A general medical short-stay unit is not more efficient than a traditional model of care

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Many hospitals use a short-stay unit (SSU) for medical patients thought to require a brief hospitalisation.[1-5] The implementation of these units is presumed to create capacity within the hospital by expediting the care of co-located patients with uncomplicated medical problems.[6]

Many medical SSUs have a narrow clinical focus, such as patients with chest pain or asthma.[7,8] In Australia, there are defined targets for care provision, including disposition of patients from the emergency department (ED) within 4 hours. SSUs of a more general nature are a strategy offered to achieve this key performance indicator[9] on the assumption that they shorten hospital length of stay (LOS). The efficiency of a "specialised" medical SSU has been clearly established. Low-risk chest pain assessment units, short observation units attached to EDs and SSUs for the infusion of chemotherapy all reduce hospital crowding.[10-14] The efficiency of a general medical SSU is less clearly established, despite claims that these units reduce LOS[15] and improve bed capacity.[16] Measuring efficiency in terms of LOS can be misleading without adjusting for the wide age range and significant comorbidity that typify general medical inpatients and extend LOS in general medicine wards.[17] No study has demonstrated efficiency of a general medical SSU after adjustment of LOS for these variables.

The relative stay index (RSI) is a nationally developed measure of hospital efficiency.[18] The RSI is calculated by dividing the actual LOS for a patient by the LOS expected after age, diagnosis-related group, complexity of illness and the hospital's general casemix are taken into consideration. This calculation facilitates comparison of an index hospital with other hospitals in Australia.[18] An RSI value of greater than 1.0 suggests worse efficiency of the index hospital, while a value of less than 1.0 suggests efficiency that is better than average.[19]

We sought to examine the efficiency of an SSU compared with a long-stay unit (LSU) over a 5-year period. Comparative analysis between the SSU and the LSU was not straightforward because one quarter of short-stay patients remain in hospital longer than expected (more than 72 hours);[1,20] and long-stay patients may be discharged in a shorter time than expected (less than 72 hours).[20] "Misallocation" of patients can occur deliberately for load-levelling purposes. This unique cross-over strategy of bed allocation allowed us to compare the performance of the short- and long-stay units and provide answers to each of the following questions:

- Does an SSU operate efficiently when compared with similar hospitals throughout Australia?
- Was mortality, readmission rate or RSI increased in patients who were misallocated to an LSU or an SSU?
- Does the efficiency of a whole general medicine department improve after the implementation of a short-stay allocation strategy?

Methods

The Department of General Medicine at Flinders Medical Centre consisted of an acute medical unit (AMU) and four other general medical wards headed by four general physicians. About 5000 patients were admitted to general medicine from the ED each year. These patients were often elderly and usually did not have significant disease within a single system that would facilitate their admission to a specialty unit such as cardiology or neurology. An SSU was established within the department from one of the above four units in 2004 and was fully operational by January 2005. Its formation coincided with the conversion of the remaining three general medical units to LSUs. Catering to the needs of patients with an anticipated LOS of 24–72 hours, the Flinders Medical Centre SSU was co-located within the hospital's AMU and was staffed on a week-by-week basis by one of the consultant general physicians accompanied by an intern, resident medical officer and medical registrar. In 2010, restructuring of the AMU led to the dissolution of the SSU and absorption of those patients into the daily AMU workload.

This study fell under the remit of the hospital quality and safety governing council at that time and was approved as a quality assurance initiative. A patient database was created by linking the hospital morbidity dataset collected at discharge to an inpatient tracking database and an ED database. This enabled the creation of an annual dataset of patients admitted to general medicine that included details of sex, date of birth, date and day of

Abstract

Objectives: To assess the efficiency of a short-stay unit (SSU) for undifferentiated medical patients and evaluate its effect on the overall efficiency of a general medicine department.

Design, setting and patients: Retrospective study of all general medical patients admitted to the SSU at Flinders Medical Centre, South Australia, during its 5 years of operation (2005–2009), compared with 4 years before its institution and 2 years after its closure.

Main outcome measures: Relative stay index (RSI); inhospital mortality; readmissions within 7 and 28 days.

Results: 23790 general medical patients were admitted overall, and 10764 of these (45.2%) were admitted to the SSU. The RSI for the SSU during its years of operation was 0.79, compared with 1.34 for the long-stay unit. The overall RSI for the department did not improve during those years and was not significantly different to the periods before or after.

Conclusions: We found no evidence that an SSU for undifferentiated medical patients creates bed capacity. It does, however, appear to be safe.

admission and discharge, Charlson Comorbidity Index[21] score, readmission within 7 or 28 days after discharge, RSI and all-cause inhospital mortality. We performed a retrospective analysis of patients admitted from 2005 to 2009. To assess the outcomes of misallocated patients, we analysed data for patients admitted to the SSU or the LSU and divided them into groups according to whether they stayed in hospital for less or more than 72 hours. To assess the impact of an SSU on the efficiency of the department as a whole, we applied RSI definitions from 2012 to all patients admitted to the general medicine department and compared the annual RSIs before, during and after the operation of the SSU.

Results

Between 2005 and 2009, 10 764 patients (45.2% of all 23 790 general medical admissions) were allocated directly to the SSU. SSU patients were younger and had a lower Charlson score than patients allocated to the LSU (Box 1). Regardless of LOS, patients allocated to the SSU had low 7- and 28-day readmission rates compared with patients assigned to an LSU. Analysis of the outcomes of SSU patients who stayed over 72 hours showed no compromise of mortality or readmission rates, but a worse RSI (1.29) than the national average (Box 2).

For the same 5 years, 13 026 patients were allocated directly to an LSU. The RSI for the long-stay cohort was 1.34 (Box 2), indicating less efficient care than that given to similar patients in hospitals throughout the country. Of this cohort, 2387 (18.3%) were discharged within 72 hours of admission, giving an RSI of 0.40 (Box 2), which suggests that LSUs were at least as adept as the SSU at attending to the needs of short-stay patients, if not more so.

In the cohort of LSU patients discharged within 72 hours of admission, the mortality was higher (Box 2) — almost twice the rate seen in the other patient groups — a finding we attributed to the deliberate assignment to an LSU of any patient thought to be terminally ill. A subsequent chart review of 10 patients selected at random in this category showed that such patients had been assigned to the LSU, lending support to our view.

Hospital stays of patients discharged within 72 hours of admission were associated with a low RSI, regardless of the type of medical team (SSU or LSU team) coordinating their care (RSI long stay, 0.40; RSI short stay, 0.39). Patients who stayed in hospital longer than 72 hours had a much higher RSI, irrespective of the team (RSI long stay, 1.45; RSI short stay, 1.29).

There was no significant change in RSI for the whole Flinders Medical Centre General Medicine service over the 11 years spanning the origin and termination of the SSU (Box 3).

Discussion

SSUs are purported to improve hospital efficiency and capacity by allowing clinicians to focus on the needs of patients with conditions that do not require a long hospital stay.[2-5] Before our study, there was no strong evidence base supporting a role for these units. Our study adds robust data to the limited existing knowledge by reporting data from a 5-year period for over 23 000 patients. Previous studies of general medical SSUs were limited by small numbers,[15] brief study periods,[1] or a lack of direct comparison for severity of illness.[20] At best, a shorter LOS has been cited as the measure that demonstrates effective SSU performance.[9] However, in the practice of inpatient general medicine in Australia, measuring performance in terms of LOS might not reflect the efficiency of a service, especially without adjustment for patient age, comorbidity or severity of the principal diagnosis.

Our first question was whether an SSU for general medical patients operates efficiently compared with the care received by similar patients in other Australian hospitals. With an RSI of 0.79 in our SSU, the answer to this question appears to be yes. Allowing doctors without specific training or focus to attend to the needs of short-stay patients appears to expedite the discharge of those patients and to create capacity within the hospital.

1 Characteristics of patients admitted to the Flinders Medical Centre SSU and LSU over the 5 years 2005–2009, by length of stay

	Age, years (mean, [SD])	Charlson comorbidity score (mean, [SD])
All SSU patients	67.5 (20.3)	0.98 (1.63)
All LSU patients	74.7 (17.3)*	1.87 (2.25)*
SSU patients staying less than 72 h	67.4 (20.5)†	0.85 (1.47)*†
SSU patients staying more than 72 h	67.7 (19.6)†	1.32 (1.96)†
LSU patients staying less than 72 h	69.5 (20.9)*	1.34 (1.95)*
LSU patients staying more than 72 h	75.8 (16.1)*†	1.99 (2.30)†

SSU=short-stay unit. LSU=long-stay unit. *P < 0.001 compared with all SSU patients. †P < 0.001 compared with all LSU patients. ◆

2 Performance of the short and long-stay general medical units at Flinders Medical Centre, 2005–2009

	SSU admission	Short-stay allocation but LOS exceeded 72 h	LSU admission	Long-stay allocation but LOS less than 72 h
No. of patients	10 764	3006 (27.9%*)	13 026	2387 (18.3%*)
Relative stay index	0.79†	1.29†	1.34†	0.40†
Inhospital mortality‡	0.48†	0.41†	1	1.73†
Readmission within 7 days‡	0.96	0.90	1	1.02
Readmission within 28 days‡	0.85†	0.88	1	1.13

SSU = short-stay unit. LSU = long-stay unit. LOS = length of stay. *Proportion of all patients allocated to that unit. †Significantly different risk to reference (P < 0.05). ‡Mortality and readmission rates are expressed as incident rate ratios. ◆

3 Relative stay index (RSI) for the Flinders Medical Centre Department of General Medicine

Calendar year	RSI*
2001	1.09
2002	1.03
2003	1.03
2004	1.1
2005	1.12
2006	1.09
2007	1.14
2008	1.04
2009	1.21
2010	1.12
2011	1.05

Shaded rows indicate the existence of the short-stay unit. *An RSI value of greater than 1.0 suggests worse efficiency of the index hospital, while a value of less than 1.0 suggests efficiency that is better than average.[19] ◆

Our second question investigated the quality and safety of the care given to patients who were misallocated to either the SSU or LSU. Our data showed an RSI significantly less than 1.0 for all patients going home in less than 72 hours, regardless of which unit they were allocated to. This suggests the long-stay team is also effective at meeting the needs of a short-stay patient. Further, we considered the possibility that by allowing the LSU to focus on the needs of the long-stay patients, the addition of an SSU might lead to an RSI of less than 1.0 for the LSUs when comparison is made to similar patients in hospitals around Australia. The RSI of 1.34 for our LSU indicates there was no such efficiency. Similar medical staff were on rotation through both the long- and short-stay units, presumably dispensing care of similar quality in each unit. LOS and even RSI may therefore be inadequate as measures of efficiency of care, especially if patients are separated into short and long-stay streams.

Our data show that an SSU is a safe and viable alternative to a traditional ward. The mortality rate was low for inpatients of this unit, as were readmission rates within 1 week and 1 month of discharge. However, streaming patients onto an SSU or LSU does not convincingly expedite their discharge.

To answer our final question, the RSI for the entire general medicine service was examined before, during and after the existence of the SSU. For an SSU to effectively increase bed capacity within a general medical service, the RSI for the entire service must improve. If we develop an "efficient" RSI for the SSU but are left with an "inefficient" RSI for the LSUs, then there is no net increase in bed capacity. Sadly, there was no significant reduction of the overall RSI after the Flinders Medical Centre SSU began.

The limitations of our study include the retrospective nature and the increasing number of admissions and resources allocated to the general medicine department over time. These limitations have been recognised previously.[22]

A general medical SSU by this title alone does not identify clinical goals that are specific enough to enable its multidisciplinary clinical staff to achieve clinical targets more efficiently than staff within a traditional unit. Studies that have suggested a beneficial effect of a medical SSU on efficiency have described units that shared certain characteristics: clearly defined admission criteria for inclusion or exclusion of patients; clearly defined treatment algorithms; and clearly defined discharge criteria.[22]

Our SSU does not seem to improve the efficiency of the department overall. This could be owing to improved efficiencies of care for groups of patients currently cared for elsewhere in the hospital (eg, patients with chest pain, transient ischaemic attack, asthma). In the past decade, specific treatment protocols for patients with these discrete diagnoses have been developed, producing defined pathways that include admission to a unit other than general medicine. These patients, along with the efficiencies of these protocols, have gone to other teams.

The Flinders Medical Centre ED has an observation unit that attends to the needs of over 900 patients a year who in other institutions might be admitted to general medicine. Common admission diagnoses to this ED unit are renal colic, misuse of alcohol or other drugs and gastroenteritis. In hospitals without such an ED observation unit, the RSI for general medicine might be lower as a result of inclusion of such short-stay patients as general medical admissions.

An SSU for general medical patients is a safe alternative to a traditional general medical ward. If patients are misallocated to that unit or an LSU, this does not appear to compromise performance. We found no compelling evidence that streaming patients to and away from an SSU is more efficient than unsegregated care.

1 Lucas BP, Kumapley R, Mba B, et al. A hospitalist-run short-stay unit: features that predict length-of-stay and eventual admission to traditional inpatient services. *J Hosp Med* 2009; 4: 276-284.

2 Richardson DB. Responses to access block in Australia: Australian Capital Territory. *Med J Aust* 2003; 178: 103-104.

3 Hammett RJH, Robinson BG. Responses to access block in Australia: Royal North Shore Hospital. *Med J Aust* 2003; 178: 105-107.

4 Ashby RH. Responses to access block in Australia: Queensland. *Med J Aust* 2003; 178: 107-108.

5 Cameron PA, Campbell DA. Responses to access block in Australia: Royal Melbourne Hospital. *Med J Aust* 2003; 178: 109-110.

6 Clinical Epidemiology and Health Service Evaluation Unit. Models of care to optimise acute length of stay. Melbourne: Clinical Epidemiology and Health Service Evaluation Unit, Melbourne Health, 2004. http://www.health.vic.gov.au/archive/archive2006/hdms/mofcare_final.pdf (accessed May 2013).

7 Jibrin I, Hamirani YS, Mitikiri N, et al. Maryland's first inpatient chest pain short stay unit as an alternative to emergency room-based observation unit. *Crit Pathw Cardiol* 2008; 7: 35-42.

8 Broquetas JM, Pedreny R, Martínez-Llorens JM, et al. [Short-stay respiratory unit: a new option for inpatient care] [Spanish]. *Arch Bronconeumol* 2008; 44: 252-256.

9 Damiani G, Pinnarelli L, Sommella L, et al. The short stay unit as a new option for hospitals: a review of the scientific literature. *Med Sci Monit* 2011; 17: SR15-SR19.

10 Royal Perth Hospital Nursing. Short stay medical unit. http://www.nursingwa.com.au/content/specialtiesAndCampuses/specialty.aspx?CategoryID=7&SpecialtyID=52 (accessed May 2013).

11 Jefferson Healthcare. Medical short-stay. http://www.jeffersonhealthcare.org/Services/Medical-Short-Stay.aspx (accessed May 2013).

12 Gaspoz JM, Lee TH, Weinstein MC, et al. Cost-effectiveness of a new short-stay unit to "rule out" acute myocardial infarction in low risk patients. *J Am Coll Cardiol* 1994; 24: 1249-1259.

13 Clinical Epidemiology and Health Service Evaluation Unit. Short stay and observation units. Final report. Melbourne: Melbourne Health, 2001. http://www.health.vic.gov.au/archive/archive2006/hdms/souprep.pdf (accessed May 2013).

14 Cooke MW, Higgins J, Kidd P. Use of emergency observation and assessment wards: a systematic literature review. *Emerg Med J* 2003; 20: 138-142.

15 Downing H, Scott C, Kelly C. Evaluation of a dedicated short-stay unit for acute medical admissions. *Clin Med* 2008; 8: 18-20.

16 Australasian Health Facility Guidelines, Australasian Health Infrastructure Alliance. Part B – Health facility briefing and planning. 330 – Medical assessment unit (addendum to 340 – Inpatient accommodation unit). Revision 1.0, 28 June 2012. http://www.healthfacilityguidelines.com.au/guidelines.aspx (accessed May 2013).

17 Matsui K, Goldman L, Johnson PA, et al. Comorbidity as a correlate of length of stay for hospitalized patients with acute chest pain. *J Gen Intern Med* 1996; 11: 262-268.

18 Australian Institute of Health and Welfare. Hospital performance: relative stay index. http://www.aihw.gov.au/haag09-10/hospital-performance-relative-stay-index (accessed May 2013).

19 The Health Roundtable. Relative stay index (RSI). http://fogbugz.healthroundtable.org/default.asp?W172 (accessed May 2013).

20 Yong TY, Li JY, Roberts S, et al. The selection of acute medical admissions for a short-stay unit. *Intern Emerg Med* 2011; 6: 321-327.

21 Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care* 2005; 43: 1130-1139.

22 Daly S, Campbell DA, Cameron PA. Short-stay units and observation medicine: a systematic review. *Med J Aust* 2003; 178: 559-563. ❑