Identifying patient-level health and social care costs for older adults discharged from acute medical units in England.

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Abstract

Background: acute medical units allow for those who need admission to be correctly identified, and for those who could be managed in ambulatory settings to be discharged. However, readmission rates for older people following discharge from acute medical units are high and may be associated with substantial health and social care costs.

Objective: Identifying patient-level health and social care costs for older people discharged from acute medical units in England

Design: prospective cohort study of health and social care resource use

Setting: An acute medical unit in Nottingham, England

Participants: 456 people aged over 70 who were discharged from an acute medical unit within 72 hours of admission

Methods: Hospitalisation and social care data were collected for three months post-recruitment. In Nottingham, further approvals were gained to obtain data from general practices, ambulance services, intermediate care and mental healthcare. Resource use was combined with national unit costs.

Results: Costs from all sectors were available for 250 participants. Mean (95% CI, median, range) total cost was £1926 (1579-2383, 659, 0-23612). Contribution was: secondary care (76.1%), primary care (10.9%), ambulance service (0.7%), intermediate care (0.2%), mental healthcare (2.1%) and social care (10.0%). The costliest 10% of participants accounted for 50% of the cost.

Conclusions: This study highlights the costs accrued by older people discharged from AMUs: they are mainly (76%) in secondary care and half of all costs were incurred by a minority of participants (10%).

Key points

- Mean health and social cost in the three months following discharge was £1926.

- Contribution to health and social care costs was primarily secondary care (76.1%), followed by primary care (10.9%) and social care (10.0%)

- The costliest 10% of participants accounted for 50% of the cost.

- The results justify development of interventions to reduce hospitalisation in this group, although these are more likely to be cost effective if targeted upon the minority of higher service users.

Introduction

Over the last 15 years, the English National Health Service (NHS) has reconfigured acute care; a key innovation has been the introduction of Acute Medical Units (AMUs), now present in 98% of hospitals [1].The number of vulnerable older people presenting in crisis to AMUs is rising.[2] Service evaluations indicate that readmission rates for older people in the year following discharge from AMUs are high (27%).[3, 4]   These poor outcomes may be associated with high resource-use, which could help justify spending on interventions to improve outcomes. However, the true health and social care costs of this care have rarely been described at all, or appropriately [5].

This study describes health and social care costs incurred over three months by older people post-AMU discharge.

Method

Participants

The Acute Medicine Outcome Study (AMOS) was a two centre (Nottingham and Leicester) cohort study which aimed to recruit 700 participants. Older people (70 years or older) that had attended and then discharged from an AMU within 72 hours were included in this study. The characteristics and outcomes of this population are reported elsewhere [3].

Source of costing data

Resource-use data can be collected alongside clinical studies to inform estimates of costs of care. Despite clear recommendations [6], only half of published studies measure costs other than secondary care, even fewer include social care costs. Various methods exist to collect resource-use information including questionnaires, diaries, and electronic record searches; however, respondents dislike keeping diaries [7] and people with lower educational attainment under-report in diaries,[8] as might those with cognitive impairment – common in the population of interest described here. Electronic Administrative Record (EAR) systems to record patient health and social care are now common, and this information can be used to derive patient costs.

EAR systems were interrogated across a range of health and social care services. Hospitalisation and social care data were collected retrospectively for 644 patients in Leicester and Nottingham for three months post-AMU discharge (Jan 09-Feb 11). In the 456 participants (in Nottingham), further approvals were gained to obtain data from general practices, ambulance services, intermediate and mental healthcare. All data were anonymised at the service. Resource-use was combined with national unit costs to derive total patient costs. Extensive fieldwork was completed with the included agencies to derive parameters covering resource use (Table 1).

<<Table 1>>

Secondary care

Secondary care data (day-case, inpatient, outpatient and intensive care) were obtained from two Patient Administration Systems (PAS) covering five hospitals in Nottingham. In Leicester, the Secondary Uses Service (SUS) dataset was interrogated. The same parameters were available and obtained from PAS and SUS datasets. Unit costs were attached using NHS Reference Costs for 2009/10 [9].

Primary care

Primary care resource-use data were obtained from Nottingham GP practice EAR systems. Of 118 GP practices serving our cohort, data were obtained from 48 practices (250/456 participants): seventeen practices external to Nottinghamshire were excluded (44/456 participants); three practices (19/456 participants) declined; 50 practices (147/456 participants) did not respond to (a minimum of) three emails, letters, or telephone calls during practice recruitment; three participants could not be identified on the practices' EAR system. Data were collected from five different EAR systems: EMIS LV, 119 patients (47.6%); SystmOne, 104 (41.6%), Synergy, 22 (8.8%), EMIS PCS, 4 (1.6%), and Vision, 1 (0.4%). Unit costs were applied based on time taken to perform each task using time assumptions obtained from PSSRU 2009/10 [10], empirical literature, or expert opinion, and mid-point yearly salary estimations taken from the NHS "Agenda for Change" pay rates [11]. The protocol for obtaining primary care data is included in Webappendix 3.

Other healthcare

Nottingham patient-specific ambulance service resource-use was obtained from the Caller Aided Despatch (CAD) IT service team, which was cross-referenced with paper-based Patient Record Forms (PRFs) to identify study participants.

Two types of intermediate care (physical and mental health), within two different catchment areas, were identified in Nottingham. Three of the organisations used SystmOne, allowing sharing of data via the 'Spine'.[12]

In Nottingham, a mental healthcare care trust provided data via the RiO system [13].

Social care

Social care services within two different catchment areas, with two different electronic systems, were identified within Nottingham. Services consisted of contacts and assessments, and care plans.

Cost analysis

Unit costs were combined with resource-use to generate patient-level costs. The total costs from all services, were estimated where possible, for all patients who remained in the study for 90 days without withdrawal (patients who died during the study were not classed as 'withdrawn'). Analysis was undertaken using STATA version 11.

Research ethics committee and regulatory approvals were obtained (Southampton and South West Hampshire Research Ethics Committee (A) reference number: 08/H0502/139)).

Results

From 1680 eligible patients, 667 participants were recruited into the AMOS study; reasons for not being recruited included: 409 (24%), lack of mental capacity and no consultee; 459 (27%), declined to be recruited; 93 (6%), insufficient English; 50 (3%) AMU staff advised not appropriate; two participants withdrew soon-after recruitment. 471 participants were recruited in Nottingham (71%) and 196 from Leicester (29%). At 90 days, 34 (5.3%) participants had died and 6 (0.9%) of the 633 surviving participants had moved to a care home. The recruitment and flow of participants in this

cohort study has previously been reported.[3] Of 667 recruited participants, 23 withdrew from having their resource-use analysed. Of 644 participants, 57% were female, the mean (range) age was 80 (70-101) and 95% were alive at the end of the 3 month period. The final cohort consisted of 644 participants from Nottingham (456) and Leicester (188). We report the resource-use and costs of the 456 Nottingham patients with secondary and social care costs, and the subset of 250 of these patients with total costs including primary care (Table 2). The results for Leicester are reported in Webappendix 4.

<<Table 2>>

Mean (95% CI, median, range) total cost for 250 Nottingham patients with complete data was £1926 (1579-2383, 659, 0-23612). The mean and median reflect the highly right-skewed distribution of these costs, indicating non-normality, very typical in this type of data. Three month readmission rate was 27%, the same as for the whole cohort. Secondary care costs were the main cost driver, constituting 76.2% of costs. Contribution from other sectors was: primary care (10.9%), ambulance service (0.7%), intermediate care (0.2%), mental healthcare (2.1%) and social care (10.0%). The costliest 10% of patients accounted for 50% of the overall cost of the cohort.

Discussion

The mean total cost per older patient discharged from an AMU over three months was £1926, but the costliest 10% of patients accounting for 50 % of overall costs. Secondary care was the main cost driver, constituting three quarters of costs, with primary and social care as other main contributors (11% and 10% respectively).

A limitation of these results is that they may not be completely representative of older patients discharged from AMU, partially due to patients excluded from AMOS, and partially due to limited access to primary care data. A further limitation of this method was quality of resource use and unit cost parameters collected.

The key strength of this study is the use of electronic administration records rather than unreliable methods such as self-reported service use, allowing capture of better approximation of the true health and social care costs for this cohort.

Although this group of patients has not been studied in this way before, other studies of frail older people living at home [14-16] have also shown that the majority of the costs they incur are in secondary care. From our results, it follows that the most appropriate target for cost reduction in this group is by attempting to reduce hospitalisation.

Collecting data from EARs is not simple in the UK, because there are many different systems used by different agencies; access to each requires specific permission and procedures to ensure data security. We were not able to access all data for primary care due to lack of permission from GPs.

In this study, great effort was made to accurately and precisely identify resource-use and unit costs, using as standardised an approach as possible. Inter-patient variation in costs were identified, that may not have been apparent if top-down or other more approximate estimation methods had been used. However, given the small contribution to the total costs of many services a case can be made for omitting these costs in future studies of this cohort.

Conclusions

This study is the first attempt to use electronic records to identify the real NHS and social care costs in a cohort of frail older people post-AMU discharge. The majority of costs are incurred by a minority of 10%, and three quarters of these costs are incurred in hospitals. This work underlines current complexities of accessing and collecting these data, data which could inform future service configuration in this resource-constrained environment. Until access to EARs improves, the choice is between complete data from small biased samples or incomplete data from larger more representative samples.

Declaration of sources of funding

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Tables and Figures

Table 1: Summary of resource use parameters obtained in this study (see Webappendix 1 for further detail)

Service	Service parameter/code*	Resource use source	Unit cost source*
Secondary care			
Inpatient and day case	Start of episode (date), end of episode (date), episode number, spell number, primary diagnosis (ICD-10 code and description), co-morbidities (ICD-10 code and description), procedures (OPCS-4 code and description), HRG-4 code, source of admission, method of admission, specialty on admission, method of discharge, destination of discharge, site code.	Patient Administration System (PAS); Secondary Uses Service (SUS) dataset	NHS reference costs 2009/10 (using HRG-4 codes)
Outpatient care	Start of episode (date), end of episode (date), type of visit, location, description, Treatment Function Code (TFC), TFC description, attendance status.	Patient Administration System (PAS)	NHS reference costs 2009/10 (Using TFCs)
Intensive care	Start of episode (date), end of episode (date), level of care.	Patient Administration System (PAS)	NHS reference costs 2009/10
Primary care			
Type of events	Consultations, procedures, telephone calls, home visits, administrative tasks, tests ordered and test results received	GP EHR's system	
Event details	Date of event, place of event, type of event, provider, free-text.	GP EHR's system	PSSRU 2010 NHS wage schedule
Medication and wound dressings	Date of issue, rubric (name of drug), dosage, preparation, acute/repeat	GP EHR's system	BNF 2011 C&D 2011
Ambulance service			
	Date and time of event, call stop reason, call sign, resource type, hospital attended, clinic/ward attended by resource, primary complaint, dispatch code, government standard at time of call,	Caller Aided Dispatch (CAD) system, Patient Record Forms (PRF's)	NHS reference costs 2009/10

	time from call until arrival on scene, time at scene.		
Intermediate care			
	Date and time of referral, location, reason for referral , service offered, activity, activity description, activity length (minutes), specialist, care plan category, care plan sub-category, consultation method, date of discharge, location after discharge, discharge reason.	TPP SystmOne	PSSRU 2010
Mental health care			
	Activity date, activity type, activity code, specialty code, Team/Ward type.	CSE Healthcare RiO	NHS reference costs 2009/10
Social care			
	Start date, end date, category of contact , service description, reason for referral, outcome of assessment, source	OLM Care First (City) Corelogic Frameworki (County)	PSSRU 2010

*If unit costs were sourced from a reference pre-2010 then these costs were standardised to

2010 prices using the Hospital & Community Health Services (HCHS) index [17]

for annual price inflation in the NHS.

Table 2: Summary of patient resource use and costs (Nottingham)

Mean (range) age: 80 (70-101); 62% female

Parameter	No. service users, mean no. events per service user^ (SD, range)	Mean cost per patient in the cohort /£ (95% CI, median, range)	Mean cost per patient in the complete data subset (n=250)/£ (95% CI, median, range)
Hospital care (n=456)	360, 4 (4,1-44)	1518 (1285-1849, 360,0-23529)	1448 (1146-1851,365,0-23529)
Inpatient care~	119, 2^ (2,1-11)	1042 (825-1358, 0,0,23011)	952 (680-1350,0,0-23011)
Day case care	71, 1 (1,1-4)	128 (98-167, 0,0-2503)	136 (93-201,0,0-2503)
Outpatient care	358, 3 (3,1-44)	340 (311-376, 234, 0-4021)	347 (308-390, 279, 0-1823)
Critical care#	3, 1 (0,1-1)	7 (2-22, 0, 0-1278)	13 (4-40, 0, 0-1278)
Ambulance service (n=456)	17, 2 (1,1-6)	17 (10-30, 0,0-1306)	14 (6-26, 0, 0-683)
Intermediate care (n=456)	5	10 (2-39, 0, 0-3034)	3 (1-14, 0, 0-572)
Mental health care (n=456)	28, 4 (3,1-12)	37 (24-56, 0, 0-1650)	42 (26-69, 0, 0-1240)
Social Care (n=456)	76, 4 (3,1-14)	148 (98-226, 0, 0-6752)	201.24 (119-334, 0, 0-6752)
Total costs (excluding primary care)	**377, 5 (5,1-44)**	**1730 (1476-2070, 444,0-23529)**	**1708 (1365-2147, 457,0,23529)**
Primary care (n=250)	243, 44 (36,2-246)	-	218 (194-251, 159, 0-1948)
Consultations	113, 3 (2,1-11)	-	28 (23-33, 0,0-183)
Home visits	42, 7 (12,1-50)	-	23 (15-41,0,0-1108)
Procedures	25, 3 (3,1-16)	-	4 (2-8,0,0-231)
Other events*	202, 22 (20,1-101)	-	51 (44-57, 36, 0-301)
Medication	232, 21 (20,1-111)	-	102 (88-120, 57, 0-731)
Wound dressings	64, 4 (4,1-21)	-	10 (7-15, 0,0-274)
Total costs including primary care	**248, 9 (9,1-61)**	-	**1926 (1579-2383, 659,0-23612)**

^ Mean no. events for inpatient care is based on mean no. episodes, and not no. spells. Mean no. events could not be calculated for intermediate care due to the retrospective recoding of all events during an administrative period; all events seemed to occur on one particular day per week. Mean No. events for 'Total' does not include primary care events classed as 'other events', 'medication' or 'wound dressing'.

~Mean (95% CI, median, range) length of hospital stay for those patients with an inpatient admission

over the trial period was: 12 (10-16, 7, 1-89)

#Mean (95% CI, median, range) length of intensive care stay for those patients with a intensive care admission was: 15 (4-36, 5, 3-36)

*'Other events' includes all none face-to-face entries on the EAR system that requires staff time to execute i.e. administration, telephone calls, etc. Entries that were electronic and external to the practice or created by an electronically-automated system (i.e. did not require staff time to execute) were excluded from this analysis