

## Research Article

# Community Stepdown Care: A Safe Alternative for Selected Elderly Patients Attending Emergency Department?

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*Background.* The Community Stepdown Care Initiative attempts to provide right siting of care for elderly emergency department attendees whose main need is rehabilitation. *Objectives.* The aim of this study was to compare reattendance and rehospitalisation rates, length of stay, medical complication rates, and discharge destination between the community hospital cohort and the acute hospital cohort. *Methods.* A retrospective cohort study was conducted from June 2007 to November 2008. *Results.* Two hundred and thirty patients were enrolled in the study. 68 patients were successfully transferred to stepdown care; 162 patients were admitted to acute hospital. The odds ratio of reattendance was similar in both cohorts at 2 weeks, 6 months, and 12 months. The odds ratio of rehospitalisation was similar in both cohorts at 2 weeks, 3 months, 6 months, and 12 months. There was no statistical difference in the medical complication rates between the cohorts. Patients were more likely to be discharged home from the community hospital compared to acute hospital (adjusted OR 4.11,  $P = 0.03$ ). 14% of patients from the acute hospital cohort was discharged to community hospital. *Conclusions.* For selective elderly emergency department attendees whose predominant need is rehabilitation, stepdown care is a safe alternative compared to usual acute hospital care.

## 1. Introduction

The estimated worldwide population aged more than 65 years old in 2000 was 420 million [1]. The size of this age group is projected to increase to 973 million by 2030 [2]. There will be an estimated increase of 9% and 6% of elderly population aged more than 65 years old in Europe and Asia, respectively [1]. In Singapore, 7.2% of the current population of 4 million are 65 years old and above [3]. This figure is predicted to rise to 18.4% (equivalent to 900,000 people) by 2030 [3, 4]. This has significant impact on the healthcare systems of the world and how healthcare is delivered.

Certain medical needs increase with age, such as higher proportion of them requiring rehabilitation and the need for geriatric assessment [5–7]. Most of their medical needs are complex and require more detailed diagnostic workup and management [8]. They require an extended period of hospital stay to regain independence [9]. Premature discharge prior to arrangement of postacute or subacute care for these patients may risk readmission in the near future [10, 11].

A recent study in the United Kingdom (UK) suggested that 25% of patients admitted to an elderly care department had postacute care needs, and a majority required rehabilitation [12]. Studies from Japan and UK have demonstrated that a significant percentage of beds in acute hospitals are used inappropriately [13, 14]. Other studies have found that certain patients in acute hospitals were better suited to be managed at alternative care settings [15]. From the health service's point of view, protracted acute hospital stay where the services are not fully utilized incur significant costs [16–18]. From the patient's perspective, protracted stay in acute hospitals are not without its risks. It is well known that hospital acquired infection is a very real problem and has become an equally important cause of morbidity and mortality in the elderly [19].

The Singapore government has started various initiatives to reorganize the preexisting healthcare delivery system in response to the ageing population [3]. The Framework of Integrated Services for the Elderly is an example. The aims of the framework are to upgrade professional standards of

care as well as to provide a continuum of care for the elderly. For the patients, it provides a seamless access to different levels of care. For providers, the “lean” organization of the system means resources are used more efficiently, with the right siting of care.

The emergency department (ED) plays an important role in this new model of care [20]. As the first point of call for most elderly patients requiring medical attention, the ED receives the bulk of the patient volume [21]. It has the role to assess and to coordinate the most appropriate intermediate level care for the patients. For example, once a patient is deemed medically stable, does not require further medical or surgical intervention, and the main aim is for rehabilitation, a transfer to a community hospital is arranged.

Currently there are no studies in the literature describing intermediate care models and its effectiveness in Asia and in particular, Singapore. Of note, there have been no studies assessing a model where patients are directly transferred from ED to community hospitals.

The study hospital is a 1,200-bed acute restructured hospital in Singapore. It has a catchment of 1–1.5 million people in the northern and north-east regions [22]. It is the second largest acute general hospital in Singapore. The Community Hospital Stepdown Care Initiative was a collaboration between the departments of Emergency Medicine, Geriatric Medicine, and three community hospitals in Singapore. This pilot project was set up for a few reasons. Firstly, it recognizes that not all elderly patients who attended ED require acute medical care [19, 23]. Carefully selected patients can be transferred directly from ED to a stepdown care facility such as a community hospital, instead of being admitted first to the acute hospital. Secondly, it recognizes the importance of early review of elderly patients by specialist teams, so that care needs can be assessed and instituted as soon as possible [11, 24]. Thirdly, it takes advantage of the preexisting infrastructure that is available in the Singapore healthcare system. It allows full utilization of the potential resources such as the community hospitals [4, 25]. Finally, it recognizes that inappropriate admissions to acute hospital would expose vulnerable patients to avoidable hospital acquired complications [18, 19].

The aim of this paper is to analyze the data gathered from this pilot project in order to assess the feasibility and safety of direct transfer to the stepdown care facility as an alternative to acute hospital admission for elderly ED attendees whose main need is rehabilitation.

The objectives of the study were (1) to compare the frequency of reattendance and rehospitalisation episodes between patients transferred to stepdown care and patients admitted to acute hospital; (2) to compare the length of stay between the cohorts; (3) to compare the frequency of medical complications between the two cohorts; (4) to compare the discharge destination of patients between the two cohorts.

## 2. Materials and Methods

This was a retrospective cohort study. The community hospital cohort referred to the group of patients who were transferred to stepdown care. The acute hospital cohort referred

to the group of patients who were admitted to acute hospital (usual ED workflow).

Figure 1 shows the workflow of the program. The ED geriatric assessment team consists of emergency physicians and emergency staff grade nurses who have received specialized training in geriatric care. Prior to transfer, any outstanding specialist appointments will be booked and the medical summary of the patients eligible for transfer is reviewed by the facility’s medical team. All community hospitals participating in this study have a multidisciplinary team, consisting of geriatricians, allied health professionals, and medical social workers. The availability of transfer to a stepdown care facility is limited by the availability of community hospital beds at the time of disposition.

Baseline characteristics that were collected include (1) gender; (2) age; (3) ethnicity; (4) admitting diagnosis; (5) the presence of medical comorbidities. The primary outcomes were frequency of reattendance and rehospitalisation episodes over a period of 12 months after discharge from index admission. Secondary outcomes were medical complications during hospital stay and discharge destination. Medical complications were defined by the presence of (1) sepsis; (2) gastrointestinal bleeding; (3) deep vein thrombosis; (4) pulmonary embolism. Discharge destinations were defined by (1) own home; (2) community hospital or rehabilitation facility (for the acute hospital cohort); (3) nursing home or long term care home.

Analysis of baseline data and clinical outcomes were pre-specified and done using STATA version 11 (TX,USA, 2009). For baseline characteristics, categorical variables (gender, age, ethnicity, admitting diagnoses, and comorbidities) were compared between the cohorts using chi square tests. For the primary outcome, the association between the community hospital cohort and acute hospital cohort was measured using odds ratios. Each reattendance and rehospitalisation interval (at 2 weeks, 3, 6, and 12 months) was analyzed separately. The adjusted odds ratios were derived using logistic regression, controlling for the effect of admission diagnoses, age, gender, and the presence of comorbidities. Admission diagnosis was controlled for as it was systematically different at baseline. Age, gender, and medical comorbidities were controlled as these factors were determined (a priori) to be confounding factors. Similar statistical analyses were applied for secondary outcomes. The level of significance was set to 0.05. The Domain Specific Review Boards of the National Healthcare Group (DSRB NHG), Singapore approved this study.

## 3. Results

During the study period between June 15, 2007 and November 15, 2008 (17 months), 54,253 patients aged 65 years old and above who attended ED. Out of this, 230 patients were found to be eligible for stepdown care based on the inclusion and exclusion criteria (Figure 1). Sixty eight patients were successfully transferred to community hospital stepdown care. One hundred and sixty two patients were admitted to acute hospital.

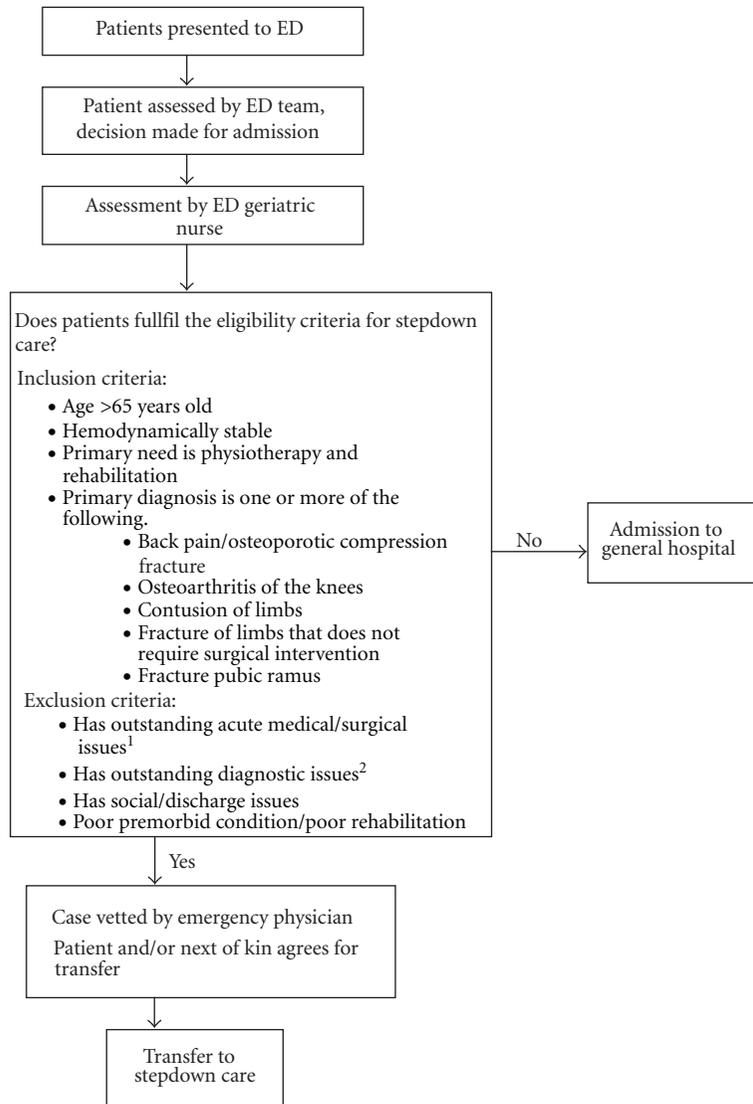


FIGURE 1: Workflow for community Hospital Stepdown Care initiative.

Table 1 shows the baseline characteristics of both cohorts in the study. In general, the baseline characteristics were similar. Patients were mostly Chinese females, with an average between 79 to 80 years old. The most common admitting diagnosis was musculoskeletal back pain and osteoporotic compression fractures of the lumbar spine. More than 50% of patients in both cohorts had hypertension as a comorbid condition. Of note, there was some evidence for a difference in the admission diagnoses between the groups ( $\chi^2 = 9.0288$ ,  $P = 0.03$ ). Patients in the community hospital cohort were more likely to have limb-related injuries, whilst patients in the acute hospital cohort were more likely to have osteoarthritis of the knees and fracture of pubic ramus.

**3.1. Primary Outcomes.** The odds for reattendance was similar between cohorts at 2 weeks, 6, and 12 months (Table 2). The effect appeared to be sustainable over 12 months in general. The odds ratios remained unchanged even after

controlling for the effects of age, gender, admitting diagnoses, and comorbidities.

The odds for rehospitalisation was also similar between acute hospital and community hospital cohorts at 2 weeks, 3, 6, and 12 months (Table 3). The odds ratios remained unchanged after controlling for age, gender, admission diagnoses, and comorbidities.

**3.2. Secondary Outcomes.** The total length of stays for acute hospital cohort and stepdown care cohort were 1572 days and 1322 days, respectively, (Table 4). Analysis of the length of stay data revealed a skewed distribution. The median length of stay in the community hospital cohort was 14.5 days compared to 4 days in the acute hospital cohort. 23 (14%) out of 162 patients from the acute hospital cohort were transferred to community hospitals during their index admission. 541 (34%) out of 1572 inpatient days were spent in community hospitals for the acute hospital cohort. During

TABLE 1: Baseline characteristics of patients in the study.

Variables	Community hospital group ( <i>n</i> = 68)	Acute hospital group ( <i>n</i> = 162)	<i>P</i> value
Gender (Males)	11 (16.18%)	36 (22.22%)	0.299
Age (mean years)	80.65	79.10	
Ethnicity			0.250
Chinese	88.24%	83.33%	
Indian	2.94%	6.79%	
Malay	7.35%	9.88%	
Others	1.47%	0%	
Diagnosis			0.03
Back pain/osteoporotic spine fractures	67.65%	70.99%	
Osteoarthritis of the knees	8.82%	14.81%	
Pubic ramus fracture	4.41%	7.41%	
Limb contusion/fracture (not requiring surgery)	19.12%	6.79%	
Co-morbidities			0.25
Diabetes mellitus	36.76%	25.93%	
Ischemic heart disease	11.76%	20.99%	
Hypertension	64.71%	58.64%	
Chronic obstructive airways disease	0%	1.85%	

TABLE 2: Comparison of reattendance rates.

Reattendance at ( <i>n</i> = total no. of reattendance episodes)	% of acute hospital group (absolute no.)	% of community hospital group (absolute no.)	Unadjusted OR <sup>1</sup> (95% CI)	Adjusted OR <sup>2</sup> (95% CI)	Adjusted <i>P</i> value
2 weeks ( <i>n</i> = 12)	6.17% (10)	2.94% (2)	0.46 (0.10–2.16)	0.45 (0.09–2.16)	0.32
3 months ( <i>n</i> = 52)	22.22% (36)	23.53% (16)	1.08 (0.55–2.11)	1.10 (0.54–2.26)	0.79
6 months ( <i>n</i> = 72)	32.72% (53)	27.94% (19)	0.78 (0.42–1.44)	0.81 (0.42–1.55)	0.52
12 months ( <i>n</i> = 94)	43.83% (71)	33.82% (23)	0.62 (0.35–1.12)	0.64 (0.35–1.18)	0.16

<sup>1</sup> Acute hospital cohort = 0, community hospital cohort = 1.

<sup>2</sup> Controlled for age, gender, diagnosis, and co-morbidities.

TABLE 3: Comparison of rehospitalisation rates.

Rehospitalisation at ( <i>n</i> = total no. of reattendance episodes)	% of acute hospital group (absolute no.)	% of community hospital group (absolute no.)	Unadjusted OR <sup>1</sup> (95% CI)	Adjusted OR <sup>2</sup> (95% CI)	Adjusted <i>P</i> value
2 weeks ( <i>n</i> = 12)	6.17% (10)	2.94% (2)	0.42 (0.09–1.93)	0.40 (0.08–1.92)	0.25
3 months ( <i>n</i> = 47)	20.99% (34)	19.12% (13)	0.89 (0.44–1.82)	0.89 (0.43–1.88)	0.77
6 months ( <i>n</i> = 65)	29.01% (47)	26.47% (18)	0.86 (0.45–1.61)	0.90 (0.46–1.75)	0.76
12 months ( <i>n</i> = 86)	39.51% (64)	32.35% (22)	0.70 (0.38–1.26)	0.75 (0.40–1.40)	0.36

<sup>1</sup> Acute hospital cohort = 0, community hospital cohort = 1.

<sup>2</sup> Controlled for age, gender, diagnosis, and co-morbidities.

TABLE 4: Comparison of length of stay.

Description	Acute hospital group ( <i>n</i> = 162)	Community hospital group ( <i>n</i> = 68)
Total length of stay (days)	1572	1322
Total length of stay (days) in		
Acute hospital	1031 (66%)	NA
Community hospitals <sup>1</sup>	541 (34%)	
Median length of stay <sup>2</sup>		14.5
Acute hospital only	4	
Acute hospital and community hospital	4	

<sup>1</sup> 23 (14%) out of 162 patients were transferred to community hospital during index admission.

<sup>2</sup> Median was used instead of mean as the length of stay distribution of both groups were skewed.

TABLE 5: Comparison of secondary outcomes.

Secondary outcome variables ( <i>n</i> = total no. of cases)	% of acute hospital group (absolute no.)	% of community hospital group (absolute no.)	Unadjusted OR <sup>1</sup> (95% CI)	Adjusted OR <sup>2</sup> (95% CI)	Adjusted <i>P</i> value
Complication rates <sup>3</sup> ( <i>n</i> = 29)	10.49% (17)	17.65% (12)	1.47 (0.64–3.40)	1.49 (0.62–3.61)	0.37
Discharged home ( <i>n</i> = 201)	83.95% (136) <sup>4</sup>	95.59% (65) <sup>5</sup>	4.14 (1.21–14.19)	4.11 (1.17–14.45)	0.03
Discharged to nursing home ( <i>n</i> = 3)	1.23% (2)	1.47% (1)	1.19 (0.11–13.39)	1.25 (0.10–15.47)	0.86

<sup>1</sup>Acute hospital cohort = 0, community hospital cohort = 1.

<sup>2</sup>Controlled for age, gender, diagnosis, and co-morbidities.

<sup>3</sup>Refers to sepsis and gastrointestinal bleeding only (there was no cases of pulmonary embolism or deep venous thrombosis).

<sup>4</sup>24 out of 162 patients in the acute hospital cohort was discharged to a community hospital or rehabilitation facility. Records of 2 patients were unavailable.

<sup>5</sup>Records of 2 patients were unavailable.

admission, 29 out of 230 patients were found to have developed a medical complication (Table 5). There was no pulmonary embolism or deep vein thrombosis reported in either cohort. The odds ratio of having a complication during admission in the community hospital group was 1.47 (95% CI 0.64–3.40) times higher compared to the acute hospital cohort, but this was not statistically significant. After controlling for age, sex, diagnoses, and comorbidities, the odds ratio's remain unchanged.

In terms of discharge destination, 201 out of 230 patients were successfully discharged home. The odds for patients in the community hospital cohort to be discharged to their own homes was 4.14 (95% CI 1.21–14.19) times higher compared to the acute hospital cohort (Table 5). The adjusted odds ratio was 4.11 (95% CI 1.17–14.45) and this was statistically significant ( $P = 0.03$ ). Twenty four (14.8%) out of 162 patients in the acute hospital cohort was discharged to a community hospital or rehabilitation facility. There were four patients (two from each cohort) of which the discharge destination information was unavailable.

Analysis of the descriptive data related to the acute hospital cohort revealed some significant findings. 41% of patients were not transferred to stepdown care due to unavailability of services during weekends and holidays. 6% of patients were not transferred due to unavailability of community hospital beds. 6.8% was not transferred as they were private patients. The reason for nontransfer was not recorded in 39.3% of the patients in the acute hospital cohort.

#### 4. Discussion

As the world population ages, there is a need to change how medicine is practised to cater for the changing trends in demographics and casemix. The emergency department, as one of the first point of contact for the elderly patients seeking medical attention, is in good position to provide right siting of care. The Community Stepdown Care Initiative was conceived as a response to such change in healthcare needs. The overall findings of this study demonstrated that the Community Stepdown Care Initiative is a feasible alternative to acute hospital admission for medically stable elderly patients requiring rehabilitation.

In terms of the primary outcomes, the odds ratio of reattendance and rehospitalisation was similar between the cohorts. This appeared to be sustainable over 12 months. Patients transferred to community hospitals had similar healthcare utilization rates compared to acute hospital cohort even though the care setting has been different. This was despite after controlling for patient characteristics such as admitting diagnosis and comorbidities which were important determinants of healthcare utilization [26, 27]. This implied that the alternative of direct transfer to stepdown care is a feasible option from the health service's point of view, in carefully selected patients [7, 23]. A recent randomized controlled trial done under similar workflow arrangements in Norway found the readmission rates was lower in the cohort transferred to community hospitals [28]. The Norway study however did not include admitting diagnosis as an inclusion criteria. Hence, it was possible that the larger range of diagnoses and the varying needs for rehabilitation included may have influenced the overall readmission rates.

The length of stay of patients in the community hospital cohort was significantly longer compared to the acute hospital cohort (median of 14.49 days versus 4 days). This finding was expected, based on the available knowledge about elderly care. Firstly, it is well known that elderly patients require longer period of rehabilitation before achieving pre-morbid independence and to be able to live at home again [11, 24]. It is quite normal for most rehabilitation programs to run for the duration ranging from 2 to 6 weeks [8]. Secondly, it takes time for the social support services to be put in place, to ensure that there is adequate aftercare upon discharge from hospital.

Compared to the acute hospital cohort, the odds of being discharged home is higher in the community hospital cohort. The association was still significant after controlling for age, gender, admitting diagnoses, and comorbidities. Patients admitted to the community hospitals were more likely to have achieved pre-morbid independence upon discharge.

**4.1. Limitations.** There are limitations to this study. Only 230 out of 54,253 elderly ED attendees were eligible to be included in the study, hence one may argue the necessity of such program as it only included a small number of

patients. The authors acknowledge that the program is still in its infancy, and time and experience are required to further explore the utility of the program. Due to the small sample size of 230 cases, the study may not have adequate power to demonstrate the evidence for a difference in effects between cohorts. Unfortunately, due to the relatively new intervention locally, not much baseline information or data can be found to reasonably ascertain the appropriate sample size. The retrospective nature of this study also meant that there is a problem with missing data. In our study, the reasons for nontransfer were unclear in 39.3% of patients in the acute hospital cohort. Hence, it would be difficult to modify current workflow to improve recruitment rates for the step-down care service. The primary outcome measures were limited to healthcare utilization rates. Without measuring a patient related health outcome concurrently, it is not possible to conclude whether the program or the reduced healthcare utilization rates translated into better patient satisfaction levels. Another perspective not evaluated for this program was its cost effectiveness when compared against the current workflow. Unfortunately, the financial information for both cohorts were not available at the time of the study.

## 5. Conclusion

The results of this study demonstrated that transferring patients to stepdown care directly from ED is a safe and practical option. Healthcare utilization rates were similar in terms of reattendance and rehospitalisation. Patients stayed longer in community hospitals, but this can be explained by the longer recovery period required as well as the time needed to ensure community support services are put in place before discharge. Larger studies are needed to further reaffirm the effectiveness of the stepdown care program.

## Conflict of Interests

The authors declare that they have no conflict of interests.

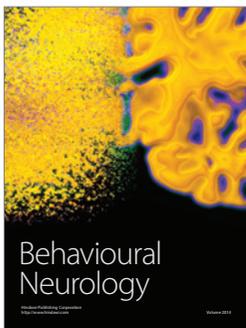
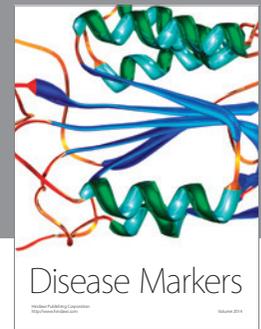
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