

A controlled evaluation of comprehensive geriatric assessment in the emergency department: the ‘Emergency Frailty Unit’

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Abstract

Background: the ageing demographic means that increasing numbers of older people will be attending emergency departments (EDs). Little previous research has focused on the needs of older people in ED and there have been no evaluations of comprehensive geriatric assessment (CGA) embedded within the ED setting.

Methods: a pre-post cohort study of the impact of embedding CGA within a large ED in the East Midlands, UK. The primary outcome was admission avoidance from the ED, with readmissions, length of stay and bed-day use as secondary outcomes.

Results: attendances to ED increased in older people over the study period, whereas the ED conversion rate fell from 69.6 to 61.2% in people aged 85+, and readmission rates in this group fell from 26.0% at 90 days to 19.9%. In-patient bed-day use increased slightly, as did the mean length of stay.

Discussion: it is possible to embed CGA within EDs, which is associated with improvements in operational outcomes.

Keywords: *comprehensive geriatric assessment, CGA, emergency medicine, health services research, older people*

Introduction

People aged 80+ accounted for 6.5% (1.05/16.2 million) and those aged over 90 accounted for 1.8% of first attendees to English Emergency Departments (EDs) in 2010–11. For those aged 85+, 62% were admitted to hospital; this ‘conversion rate’ is relatively high (the overall conversion rate for all ages was 21%), possibly reflecting the clinical complexity of assessing and managing these patients in a time constrained ED. The ED conversion rate is increasingly recognised as a key determinant of subsequent resource use [1], not least because older people admitted to hospital are at high risk of adverse events [2–4], including long stays, high readmission rates and high rates of long-term care use [5, 6].

There is a growing body of evidence suggesting that ‘hospital at home’ for selected patients offers significant advantages in terms of lower mortality [7] and reduced functional decline [8]. However, once older people are admitted

to hospital, it becomes increasingly difficult to arrange early supported discharge due to a variety of clinical and organisational barriers. So a focus on identifying those that can be reliably and safely managed outside of the hospital in the ED is a key.

Given the relatively small proportion of total activity that the oldest old represent, it is not surprising that hitherto, their care in the ED has not received a great deal of attention [9]. There are a few trials addressing the emergency care of older people, mainly focusing on post-discharge support [10], with relatively few that address the care of older people within the ED itself [9]. Those studies that have addressed the care of older people within the ED tend to be condition specific, rather than addressing the organisational or holistic aspects of care for older people.

Comprehensive geriatric assessment (CGA) is defined as ‘a multidimensional, interdisciplinary diagnostic process to determine the medical, psychological, and functional

capabilities of a frail older person in order to develop a coordinated and integrated plan for treatment and long-term follow-up' [11]. While integrating standard medical diagnostic evaluation, CGA emphasises problem solving, functional status, and prognosis with the aim of restoring independence and alleviating distress [12, 13]. CGA improves outcomes for older people in various settings, including reduced mortality or deterioration (odds ratio 0.76), improved cognition, improved quality of life, reduced length of stay, reduced re-admission rates, reduced rates of long-term care use (odds ratio 0.78) and reduced costs [14–16].

We report here finding a controlled evaluation of the impact of an embedded CGA service in the ED of large teaching hospital in the East Midlands, UK.

Methods

Study design

We used a historical cohort design to evaluate the impact of the Emergency Frailty Unit (EFU). This design was necessary as the EFU was a service development which affected the care of older people throughout our hospital and so a contemporaneous controlled evaluation was not possible.

Usual care

The Emergency Decisions Unit (EDU) of the ED is a geographically discrete, 16-bedded ward base 20 m from the main ED. Historically, the EDU was run by emergency physicians (doctor specialising in emergency medicine) and has always been well integrated into the main ED; its main purpose was to provide a facility for people that are likely to be able to return home within 24 h, who were awaiting additional diagnostic information or assessments. Standard care in the EDU was delivered by emergency physicians, nurses, physiotherapists, occupational therapists and 'primary care coordinators'. Primary care coordinators are nurses with a background in community care who assess older people according to the domains of CGA (medical diagnoses, medication, problem list, mental health, basic and instrumental activities of daily living, social circumstances, environmental issue and spirituality) following the nursing models of Roper *et al.* [17] and Orem [18]. The EDU team had access to the duty general internal medicine consultant on an *ad hoc* basis, and referral rights to outpatient services, such as falls clinics, but no routine input from specialists trained in geriatric medicine. The distinctions between emergency medicine, acute medicine and geriatric medicine are summarised in Supplementary data available in *Age and Ageing* online, Appendix 1.

Intervention

In January 2011, the University Hospital of Leicester merged two acute medical services (Leicester Royal Infirmary and

Leicester General Hospital) onto one site (Leicester Royal Infirmary). This allowed a team to be freed up from delivering conventional integrated (non-age attuned) acute care in the acute medical units to support the development of the EFU. The EFU was allocated between 8 and 12 beds on a day-by-day basis, according to demand. In the first quarter of 2011, the major change in the EDU configuration was the addition of an acute medical consultant (acute physician or a geriatrician) to the EDU team, whose role was to support decision-making relating to medical care. From March 2011, the service moved to complete coverage by geriatricians, 08.00–18.00, 7 days a week. A standardised integrated proforma was developed, along with care pathways guiding the care of frail older people within the main ED. In addition to a daily ward round of patients admitted overnight, the geriatricians also fulfilled an in-reach function to the major receiving area of the ED. Additional efforts were made to integrate geriatric medicine and emergency medicine through shared clinical assessments and decision-making, joint governance meetings and joint education and training meetings. The EFU continued to focus its efforts on older people who were likely to be discharged home within 24 h, with a standard acute medical care being provided elsewhere within the hospital for those patients who required it. The existing care pathways between secondary care and primary and/or social care were further developed and strengthened. There was an emphasis on vertically integrated care pathways for frail older people [19], including for example, permitting the EFU assessment to act as the admission assessment and management plan in community rehabilitation facilities.

Evaluation

Primary outcome and sample size

This was a service development, the business case for which was predicated on reducing admissions to hospital, hence the primary outcome was a reduction in the proportion of older people attending the ED who were admitted for on-going hospital care (ED 'conversion rate'). We used the conversion rate for those aged 85 years or older as the primary outcome as they best represented the target population (local data showed people aged 85+ had the longest length of stay, highest readmission rates and highest rates of in-patient complications). In 2010 (control period), the ED conversion rate for people aged 85+ was 5,322/7,652 (70%). For the intervention to be clinically and economically meaningful, the minimum relative risk reduction in the conversion rate required was 10% (from 70% down to 63%). A two group continuity corrected Chi-square test with a 0.05 two-sided significance level had 99% power to detect a 10% relative difference in the conversion rate (from 70% down to 63%) for a sample size of 1,695 in each cohort. The mean number of people aged 85+ attending the ED each month was 450; to allow time for the EFU to be fully established and mature, it was decided to evaluate the unit after 12 months, which would have provided an intervention cohort sample size of

7,500. A ‘washout’ period of 6 months was observed during which the intervention matured.

Secondary outcomes

The secondary outcomes were readmissions following attendance at the ED at 7, 30 and 90 days, length of stay for admitted patients and total bed-day use. These outcomes and the ED conversion rates were examined according to age groups 16–64, 65–74, 75–84 and 85+. Readmission rates were presented using the number of ED attendees as the denominator to account for any temporal changes in the patterns of attendance. Ninety day readmission rates are only given for patients attending up until March 2012 to avoid under-reporting due to delays in data capture.

It was not possible to collect accurate or meaningful process outcomes such as the number of patients seen by the new service, mainly because the EFU itself (where patients were assigned to a geriatrician and hence identifiable) reflected only part of the totality of the intervention which included in-reach into the majors area and clinical discussions (which could not be counted).

Analysis

Data were collected on a monthly basis as that was the commissioners’ requirement, hence that is the data that is reported. Simple descriptive analyses were used to describe outcomes—proportions for conversion rates and readmission rates, and mean for length of stay. Although the length of stay is typically skewed, commissioners and providers prefer to report the mean length of stay and with large sample sizes the difference is minimal.

Results

The overall patterns of attendance to the ED in Leicester are presented in Table 1. These are divided into the control

period (2010; standard care); transition period (January–June 2011, while the EFU was in development) and the intervention period (July 2011–June 2012, during which the unit was fully established). In the control period, there were 109,994 attendees, 6,895 (6.3%) of whom were aged 85 or older; in the transition period, there were 53,182 attendees, 4,034 (7.6%) of whom were 85+; in the intervention period, there were 110,517 attendees, 9,035 (8.2%) of whom were 85+ (Figure 1).

While ED attendances fell in the 16–64 age group over the two-year study period, they increased in the 65+ age group; most marked was the increase in 85+ attending the ED, rising from 638 per month in 2010 to 753 per month in 2012 (18% increase).

The proportion of people aged 85+ admitted in the intervention period was 61.2% [95% confidence interval (95% CI) 57.7–64.7%] compared with 69.6% (95% CI: 66.0–73.1%) in the control period, *P* < 0.001.

The risk ratio (95% confidence interval) for admission comparing the intervention group to the control group was 0.76 (0.71–0.81) for those aged 16–64, 0.90 (0.80–1.00) for those aged 65–74, 0.88 (0.82–0.96) for those aged 75–84 and 0.88 (0.81–0.95) for those aged 85+.

Readmission rates fell across all age groups comparing intervention to control periods, with risk ratios of 0.71 (0.42–1.1) at 7 days, 0.74 (0.55–1.00) at 30 days and 0.77 (0.63–0.93) at 90 days for those aged 85+.

The length of stay and total bed-day use per month are shown in Table 2. Despite accounting for around a third of attendees, people aged 75 or older accounted for nearly two-thirds of bed-days. Despite a greater number of older people attending the ED, the number of admissions in older people fell; for example, there were 11% fewer people aged 85+ admitted in the intervention period compared with the control period. However, overall bed-day use increased in people aged 65+ (whereas it fell in the younger age group), leading to an increased mean length of stay in the older age group.

Table 1. Mean monthly patterns of emergency department attendance 2010–12

Mean monthly figure	Age category	Control group (%)	Transition period (%)	Intervention group
ED conversion rate	16–64	1,592/6,983 (22.8)	1,491/6,620 (22.5)	1,166/6,720 (17.4)
	65–74	348/716 (48.6)	352/715 (49.2)	338/775 (43.6)
	75–84	507/830 (61.1)	529/857 (61.7)	520/962 (54.1)
	85+	444/638 (69.6)	463/672 (68.9)	461/753 (61.2)
Seven days readmission rate (all attendees)	16–64	536/6,983 (7.7)	467/6,620 (7.1)	439/6,720 (6.5)
	65–74	40/716 (5.6)	38/715 (5.3)	35/775 (4.5)
	75–84	38/830 (4.6)	37/857 (4.3)	37/962 (3.8)
	85+	30/638 (4.7)	28/672 (4.2)	25/753 (3.3)
Thirty day readmission rate (all attendees)	16–64	938/6,983 (13.4)	813/6,620 (12.3)	731/6,720 (10.9)
	65–74	80/716 (11.2)	77/715 (10.8)	67/775 (8.6)
	75–84	95/830 (11.4)	94/857 (11.0)	85/962 (8.8)
	85+	79/638 (12.4)	77/672 (11.5)	69/753 (9.2)
Ninety day readmission rate (all attendees)	16–64	1,451/6,983 (20.8)	1,296/6,620 (19.6)	1,172/6,720 (17.4)
	65–74	135/716 (18.9)	131/715 (18.3)	130/775 (16.8)
	75–84	181/830 (21.8)	177/857 (21.0)	176/962 (18.3)
	85+	166/638 (26.0)	147/672 (21.9)	150/753 (19.9)

	Usual care	Intervention period
Setting	Emergency decision unit within the emergency department	Unchanged
Integration with main emergency department	Short walk, tannoy system and pathways	Unchanged except for additional frailty pathways
Clinical leads	Emergency physicians	Emergency physicians and geriatricians
Nursing	Emergency medicine	Emergency medicine with some additional training in geriatric syndromes and manual handling
Care coordination	Primary care coordinators with good knowledge of and access to community services	Unchanged
Comprehensive geriatric assessment (medical diagnoses, medication, problem list, mental health, basic and instrumental activities of daily living, social circumstances, environmental issue and spirituality)	Primary care coordinators working with nurses and therapists, supported by emergency physicians	As before with specialist geriatrician input and integrated clerking proforma Additional education and training and team-working
Access to specialist geriatrician	Via ad hoc phone calls or outpatient referrals	Embedded geriatrician available 8-6pm seven days per week
Access to community services	All community hospital and intermediate care service available	Unchanged but greater promotion and use of community services

Figure 1. Summary comparison of usual care and the EFU.

Table 2. Mean length of stay and bed-day use following admission from the emergency department 2010–12

Mean monthly figure	Age category	Control group (%)	Transition period (%)	Intervention group (%)
Number of admissions (%)	16–64	1,768 (55)	1,749 (53)	1,253 (48)
	65–74	396 (12)	419 (13)	371 (14)
	75–84	565 (18)	603 (18)	534 (21)
	85+	492 (15)	527 (16)	439 (17)
Total bed-days (%)	16–64	4,767 (30)	4,784 (26)	4,599 (27)
	65–74	2,436 (15)	3,081 (17)	2,544 (15)
	75–84	4,468 (28)	5,209 (29)	4,846 (29)
	85+	4,385 (27)	5,115 (28)	4,826 (29)
Mean length of stay (days)	16–64	2.7	2.7	3.7
	65–74	6.1	7.4	6.9
	75–84	7.9	8.6	9.1
	85+	8.9	9.7	11.1

Discussion

The introduction of CGA into one ED was associated with a clinically and statistically significant reduction in admissions

(risk ratio 0.88, 95% CI: 0.81–0.95) and readmissions in people aged 85+ following discharge from the ED [risk ratio 0.77 (95% CI: 0.63–0.93) for 90 day readmissions]. Over the same period, attendances increased in people aged 65+, whereas attendances decreased in younger people. Conversion rates and readmission rates fell across all age groups; the improvements seen for conversion rates in younger patients are thought to be related to the time freed up for emergency physicians to care for younger patients. Although this cannot be verified, there were no other substantial changes in the configuration of the ED in Leicester during the evaluation period. The mean length of stay for older people increased, which is possibly related to only the sickest of patients being admitted to hospital. Total bed-days increased slightly in the intervention period, but possibly less than might have been expected given the large increase in the number of people aged 85+ attending in the intervention compared with the control period.

The strengths of this evaluation include the large sample size, the well described intervention, and the inclusion of immediate outcomes (such as conversion rates) and

longer-term outcomes (readmission rates), reflecting the whole systems approach underpinning this service development. Weaknesses include lack of a contemporaneous control group, which makes inferring a casual effect difficult, and a lack of process data on the number of patients seen by the new service, so it is not possible to describe a 'dose-response' relationship. However, it is likely that the new service led to cultural changes within the ED that had an influence beyond just those patients having direct contact with the service, so the process data would be difficult to interpret. Other explanations for the association between improved outcomes for older people and the introduction of CGA into the ED include confounding (other interventions or changes to ED practice may have influenced the findings) or bias [it is possible that the population attending in the intervention period were different (e.g. less unwell) compared with those in the control period]. Other weaknesses include the lack of individual patient outcomes such as quality of life or functional ability. While it is possible to associate the admissions avoided with an economic gain, any such calculations are extremely sensitive to length of stay, and hence potentially misleading.

The importance of this issue is reflected in a number of reports (e.g. King's Fund report on ED conversion rates [1], Royal College of Physicians' report on EDs [20], Patients' Association [2] and NHS Ombudsman's reports [3]) and previous studies highlighting the problems experienced by older people in acute hospitals including long stays, high readmission rates and high rates of long-term care use [5, 6].

The association of improved service outcomes for older people receiving CGA is consistent with the international literature from other settings, including reduced mortality or deterioration (odds ratio 0.76), improved cognition, improved quality of life, reduced length of stay, reduced readmission rates, reduced rates of long-term care use (odds ratio 0.78) and reduced costs [14–16]. Although discharge from hospital is a crude measure, the reduction in subsequent readmissions seen in this study may be related to efforts to link emergency care of older people to on-going care in community settings (so-called 'vertical integration' [19]), and is consistent with the research literature on hospital at home, which offers significant advantages in terms of lower mortality [7] and reduced functional decline [8].

Conclusion

The methodological limitations of the study design used for this service evaluation, and the lack of detailed individual patient and service cost outcomes mean that it is too early to expect these findings to be generalisable; undoubtedly more robust evaluations are required. However, in the context of an ageing population and the shrinking health care budgets, services do need to re-examine how they operate and consider doing things differently. Early intervention for frail older people may offer benefits for patients and services alike, and is worthy of on-going study.

Key points

- Emergency attendances in older people will continue to increase.
- CGA can be delivered within the ED.
- CGA in the ED was associated with improved discharge rates and reduces readmission rates in older people; there may be additional related benefits for younger patients.

Conflicts of interest

None declared.

Supplementary data

Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

References

1. Imison C, Poteliakhoff E, Thompson J. Older people and emergency bed use. Exploring variation. Ideas that change helathcare. London: The King's Fund, 2012.
2. Patients Association. We've Been Listening, Have You Been Learning?, London, 2011. <http://patients-association.com/Portals/0/Public/Files/Research%20Publications/We've%20been%20listening,%20have%20you%20been%20learning.pdf>.
3. Health Service Ombudsman. Care and compassion? Report of the Health Service Ombudsman on ten investigations into NHS care of older people. London: Department of Health, 2011.
4. Jayadevappa R. Quality of emergency department care for elderly. *Emerg Med* 2011; 1: e107.
5. Sager MA, Franke T, Inouye SK *et al.* Functional outcomes of acute medical illness and hospitalization in older persons. *Arch Intern Med* 1996; 156: 645–52.
6. Woodard J, Gladman J, Conroy S. Frail older people at the interface. *Age Ageing* 2010; 39(S1): i36.
7. Caplan G, Sulaiman N, Mangin D, Aimonino Ricauda N, Wilson A, Barclay L. A meta-analysis of Hospital in the Home. *Med J Aus* 2012; 197: 512–19.
8. Shepperd S, Doll H, Angus R *et al.* Admission avoidance hospital at home. *Cochrane Database Sys Rev* 2008.
9. Clevenger CK, Chu TA, Yang Z, Hepburn KW. Clinical care of persons with dementia in the emergency department: a review of the literature and agenda for research. *J Am Geriatr Soc* 2012; 60: 1742–48.
10. Conroy SP, Stevens T, Parker SG, Gladman JRF. A systematic review of comprehensive geriatric assessment to improve outcomes for frail older people being rapidly discharged from acute hospital: 'interface geriatrics'. *Age Ageing* 2011; 40: 436–43.
11. Rubenstein LZ, Stuck AE, Siu AL, Wieland D. Impacts of geriatric evaluation and management programs on defined outcomes: overview of the evidence. *J Am Geriatr Soc* 1991; 39(9 Pt 2): 8S–16S; discussion 17S–18S.
12. Rubenstein LZ, Rubenstein LV. Multidimensional assessment of elderly patients. *Adv Intern Med* 1991a; 36: 81–108.

13. Ellis G, Langhorne P. Comprehensive geriatric assessment for older hospital patients. *Br Med Bull* 2005; 71: 45–59.
14. Beswick AD, Rees K, Dieppe P *et al.* Complex interventions to improve physical function and maintain independent living in elderly people: a systematic review and meta-analysis (see comment). *Lancet* 2008; 371: 725–35.
15. Ellis G, Whitehead M, O'Neill D, Robinson D, Langhorne P. Comprehensive geriatric assessment for older adults admitted to hospital. *Coch Lib Coch Collab* 2011.
16. Ellis G, Whitehead MA, Robinson D, O'Neill D, Langhorne P. Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. *BMJ* 2011; 343.
17. Roper N, Logan W, Tierney A. A model for nursing. *Nurs Times* 1983; 9: 24–7.
18. Orem D. *Nursing: Concepts of practice*. 4th edition. St Louis, MO: Mosby-Year Book Inc., 1991.
19. Ernst & Young. *National Evaluation of the Department of Health's Integrated Care Pilots*. London: RAND Europe, 2012.
20. Royal College of Physicians. *Hospitals on the Edge: Time for action?* London: Royal College of Physicians, 2012.

Received 7 December 2012; accepted in revised form 11 June 2013