

An Evaluation of a Proactive Geriatric Trauma Consultation Service

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Objective: To describe and evaluate an inpatient geriatric trauma consultation service (GTCS).

Background: Delays in recognizing the special needs of older trauma patients may result in suboptimal care. The GTCS is a proactive geriatric consultation model aimed at preventing and managing age-specific complications and discharge planning for all patients 60 years or older admitted to the St Michael's Hospital Trauma Service.

Methods: This was a before and after case series of patients admitted pre-GTCS (March 2005–August 2007) and post-GTCS (September 2007–March 2010). Study data were derived from a review of the medical records and from the St Michael's Hospital trauma registry. Abstracted data included demographics, type of geriatric issues addressed, rate of adherence to recommendations made by the GTCS, geriatric-specific clinical outcomes, trauma quality indicators, consultation requests, and discharge destinations.

Results: A total of 238 pre-GTCS patients and 248 post-GTCS patients were identified. The rate of adherence to recommendations made by the GTCS team was 93.2%. There were fewer consultation requests made to Internal Medicine and Psychiatry in the post-GTCS group ($N = 31$ vs $N = 18$, $P = 0.04$; and $N = 33$ vs $N = 18$, $P = 0.02$; respectively). There were no differences in any of the prespecified complications except delirium (50.5% pre-GTCS vs 40.9% post-GTCS, $P = 0.05$). Among patients admitted from home, fewer were discharged to long-term care facilities among the post-GTCS group (6.5% pre-GTCS vs 1.7% post-GTCS, $P = 0.03$).

Conclusions: A proactive geriatric consultation model for elderly trauma patients may decrease delirium and discharges to long-term care facilities. Future studies should include a multicenter randomized trial of this model of care.

Keywords: geriatrics, models of care, trauma

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The proportion of people aged 65 years and older is increasing and is projected to reach 20.2% in 2050.¹ As a result, the health care system will be faced with an increasingly aging population and increases in health care demands and long-term care admissions. In a study of the total direct and indirect costs of injury in the United States, while the elderly only represented 12% of the population, they accounted for one quarter of total discharge and hospital costs.²

Delays in recognizing the special needs of older trauma patients may result in suboptimal care.³ Postinjury complications in the elderly trauma patient negatively impact survival and contribute to longer lengths of stay in survivors and nonsurvivors than in younger trauma patients.⁴ Management of geriatric trauma patients is challenging because the validity of standard injury scores such as the Injury Severity Score is uncertain^{5–8} and the elderly have more comorbidities resulting in more in-hospital complications and medical consultations.⁹ The optimal management of these patients remains unclear. A comprehensive geriatric assessment is a multidimensional, interdisciplinary diagnostic process to determine the medical, psychological, and functional capabilities of a frail elderly person to develop a coordinated and integrated plan for management and longitudinal follow-up.¹⁰ A systematic review of randomized trials comparing comprehensive geriatric assessment to usual care for hospitalized patients concluded that comprehensive geriatric assessment increases a patient's likelihood of being alive and in their own home at up to 6 months (odds ratio: 1.25, 95% confidence interval: 1.11–1.42, $P = 0.0002$).¹¹ There is some evidence from randomized trials of proactive geriatric consultation or geriatric comanagement showing enhanced clinical outcomes.^{12–14} We identified one study that described a comprehensive geriatric consultation service for trauma patients. Fallon et al,¹⁵ demonstrated the adaptation of the principles of the comprehensive geriatric assessment in the trauma environment in a prospective, descriptive study. Patients aged 65 years or older admitted to the trauma service were seen by a specialist in geriatrics within 24 hours of admission. In this descriptive study, geriatricians assisted with advanced care planning (15%), disposition decisions to promote function (49%), medication changes (65%), and pain management (42%).¹⁵ Trauma surgeons followed one or more recommendations 91% of the time.¹⁵ We were unable to identify any randomized trials of a proactive geriatric trauma consultation service (GTCS).

The GTCS at St Michael's Hospital was started in September 2007 with the goals of preventing/managing age-specific complications related to comorbidities/conditions and assisting in discharge planning. This study describes the initial evaluation of this model of care.

METHODS

The objective of this study was to provide a formative evaluation of this novel model of care. The clinical outcomes of interest were geriatric-specific in-hospital complications, trauma quality indicators, subspecialty consultation requests, and discharges to long-term care. Ethical approval was obtained from the St Michael's Hospital Research Ethics Board.

Study Design

This was a before (March 2005–August 2007) and after (September 2007–March 2010) case series comparing clinical outcomes pre- and postimplementation of the GTCS.

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Study Subjects and Setting

St Michael's Hospital is a level 1 trauma center providing quaternary trauma services in an academic setting. All patients aged 60 years or older admitted to the trauma service between the dates of interest were included in the study, regardless of Injury Severity Score. Patients dead on arrival, and those who died in the emergency department, were excluded.

Data Sources

Data sources included paper medical records, electronic medical records, and the trauma registry database. Demographic data and clinical outcomes for all patients admitted to the trauma service at St Michael's Hospital are systematically tracked in a prospectively maintained database, the St Michael's Hospital Trauma Registry Database. The registry is routinely reviewed by the Canadian Institute of Health Information and the National Trauma Data Bank in the United States. Both systems have data validators that are used to ensure accuracy of the registry database; in addition, internal monthly, quarterly, and annual data quality reviews are performed to ensure data accuracy and reliability.

Intervention

The GTCS was implemented in September 2007. All patients 60 years or older admitted to the trauma service were referred to the GTCS. The GTCS team was composed of an advanced practice nurse specialist in geriatrics, a geriatrician and occasionally a resident physician. A comprehensive geriatric assessment was performed within 72 hours of admission with recommendations on medical, functional, cognitive, and/or psychosocial issues. Recommendations were communicated in written form and supplemented with verbal communication, if necessary. A member of the GTCS attended weekly interdisciplinary trauma rounds to discuss geriatric patient care issues. Frequency of follow-up was based on issues identified during the patient consultation.

Data Abstraction

All data were abstracted on the basis of the study protocol guidelines by one of 2 designated study personnel (M.L. and M.P.), and a subset was abstracted in duplicate until at least substantial interrater reliability for geriatric-specific outcomes was obtained ($\kappa = 0.6-0.8$).

Baseline Data

Baseline data abstracted included demographics, comorbidities, injury characteristics (mechanisms of injury, Injury Severity Scores¹⁶), and acute care characteristics (length of stay, in-hospital mortality excluding the first 48 hours).

Content of the GTCS Consultation

We identified the issues addressed by the GTCS and the proportion of their suggestions that were adopted by the trauma service. The *recommendation adherence rate* was defined as the number of patients where GTCS recommendations were made and at least one or more recommendations were adopted by the trauma team, as a proportion of the total number of patients where GTCS recommendations were made. Geriatric issues addressed by the GTCS were broadly characterized as medication reconciliation, sensory impairment (either vision or hearing), pain, delirium and/or dementia, mood disorder (depression, anxiety, bipolar, or mania), nutrition, bowel and/or bladder continence, mobilization, decubitus ulcer, restraint use, other medical complications, and discharge planning. The reasons why any patient in the post-GTCS period was not seen by the GTCS within the first 72 hours of admission were categorized (died within first the 72

hours, referral not sent, discharged from hospital within the first 72 hours, or transferred to a different service within the first 72 hours).

Clinical Outcomes

Data were collected on geriatric-specific in-hospital complications (falls, delirium, and physical restraint use). Delirium was identified via a validated medical chart-abstraction instrument.¹⁷ Falls were identified as any use of the word "fall" to describe a relevant adverse event during the hospitalization. Physical restraint use (mittens, wrist restraints, hard restraints, lap belt) was identified by documentation either in standard notes and/or use of a restraint order form. Trauma quality indicators of interest included decubitus ulcer, thromboembolism, myocardial infarction, pneumonia, cardiac arrest, and missed injuries. These indicators are routinely collected via the St Michael's Hospital Trauma Registry Database using standardized coding methods. *Missed injuries* were defined as injuries not identified within the first 24 hours of admission. Among patients admitted from home, the discharge destination was abstracted. Discharge to long-term care was defined as a transfer from the trauma service directly to a facility that is designed for people who require the availability of 24-hour nursing care and supervision within a secure setting as defined by the Ministry of Health and Long-Term Care of Ontario.

Statistical Analysis

Means and standard deviations were calculated for continuous variables, and absolute and relative frequencies were measured for discrete variables. Continuous variables were compared using a Student *t* test, and proportions were evaluated using the χ^2 or Fisher exact test, as appropriate. $P < 0.05$ were considered statistically significant. All data were analyzed using SAS (version 9.1, Cary, NC).

RESULTS

Study Population

There were 238 and 248 patients in the pre- and post-GTCS groups, respectively. The patients in the post-GTCS group were older. They had more comorbidities and a trend toward more severe trauma injury as measured by the Injury Severity Score (Table 1). Falls represented the most common mechanism of injury in both groups. Before the implementation of the GTCS model, 3.8% ($n = 9$) of patients aged 60 years or older admitted to the trauma service received a comprehensive geriatric assessment compared with 59.4% ($n = 146$) of all patients after the service was implemented. Reasons patients were not assessed by the GTCS in the postimplementation period are outlined in Table 2, with death within 72 hours of admission being the most common reason for not being seen by the GTCS (33.7%).

Content of the Geriatric Consultation

The proactive geriatric consultation process identified and managed a wide array of geriatric issues (Table 3). Sensory impairment, pain, and medication reconciliation were the most common issues addressed. Adherence rate by the Trauma team to recommendations made by the GTCS was 93.2%.

Impact of the Geriatric Trauma Consultation Service

There were fewer consultation requests made to Internal Medicine ($N = 31$ vs. $N = 18$, $P = 0.04$) and Psychiatry in the post-GTCS group ($N = 33$ vs. $N = 18$, $P = 0.02$), but not to other subspecialties. There were no differences in the rates of any of the pre-specified complications or quality indicators, except delirium (50.5% pre-GTCS vs 40.9% post-GTCS, $P = 0.05$), Table 4. The impact on delirium reduction was greater among those with an Injury Severity Score greater than 15 (58.0% pre-GTCS vs 45.7% post-GTCS; $P = 0.03$). The rates of physical restraint use were high in both groups.

TABLE 1. Demographic, Injury and Acute Care Characteristics

Characteristic	Pre-GTCS (n = 238)	Post-GTCS (n = 248)	P
Admission demographics			
Age (mean years)	71.7	73.7	0.01
Sex (female, %)	42.9	36.6	0.16
High alcohol level (%)*	8.4	8.1	0.58
Nursing home (%)	4.2	5.0	0.81
Comorbidities			
Diabetes (%)	17.7	19.5	0.60
CVD (%)	14.3	12.6	0.59
Alcohol dependence (%)	10.5	9.4	0.67
Hypertension (%)	38.2	53.7	< 0.001
Cognitive impairment (%)	9.7	19.9	0.002
Mood disorder (%)	13.5	18.7	0.12
Injury characteristics			
Mechanism			
Motor vehicle collision (%)	29.0	24.9	—
Fall (%)	34.9	41.2	—
Intentional injury (%)	5.9	8.1	0.38
Injury Severity Score (mean)	22.5	24.7	0.07
Acute care characteristics			
LOS days (mean)	19.4	15.4	0.13
Mortality, excluding first 48 h (%)	12.3	14.6	0.47

*High alcohol level defined as more than 18 mmol/L.
CVD indicates cardiovascular disease; LOS, length of stay.

TABLE 2. Reasons for Patients Not Being Seen by the GTCS in the Post-GTCS Period

Reason for Patient Not Seen by the GTCS	Frequency, %
Died within 72 h of admission	33.7
No referral sent	27.6
Discharged within 72 h of admission	25.5
Transferred to a different service within 72 h of admission	11.2
Referral sent, but not seen and reason unknown	2.0

*Data missing for 2 patients.

TABLE 3. Geriatric Issues Addressed by the GTCS in the Post-GTCS Group

Geriatric Issue Addressed	Frequency (%)
Sensory impairment	40.7
Pain	30.1
Medication reconciliation	29.7
Mobilization	26.9
Delirium/dementia	26.8
Continence	26.4
Discharge planning	17.1
Nutrition	15.0
Mood disorder	14.6
Other medical complications	8.9
Restraint	4.9
Decubitus ulcer	0.4

TABLE 4. Complications and Quality Indicators Pre- and Post-GTCS

Complication	Pre-GTCS, % (n = 238)	Post-GTCS, % (n = 248)	P
Geriatric complications			
Falls	2.0	0.8	0.72
Delirium	50.5	40.9	0.05
Physical restraint use	52.5	50.3	0.65
Other quality indicators			
Decubitus ulcer	2.0	4.4	0.26
Deep vein thrombosis	0.0	0.5	1.00
Pulmonary embolus	3.5	3.5	0.96
Myocardial infarction	0.5	2.0	0.37
Pneumonia	14.1	18.2	0.27
Cardiac arrest	2.0	3.9	0.75
Missed injuries	7.1	8.4	0.63

There was a trend toward decreased length of stay in the intervention group (19.4 days vs 15.4 days, $P = 0.13$). When comparing discharge destinations among patients who were admitted from home, there were fewer patients discharged to long-term care among the post-GTCS group (6.5% pre-GTCS vs 1.7% post-GTCS, $P = 0.03$). This effect was greater for patients admitted to the intensive care unit (9.0% pre-GTCS vs 1.9% post-GTCS, $P = 0.02$), with preexisting cognitive impairment (38.9% pre-GTCS vs 7.9% post-GTCS, $P = 0.009$), or with an Injury Severity Score greater than 15 (9.2% pre-GTCS vs 1.6% post-GTCS, $P = 0.01$).

DISCUSSION

We demonstrate that the trauma team routinely adopted suggestions from the GTCS, which compares favorably to other studies.^{12,18} Patient outcomes may have improved as a result of the GTCS recommendations being implemented. Our study demonstrates that implementation of the GTCS was associated with a reduction in incidence of delirium and decreased admission to long-term care facilities among patients admitted from home. Developing delirium in hospital has been associated with substantial morbidity (including functional decline at discharge (adjusted odds ratio: 3.0, 95% confidence interval: 1.6–5.8),¹⁹ longer length of hospital stay,²⁰ increased hospital-acquired complications (adjusted odds ratio: 2.3, 05% confidence interval: 1.7–5.0),²⁰ persistent cognitive deficits (odds ratio: 12.52, 95% confidence interval: 1.86–84.21)²¹, increased rate of institutionalization (odds ratio: 2.41, 95% confidence interval: 1.77–3.29),²¹ and increased risk of postdischarge mortality (hazard ratio: 1.9, 95% confidence interval: 1.51–2.52).²¹

A systematic review of randomized trials comparing comprehensive geriatric assessment to usual care for hospitalized patients concluded that comprehensive geriatric assessment increases a patient's likelihood of being alive and in their own home at up to 6 months (odds ratio: 1.25, 95% confidence interval: 1.11–1.42, $P = 0.0002$).¹¹ The findings from our study are congruent with other studies of proactive geriatric consultation models of care. Marcantonio et al¹² reported a reduction in delirium among hip-fracture patients in a randomized trial. Sennour et al¹⁴ reported a shorter length of stay in patients admitted to a hospitalist service. Elliot et al²² described cost savings among elderly patients admitted with a fractured neck of the femur, and Harari et al,¹³ demonstrated a reduction in medical complications among elderly elective orthopedic patients. The core feature in these proactive consultation models is early involvement in the prevention and management of geriatric syndromes, function preservation, and discharge planning, rather than the traditional models that rely on a reactive strategy. A systematic review of the

spectrum of orthogeriatric care models indicates more integrated approaches may have better outcomes.²³ There may be the potential for a greater impact of collaborative models on trauma patients due to the relative complexity compared with hip fracture patients.

Limitations of our study that may introduce bias include retrospective analysis, lack of blinding of data abstractors to GTCS status, and lack of randomization. Medical records may lack accuracy or have missing data. The intervention was implemented in a single institution limiting the generalizability of the findings. This study also did not consider any new programs within the hospital setting that may have affected the decrease in the incident of delirium noted in this study, nor was there an analysis of how delirium was assessed pre-GTCS implementation. Similarly, we were not able to consider other confounders that may have impacted discharge destinations such as increased availability of rehabilitation and home care services. Adjusted analyses were not performed in the statistical analysis; however, the patients in the post-GTCS group were frailer with more trauma injury severity, which would likely underestimate the positive effects of the intervention.

Future directions include focused quality initiatives to reduce physical restraint use, systematic processes to ensure all eligible patients are referred to the GTCS, evaluation of impacts on cognitive function, and use of standardized protocols for delirium prevention. A population-based approach should be undertaken to prevent fall-related injury, especially given the evidence from several evaluation studies with well-matched control communities consistently reporting reductions in fall-related injuries across programs used.²⁴ This study suggests collaboration between trauma and geriatric specialists should continue to develop innovations to improve process-based quality indicators to meaningfully improve outcomes in the elderly. The findings from this study are an encouraging impetus for a multicenter randomized trial of this innovative model of care on outcomes including admission to long-term care facilities and in-hospital delirium.

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