior. Having a GEM nurse in the ED helps to ensure that frail seniors have an opportunity for a geriatric assessment prior to LTC placement.

**Frail seniors have acute as well as chronic health needs**

Contrary to some widely held beliefs, seniors are not seeking medical attention in EDs inappropriately. Studies examining ED utilization have shown that health need is the primary reason for the presentation of older patients to the ED (29, 32). Patients with chronic disease will have exacerbations. In older frail patients with multiple co-morbidities and decreased physiologic reserve in several organ systems, successful management of these exacerbations may not always be possible on an ambulatory care basis. In a study of 253 older patients who presented to the ED with no specific complaint and who were labeled as "home care impossible", subsequent evaluation using a structured data collection tool revealed that 51% of these patients had an acute medical diagnosis, including issues such as transient ischemic attack/cerebrovascular accident, pneumonia, delirium, CHF, abdominal pain, and acute renal failure (33), any one of which could have necessitated an ED visit.

**Value of GEM identified in other sources**

In a systematic review of 26 studies of comprehensive geriatric interventions, McCusker and Verdon describe five categories of intervention delivered in six contexts (34). The five categories include unidisciplinary and multidisciplinary assessment/referral, unidisciplinary and
multidisciplinary assessment/case-management, and case-managed community service. The six contexts for service delivery are, ED-based, hospital-based, out-patient/primary-care based, homecare-based and community-based interventions. In addition to variation in category and context, patient characteristics for entry into the studies were reviewed and the outcome variables examined were diverse. Given such heterogeneous intervention and research designs, the determination of the relative effectiveness of any of the category/context combinations is difficult and yields inconsistent findings. Regardless of category or context, the results, while mixed, create the impression that there may be something good about each intervention and more importantly that a blend of these interventions is necessary to adequately address the needs of seniors presenting in the ED.

The present study examined the effect of a unidisciplinary (nursing) assessment and referral service provided within the ED context. Four such studies were included in the review by McCusker and Verdon. Each compared the intervention against usual care. In a nonrandomized trial involving 356 high risk seniors, targeted geriatric assessment resulted in a significant reduction in the mean number of ED visits (1). Mion et al randomly assigned 326 high risk seniors who were discharged home from the ED to receive targeted geriatric assessment. They report no impact on ED use but significant reductions in nursing home admissions and enhanced patient satisfaction with ED service (3). Similar results were obtained by McCusker et al in a randomized controlled trial of a two-stage geriatric emergency intervention (35). Guttman et al added discharge planning to their assessment and referral intervention. In their pre-post evaluation design, there was a statistically significant reduction in ED revisits of 27% relative risk reduction at 8 days and 19% risk reduction at 14 days (2). These studies of unidisciplinary assessment using diverse inclusion criteria and patient profiles produced mixed but promising results.

**GEM Case Vignettes**

The following case reports describe actual clinical encounters between GEM nurses and frail seniors. The cases bring to life the sensitive and complicated nature of the GEM nurses’ clinical work, as well as the outcomes of a GEM intervention.

**Case #1: By clarifying pre-admission level of function, GEM helps identify delirium and divert a hospital admission and long-term care placement**

A visibly frightened elderly woman stands in the hallway outside her husband’s ED room. As we enter his room, her grip on my arm tightens. We see a frail, 94-year old man difficult to arouse, unable to move in bed or answer questions, unaware of his surroundings. His face grimaced, he clenches his hands. His wife’s tears flow as she says, “Please, help us.” Staff has asked social work to initiate long-term care placement.

The patient had been transported to the ED by ambulance where clinical examination and diagnostic testing revealed impaired cognition, fractured ribs, pneumonia, a pressure wound to the coccyx and an electrolyte imbalance. Hospital admission and LTC placement processes were initiated.

In gathering background information, the GEM nurse discovered that until two weeks ago, the man’s daily routine included an early morning cold shower followed by a two-kilometer walk for coffee with his friends. He loved to read and was an active gardener. Two weeks ago, while in his garden,
he tripped and fell. Over the next day or two he experienced pain in his ribs and gradually he took to his bed. He and his wife didn’t want to bother anyone and during the following two weeks he became immobile, incontinent, unable to eat and began to “see things that weren’t there”.

The GEM nurse proposed that this patient was suffering from a delirium rather than a dementing illness as had previously been thought. Following the introduction of pain and hydration management the patient began to improve. He and his family participated in an interprofessional and inter-agency team meeting and a discharge plan back home was developed.

The family physician, unaware of the patient's current status, agreed to follow him closely at home. CCAC ordered appropriate equipment and provided nursing to follow-up with recommendations for care of the stage 2 skin wound. Antibiotics were ordered. The GEM nurse provided teaching to the family in regard to transferring, positioning, pain management, and signs and symptoms of delirium with preventative strategies. As he was discharged from the ED at the end of the day in a wheelchair, with his family, he reached out to me, squeezed my hand and said “Thank you.” His wife said, “Thank you for not giving up on us.” Two weeks later, I received an envelope in the mail with a note and a photograph of this patient and his wife sitting in the garden. Community supports remain in place, delirium has almost disappeared and he was once again meeting his friends for coffee.

This case study illustrates:

- Clarification of patient's previous level of function allowed the ED medical staff to fully appreciate the acuity of the patient's decline and urgency of the current situation
- Identification of delirium and removal of misdiagnosis of dementia
- Care recommendations to support recovery from delirium
- Solicited additional support for caregiver, advocated for patient and family
- Education and support for the family
- A hospital admission was diverted
- An inappropriate long-term care admission was diverted
Case # 2: A little detective work finds a not-so-old x-ray and the answer to a mystery
A 94 year-old woman is transported to the ED after a visiting relative finds her unable to ‘care for herself’. The Triage Risk Screening Tool (TRST) identifies several risk factors including a history of cognitive impairment, difficulty walking and transferring, and living alone since her primary caregiver was herself hospitalized. Nursing staff identify several other risk factors including unusual behavior, medication issues and “failure to thrive”. Routine urinalysis and laboratory workup were initiated with unremarkable results and a referral to long-term care was considered the best thing that the ED could do until the GEM nurse became involved, triggered by the patient’s risk profile. Gathering background data is an essential element of the GEM service and for this patient, background data included an x-ray taken a year earlier in which findings in keeping with reactivation TB or atypical mycobacterial disease were described. A repeat x-ray confirmed the presence of TB and a hopeless case had a treatable disease.

This case study illustrates:
- The importance of searching for reasons frail seniors are failing to thrive
- That ED disposition decisions are sometimes made prematurely
- The potential to divert long-term care admissions
- The value of good detective work in the socio-, psychological and medical history
- The impact of a breakdown in community support

Case #3: Sometimes GEM nurses advocate for a patient to be admitted
A 79-year old female was involved in a serious motor vehicle accident. While driving her subcompact car, she hit a tow truck head-on. The patient was wearing a shoulder belt restraint and the air bag was deployed. She was noted to be disoriented immediately following the crash and was transported to ED; however the trauma team was not activated. The patient had sustained a fracture of the right arm and a lung contusion. The orthopedics service discharged the patient from the ED as no surgery was required. The ED physician, however, felt the patient was unsafe to go home, and consulted Internal Medicine. Internal Medicine did not feel that the patient had any acute medical issues which warranted admission.

The following morning, the GEM nurse was paged by the ED nurse caring for this patient. The patient had a TRST score of 3 (polypharmacy, mobility concern, professional concern). She was also nauseated and vomiting. She could not tolerate postural changes due to weakness and dizziness, and minimal activity was accompanied by hypoxia. The GEM nurse completed her assessment. Past medical history included urinary incontinence, chronic benzodiazepine use along with other over-the-counter sleep aids. She was widowed, lived alone in a large home. Prior to this event, she was physically active, entirely independent and shoveling her own snow.
The patient’s injuries involved multiple systems (pulmonary and orthopedic). The GEM nurse consulted the advanced practice nurse for trauma to assist in advocating for the patient’s admission to a trauma-related service. Since the patient was unable to maintain oxygenation with any activity nor able to maintain hydration due to nausea, acute care admission was appropriate. After review of the GEM nurse’s finding, the trauma team admitted the patient to hospital. She improved quickly and was discharged after four days.

**GEM enhances the care of frail patients by promoting senior-friendly EDs**

For older patients, prolonged stays in the ED adversely effect patient outcomes (36, 37). GEM nurses in Ontario have led several local initiatives to transform their place of practice into more senior friendly EDs, promoting improved clinical practices for frail seniors and environmental changes. Some of these improvements include:

- improved nutrition and hydration protocols
- improved mobilization protocols
- improved pain management practices
- innovative use of volunteers and family members to prevent delirium
- improved awareness and management of cognitive and behavioural issues in the ED
- implementation of pressure ulcer prevention strategies such as improved mattress surfaces
- availability and use of reclining chairs
- facilitation of increased access to interdisciplinary team members such as physiotherapy, occupational therapy and CCAC
Strategies and recommendations for the future

- Strengthen follow-up mechanisms post-GEM through linkage with enhanced specialized geriatric services and community services. GEM is an important component of specialized geriatric services and supports frail seniors at a potentially critical point of transition in the health care system.
- The implementation of the GEM role requires a period of knowledge exchange between GEM and ED staff. Both parties need to understand and accept the complementary nature of the GEM role with ED staff.
- Once the role of the GEM service is understood, it is probably ideal to focus the GEM service on seniors who are going to be discharged back to the community.
- Identify system-wide strategies to support primary care in their role providing care for frail seniors. (e.g. Geriatrics, Inter-Professional Practice and Inter-organizational Collaboration initiative).
- Future evaluation should focus on qualitative and process outcomes and quality improvement initiatives, such as stakeholder satisfaction, and capacity building outcomes. Evidence for health-related outcomes and effects on health service utilization should be derived from randomized controlled trials (28) and the positive effects of GEM in reducing institutionalization (3) and functional decline (4) have already been established in the literature.
- Future evaluation should take a broader system view as the services and supports required by frail seniors cross sectors and organizational boundaries. An individual service such as GEM serves an important role in the continuum of care providers, and as such, the evaluation should focus not on individual elements, but on the full continuum of health service provision to frail seniors.
- Qualitative data and expert opinion from key stakeholders endorse the value of GEM. Availability of GEM nurses should be expanded to provide coverage seven days per week in EDs across Ontario.

Conclusion

GEM nurses assess the more complex and challenging frail older patients in the ED. In the absence of a randomized study design, identification of an appropriate comparator group is difficult. Using a retrospective cohort study design, we were unable to demonstrate a reduction in health service utilization. This likely reflects the selection of higher risk, frail seniors as the recipients of the GEM intervention. There is strong evidence in the literature to support the efficacy of GEM. Our qualitative and formative evaluations overwhelmingly support the value of GEM in Ontario. GEM supports the delivery of best practices in the ED for frail seniors. Through our experience with GEM, we have refined our intervention models and identified strategies to address systemic issues in order to enhance anticipated outcomes and build system capacity as indicated by the addition of more than 50 GEM nurses serving frail seniors in EDs across Ontario.
Acknowledgements
We would like to acknowledge the Ontario Ministry of Health and Long-Term Care for their support of this project. The opinions, results and conclusions are those of the authors and no endorsement by the Ministry of Health and Long-Term Care is intended or should be inferred.

The RGPs of Ontario would like to acknowledge the pioneering work of the GEM nurses involved in the implementation of the GEM program in Ontario and this evaluation.

We thank Dr. Michael Schull, Brandon Zagorski and Alexander Kopp from the Institute for Clinical Evaluative Sciences for their advice and assistance with the development of the GEM program and this evaluation.
References

7. Canadian Institute for Health Information. Understanding emergency department wait times: Who is using emergency departments and how long are they waiting? 2005.
### Glossary of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACG</td>
<td>Adjusted Clinical Group</td>
</tr>
<tr>
<td>CCAC</td>
<td>Community Care Access Centre</td>
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<tr>
<td>CTAS</td>
<td>Canadian Triage Acuity Scale</td>
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<tr>
<td>GEM</td>
<td>Geriatric Emergency Management</td>
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<tr>
<td>ICES</td>
<td>Institute for Clinical Evaluative Studies</td>
</tr>
<tr>
<td>LTC</td>
<td>Long-term care</td>
</tr>
<tr>
<td>MOHLTC</td>
<td>Ministry of Health and Long-term Care</td>
</tr>
<tr>
<td>NACRS</td>
<td>National Ambulatory Care Reporting System</td>
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<tr>
<td>RGP</td>
<td>Regional Geriatric Program</td>
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<tr>
<td>RR</td>
<td>Relative risk</td>
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