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Evaluating Outcomes from an Integrated Health Service for Older Patients

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Background: Hospital-associated disability is the loss of the ability to complete one activity of daily living (ADL), with this decline occurring between the onset of acute illness and discharge from the hospital. Approximately 30% of patients who are >70 years old and admitted to hospitals are discharged with an ADL disability. Comprehensive geriatric assessment (CGA) models use a multidimensional, interdisciplinary process of diagnosis and treatment with the goal of improving outcomes and decreasing lengths of stay.

Methods: A retrospective clinical audit of Ipswich Hospital's medical records included patients for random selection who were >75 years of age and had an acute admission to the Older Person Evaluation Review and Assessment (OPERA) or general medicine (GM) service from July 2012 to December 2012. Data were collected for the entire admission period on length of stay, comorbidities, allied health visits, functional ability, and delirium and dementia at admission.

Results: Of the 267 patients evaluated, 133 were admitted to the OPERA service, and 134 were admitted to the GM service. Patients admitted to the OPERA service were significantly more ill than patients admitted to the GM service as measured by the Charlson Comorbidity Index scores (6.53 $\pm$ 1.83 vs 6.02 $\pm$ 1.96, respectively, P=0.02), Katz Index of Independence in ADL scores (3.77 $\pm$ 2.22 vs 4.72 $\pm$ 2.00, respectively, P<0.001), presence of delirium at admission (28% vs 15%, respectively, P=0.02), and presence of dementia at admission (42% vs 21%, respectively, P=0.002). However, patients in both groups had a mean acute length of stay of 4 days (P=0.33), the readmission rate was <20% for both groups (P=0.33), and the mortality rate for each group was similar (3%).

Conclusion: By showing that patients admitted to the OPERA service were more ill than patients admitted to the GM service but health outcomes were maintained, researchers hope to justify the need for such CGA models. Additional goals include garnering support for the maintenance and growth of CGA models; decreasing mortality, cost, and readmission rates; and improving the quality of life for older patients.

Keywords: *Aged, frail elderly, geriatric assessment, geriatrics, health services for the aged*

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INTRODUCTION

Longer life expectancies, the global epidemic of chronic disease, and the demand for healthcare cost efficiency are driving the need for more efficacious geriatric healthcare models. As a group, older adults have more complex medical, functional, social, and psychological needs than younger adults in addition to the conditions that precipitate hospital admission.[1] They are 3 times more likely to be admitted to the hospital than those <65 years old and are at a higher risk of hospital-associated disability and cognitive decline.[1,2] Hospital-associated disability is defined as the loss of the ability to complete one activity of daily living (ADL), with this decline occurring between the onset of acute illness and discharge from the hospital.[3] Approximately 30% of patients who are >70 years old and admitted to the hospital are discharged with an ADL disability.[3] Of these discharges, >95% have at least one geriatric syndrome such as falls, cognitive impairment, delirium, bladder or bowel incontinence, and ADL limitations.[4]

Additionally, cost is becoming an ever more important prerequisite for healthcare models because the total medical expenditure for patients >85 years old is double that of patients in the 65-74 age group.[5] Focused geriatric care, if appropriately targeted, has been shown to decrease

lengths of stay and expenditures without adversely affecting outcomes.[5]

One way to address these challenges is the establishment of comprehensive geriatric assessment (CGA) models in which older patients are assessed and diagnosed through a multidimensional, interdisciplinary process. By determining the medical, psychological, and functional capability of older patients, a coordinated and integrated plan for treatment and long-term follow-up can be developed.[1] An important principle of CGA models is that the functional status of an older patient is as important as the clinical status.[3]

CGA models have been trialed with patients requiring acute hospitalization (ie, acute care for elders [ACE] units) as well as with patients requiring subacute and restorative care in geriatric evaluation and management units. Research indicates that CGAs used in subacute patient presentations improve long-term survival and functional status for older patients.[6] One metaanalysis showed that when CGA models are used in an acute setting, they may significantly improve the odds of patients being able to live at home after an admission,[1] a major concern for many older patients. While no standardization and agreed-upon algorithm for acute care of the elderly currently exists, taking the CGA process into account when designing a model of care for older patients is essential.

In 2009, Ipswich Hospital in Queensland, Australia implemented a model of care focused on integrating the various multidisciplinary needs of older patients requiring acute hospitalization. The Older Person Evaluation Review and Assessment (OPERA) service ran parallel to the general medicine (GM) service and offered an alternative treatment pathway with more comprehensive care led by an experienced geriatrician. In 2011, a subacute geriatric evaluation and management team was established because many of the acute patients required further evaluation and restorative care at the conclusion of their acute care episodes. The guiding principles for developing these programs included best practice literature, similar models of care at other local hospitals, and the needs of the local population. The goals of the CGA model at Ipswich Hospital were to provide ongoing support and intervention for older patients after discharge and to become integrated in a broader model of screening and assessing the needs of all older patients who presented to the emergency department (ED) needing admission.

The purpose of this study was to compare the demographics and outcomes of patients who received care through the OPERA service to the demographics and outcomes of patients who received care through the GM service, with the expectation that the data would establish a baseline for future analysis and quantify any benefits of having a dedicated CGA model for the management of older patients presenting with acute illness.

METHODS

A retrospective clinical audit of hospital medical records was undertaken to collect data on patient demographics, overall health, and health outcomes. Patients >75 years of age who had an acute admission to the OPERA or GM service from July 2012 to December 2012 were included for random selection. Data were collected for the entire admission period including any subacute care. Exclusion criteria included patients who had received acute care from another dedicated care pathway for >48 hours or who were <75 years of age. The 48-hour period was set to accommodate weekend admissions because of shared patient staffing between wards and to exclude patients who were admitted to the GM service for >48 hours and then transferred to the OPERA service.

Admission criteria for the OPERA service were age >75 years, a medical condition not requiring another dedicated care pathway such as stroke or cardiac teams, complex care needs as determined by the ED physician, and cognitive decline or functional decline identified through community nurse screenings or in the ED. Both the OPERA and GM services admitted suitable patients every day to a maximum of 20 patients in each department. The GM service admitted patients on a 1 in 5 rotating roster and could also refer suitable patients to the OPERA service. The OPERA service had a dedicated multidisciplinary team and a geriatrician who conducted daily meetings regarding patient status. The GM service referred allied health visits to a nurse-led allied health group that met twice weekly regarding patient status. Neither the OPERA service nor the GM service had a dedicated ward, so all patients were spread across 2 wards and received standard nursing care.

During the study period, 905 patients >75 years had an acute admission to the GM service, and 234 patients had an acute admission to the OPERA service. After applying the exclusion criteria, hospital identification numbers for each group were randomized, and the first 150 numbers from each group were selected for analysis. Various sample size calculations were conducted under different assumptions to ensure a power high enough to show a statistical difference. Researchers determined a sample of 150 would be adequate to show a statistical difference. Raw data were recorded using the hospital identification number, and other identifying information was omitted. After the patients were selected, the lead geriatrician trained 4 assessors with medical backgrounds to review the medical records and extract the data. While no interrater reliability scale was used, most of the data were unambiguous and could be consistently and accurately obtained. Additionally, halfway through the data collection process, all assessors were assigned the same medical records to review and record. The lead geriatrician then checked the medical records to ensure that any ambiguous data were being collected in a consistent manner. Following a review of the 150 collected patient records, further exclusions were made because of poor reporting. Records missing information on any key demographic were excluded. The final numbers of patient records included for analysis were 133 for the OPERA service and 134 for the GM service.

Data collected for statistical review included length of stay, comorbidities, allied health visits, functional ability, delirium and dementia at admission, and general demographics (Figure). Additional data collected for statistical review and quality control by Ipswich Hospital were not included in this research.

To assess length of stay, administrative data sheets in each medical record were used to determine the date of admission, any changes between departments, and dis-

OPERA category				Collectee: Date collected:		
Reg #		Admit source				
DRG						
Age		Gender		Weight		
Date of ED admission		Date of ED D/C		LOS total ED		
Date of hospital/OPERA admission		Date of hospital/OPERA D/C (separation)		LOS total OPERA		
Date of GEM admission		Date of GEM D/C (separation)		LOS total GEM		
Date of maint admission		Date of maint D/C (separation)		LOS total Maint		
Principle Dx						
Delirium admission						
Comorbidity score		**Discharge info**				
		Discharged to				
FIM score		Mobility at D/C				
Meds at admission		Readmission				
MST		FIM at D/C				
MNT		Meds at discharge				
Living arrangements preadmission		Prior outpatient visit				

Pre-hospital ADLs	Bathing		Cognitive testing	Completed	Score
	Toileting		MMSE		
	Continence		RUDAS		
	Feeding		Other OT		
	Dressing		Neuropsyc		
	Transfers				
KATZ index score					
IADLs 0 = no assistance 1 = req assistance	Transport		Multidisciplinary intervention	No. of visits	Total
	Finance				
	Housework		PT = physio		
	Cooking		OT = occupational therapist		
	Shopping		SW = social worker		
	Meds		CN = community nurse		
Mobility aids			Diet = dietician		
Fall Hx in past 6 months			SP = speech pathologist		
Adverse effects	Falls		Chronic care: Resp. CCF		
	Aggression		CR = Cardiac rehab		
	Pressure ulcers		Diabetes		
	Abscond/self D/C				
	Medication error				
	Infection				
	Delirium				
	Other				

PT			
OT			
SW			
CN			
Diet			
SP			
Resp			
CCF			
CR			
Diab			

Figure. Data collection sheet. ADLs, activities of daily living; CCF, congestive cardiac failure; D/C, discharge; Dx, diagnosis; DRG, diagnosis-related group; ED, emergency department; FIM, functional independence measure; GEM, geriatric evaluation and management; Hx, history; IADLs, instrumental activities of daily living; LOS, length of stay; MMSE, Mini-Mental State Examination; MNT, medical nutrition therapy; OPERA, Older Person Evaluation Review and Assessment; OT, occupational therapy; Resp, respiratory therapy; RUDAS, Rowland Universal Dementia Assessment Scale.

charges. Data were collected for the entire period of hospitalization, starting from the date of admission to the specific service and concluding with official discharge from the service or hospital.

The Charlson Comorbidity Index was used to assess comorbidity. The Charlson scale has been successfully used to predict the mortality for older patients with a range of medical conditions.[7]

The allied health interventions were the count of daily visits by any of the following: physiotherapist, occupational therapist, community nurse, social worker, dietician, or speech pathologist. Because of the subjective nature and difficulty of accurately reading handwritten medical records, any questionable reports received additional review by the lead geriatrician to ensure consistency.

The Katz Index of Independence in ADL was used to determine the degree of independence for each patient. A score of 0-6 was assigned to the patient's abilities in bathing, dressing, toileting, transferring, continence, and feeding, with 6 being fully functioning and 0 indicating the need for full assistance.[8] During a multidisciplinary visit, an occupational therapist generally recorded these scores and then noted them in the patient record. The Katz Index has been validated for successfully measuring older patients' ability to perform an ADL.[8]

Researchers reviewed all notes written during the length of stay to assess whether delirium or dementia was present at admission. Because >90% were acute admissions, generally patients were assessed first in the ED and then again by an OPERA or GM physician depending on the assigned service. A patient was considered to have delirium if a physician made the diagnosis within 48 hours of admission to either service. If the onset of delirium was noted after 48 hours from admission, it was considered an adverse event. A patient was considered to have dementia if the diagnosis was noted in his/her medical history. Determining the cognitive status of admitted patients was an important key indicator because older patients are at greater risk of cognitive decline than younger patients, making their care more challenging.[1]

Basic descriptive data relating to demographics were obtained and analyzed using frequencies, percentages, means, and standard deviations. Two-tailed *t* tests were used to analyze normally distributed continuous variables of age, length of stay, comorbidities, total allied health visits, and Katz Index scores. The chi-square test was used to analyze the categorical variables of sex, delirium, and dementia. A *P* value <0.05 was considered to be statistically significant. All statistics were calculated using SAS v.9.4 (SAS Institute Inc.).

RESULTS

Of the 267 patients evaluated, 133 (49.8%) were admitted to the OPERA service, and 134 (50.2%) were admitted to the GM service. Sex was not significantly different between the 2 groups ($P=0.24$) with 113 (42.3%) male patients and 154 (57.7%) female patients. Age was found to be significantly different between groups with 86.28 years as the mean age in the OPERA group and 82.38 years as the mean age in the GM group ($P<0.001$).

Baseline characteristics differed between the 2 groups (Table). The difference between the 2 groups in the number of patients presenting with delirium was significant ($P=0.02$), with 28 (21.1%) patients in the OPERA service having delirium on admission compared to 15 (11.2%) patients in the GM service. When determining which patients had dementia, researchers excluded patients with suspected delirium at admission because of the difficult nature of differentiating between these 2 diagnoses. Despite this exclusion, 42 (31.6%) patients in the OPERA service presented with a previous diagnosis of dementia compared to 21 (15.7%) patients in the GM service. This difference was significant ($P=0.002$). The difference in mean comorbidity score was also significant ($P=0.02$), with patients in the OPERA service having a mean score of 6.53 and patients in the GM service having a mean score of 6.02. Katz Index scores were also significantly different between groups ($P<0.001$), with patients in the OPERA service having a lower mean score compared to patients in the GM service.

Despite the admission criteria differences, the acute length of stay was similar between the 2 groups. Patients in both services had a mean acute length of stay of 4 days

Table. Patient Demographics (n=267)

Variable	OPERA Service n=133 (49.8%)	General Medicine Service n=134 (50.2%)	*P* Value
Sex, n (%)			0.24
Male	61 (45.9)	52 (38.8)	
Female	72 (54.1)	82 (61.2)	
Delirium at admission, n (%)			0.02
Present	28 (21.1)	15 (11.2)	
Not present	105 (78.9)	119 (88.8)	
Dementia at admission, n (%)			0.002
Present	42 (31.6)	21 (15.7)	
Not present	91 (68.4)	113 (84.3)	
Age in years, mean (SD)	86.28 (6.15)	82.38 (6.09)	<0.001
Charlson Comorbidity Index score, mean (SD)	6.53 (1.83)	6.02 (1.96)	0.02
Total allied health visits, mean (SD)	8.68 (8.68)	2.73 (2.78)	<0.001
Katz Index of Independence in Activities of Daily Living score, mean (SD)	3.77 (2.22)	4.72 (2.00)	<0.001
Acute length of stay in days, mean (SD)	4 (3.70)	4 (3.00)	0.33

OPERA, Older Person Evaluation Review and Assessment.

(P=0.33). However, 73 of 133 (54.9%) patients assigned to the OPERA service moved into a restorative phase of care under the geriatric evaluation and management team, so the entire admission length of stay was significantly longer for patients assigned to the OPERA service who needed additional subacute care (7.9 days) compared to the overall length of stay for patients assigned to the GM service (4 days). This subacute length of stay accounted for 3.9 days (49.4%) of the overall length of stay among patients assigned to the OPERA service.

Despite this increased length of stay among patients assigned to the OPERA service, the number of patients requiring readmission to the hospital within 30 days of discharge was similar between the 2 groups. The readmission rate was <20% in each group (P=0.33). Additionally, the mortality rate for each group was similar (3.0%), with 4 patients in each group dying.

DISCUSSION

Patients admitted to the OPERA service were in poorer health than patients admitted to the GM service as demonstrated by increased comorbidity scores, greater incidence of cognitive deficits at admission, and decreased Katz Index scores. Although the researchers expected patients admitted to the OPERA service to be more ill than patients admitted to the GM service, baseline data comparing the health status of these patients were not available to confirm this suspicion prior to this study. Despite the significant difference in age and poorer health of patients admitted to the OPERA service, medical care was just as effective as in the GM service when measured by the similarity in acute length of stay (P=0.33), mortality of 4 (3.0%) in each group, and readmission rates (P=0.33). Finding a similar mortality rate between groups is important, especially when considering that Katz Index and Charlson scores, as well as cognitive deficits, have been shown to accurately predict increased morbidity and mortality.[7,8] What is not clear from the data is why patients in both groups had similar health outcomes, despite the poorer health status of the patients in the OPERA group. The results could be attributable to the difference in allied health visits, general physician skill and experience, or the overall approach associated with CGAs. Examining each of these areas in future research may provide additional information about why older and more ill patients have health outcomes similar to significantly healthier patients.

Limitations of this retrospective clinical audit include the subjective nature of the initially recorded data as well as the skill level of the assessors who collected the data. Although interrater reliability was not specifically monitored, the researchers used multiple strategies to ensure the data were collected accurately: continual monitoring by the lead geriatrician throughout the data collection period, multiple sessions of formal instruction with retraining, and the clarification of difficult medical records by the lead geriatrician. However, assessors collected the data from handwritten paper records, and even though a physician oversaw the assessors, they may have introduced errors by incorrectly interpreting technically difficult medical writing. Although this possibility was not addressed or measured, steps were taken to mitigate this problem as previously discussed.

Another study limitation is the difference in patient health status at admission and at discharge. No official comorbidity or Katz Index scores were taken prior to the patients' admission into either service. Additionally, although researchers collected data on the reason for admission, the information could not be included in the analysis because of the inconsistency of the information. Not having this information limits the study because different health conditions may have different impacts on the current and future clinical and functional courses of the patients. The reason for hospital admission affects not only the admission course and the service to which the patient is assigned but also the projected length of stay and support required for recovery. Researchers collected discharge data regarding functional status and improvement, but the data could not be interpreted because information was incomplete for some patients. For future studies to determine which model of care leads to better patient outcomes, researchers should consider randomizing patients into one of the 2 care pathways. Randomizing patients would help overcome the bias related to differences in admission and give researchers a more complete picture of how a CGA model affects patients.

The strengths of this study include clearly defined exclusion criteria that ensured only one modality of care was followed for the time frame during which the data were collected. Also, validated measures such as Charlson and Katz indexes were used to ensure accuracy. Finally, regular training on data collection techniques increased the likelihood that despite the handwritten records, the data were accurately collected.

In this study, total allied health visits were both a limitation and an area of interest for future research. Because patients in the OPERA service received a mean of 8.68 visits from allied healthcare providers compared to the patients in the GM service who received a mean of 2.73 visits, these interventions without standardization of quality and frequency may have played a role in the outcomes. Also, the difference in total allied health visits revealed a possible issue regarding health equity and resource distribution. Current literature supports the idea that most health resources are allocated for older patients and that CGA models will use these resources more responsibly and reduce costs and lengths of stay.[5,9] While data from this study show an increased number of multidisciplinary teams in the OPERA service and a trend toward a decreased length of stay despite increased illness, further examination is required to make any definitive statements regarding this observation. One suggestion for future studies comparing different care modalities is to standardize the skill of allied health professionals as well as the number of multidisciplinary visits.

Other potential areas of study include the effects of specific comorbidities on lengths of stay and the effects of dedicated nursing units on patient outcomes. One study reported that a dedicated nursing unit for managing delirium decreased the rate of mortality.[10] If this finding is applicable across different comorbidities, dedicated nursing units may further benefit older patients presenting with complex needs.

One other notable observation about this study was the subacute stay of some patients after they were discharged

from the acute OPERA service. Previous research has shown that assigning older patients to a dedicated geriatric care unit can decrease length of stay.[8] However, our study indicated that decreased lengths of stay may only apply to acute length of stay. When including the subacute care that 73 of 133 (54.9%) patients admitted to the OPERA service received, the patients in the OPERA service had an increased length of stay compared to patients in the GM service (7.9 days vs 4 days). Data were not recorded after discharge from the GM service to other care pathways, which may increase length of stay measurements. Further audits may reveal discharges made from the GM service and show a subacute length of stay similar to the one for patients in the OPERA service.

CONCLUSION

The CGA approach to patient care is still an evolving methodology without widespread standardization. Collaborating with other similar units regarding best practices may lead to more standardized methods of care that have the potential to decrease costs, improve functional status, and result in improved patient outcomes. By showing that patients admitted to the OPERA service were more ill than patients admitted to the GM service but health outcomes were maintained, researchers hope to justify the need for such services. Additional goals include garnering support for the maintenance and growth of CGA models; decreasing mortality, cost, and readmission rates; and improving the quality of life for older patients.

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