

Socio-demographic and Clinical Profile of Admissions to Community Hospitals in Singapore from 1996 to 2005: A Descriptive Study

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Abstract

Introduction: Little data is available on community hospital admissions. We examined the differences between community hospitals and the annual trends in sociodemographic characteristics of all patient admissions in Singaporean community hospitals over a 10-year period from 1996 to 2005. **Materials and Methods:** Data were manually extracted from medical records of 4 community hospitals existent in Singapore from 1996 to 2005. Nineteen thousand and three hundred and sixty patient records were examined. Chi-square test was used for univariate analysis of categorical variables by type of community hospitals. For annual trends, test for linear by linear association was used. ANOVA was used to generate beta coefficients for continuous variables. **Results:** Mean age of all patient admissions has increased from 72.8 years in 1996 to 74.8 years in 2005. The majority was Chinese (88.4%), and female (58.1%) and admissions were mainly for rehabilitation (88.0%). Almost one third had foreign domestic workers as primary caregivers and most (73.5%) were discharged to their own home. There were significant differences in socio-demographic profile of admissions between hospitals with one hospital having more patients with poor social support. Over the 10-year period, the geometric mean length of stay decreased from 29.7 days (95% CI, 6.4 to 138.0) to 26.7 days (95% CI, 7.5 to 94.2), and both mean admission and discharge Barthel Index scores increased from 41.0 (SD = 24.9) and 51.8 (SD = 30.0), respectively in 1996 to 48.4 (SD = 24.5) and 64.2 (SD = 27.3) respectively in 2005. **Conclusion:** There are significant differences in socio-demographic characteristics and clinical profile of admissions between various community hospitals and across time. Understanding these differences and trends in admission profiles may help in projecting future healthcare service needs.

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Key words: Annual trends, Barthel Index scores, Caregivers, Length of stay, Rehabilitation

Introduction

Intermediate care, a range of services facilitating step-down care from the hospital to home,^{1,2} has become an integral part of the healthcare system. Community hospitals, defined as smaller hospitals with fewer onsite facilities or specialist services which are more suited for acute specialised care,^{3,4} are key providers of intermediate care. Patients are admitted to community hospitals for various purposes, such as rehabilitation, subacute care, palliative

care and respite care.⁵ These community hospitals can be viable alternatives to acute hospitals by increasing functional independence post-rehabilitation^{6,7} and reducing long-term mortality⁸ as well as readmissions to acute care⁹ while remaining as cost-effective as elderly care departments in acute hospitals.^{10,11} While a wealth of literature exists on the benefits of community hospitals for various disease-specific outcomes, there has been little evaluation of changes over time with regard to patient characteristics, medical

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comorbidities, and functional status of patients admitted to community hospitals. The lack of routine data on community hospital activities poses problems when evaluating their role in healthcare delivery.¹² The few existing studies, mainly from United Kingdom (UK), demonstrate that there can be significant changes in casemix, patient profile, and purpose of admission both over time^{13,14} and between community hospitals in the same region.⁵ Particularly in Asia, where ageing populations^{15,16} will likely increase demand for intermediate care, such studies would help in planning healthcare service delivery in these societies.

Singapore is one such example of a multi-ethnic Asian society with an ageing population. In Singapore, intermediate and long-term care (ILTC) is provided both in residential settings (e.g. community hospitals, nursing homes with and without chronic sick facilities, and hospices) and home-based settings.¹⁷ Community hospitals in Singapore provide the bulk of residential intermediate care and are run by voluntary welfare organizations (VWOs). They care for patients who have been discharged from acute hospitals but still require inpatient rehabilitative, subacute and/or convalescent care.¹⁸ As per Singapore's Ministry of Health (MOH) guidelines, community hospitals ensure that these patients achieve their optimal potential before being discharged.¹⁹ Currently, Singapore has 6 community hospitals: Ang Mo Kio Thye Hua Kwan Hospital (AMKTHKH), St Luke's Hospital (SLH), St Andrew's Community Hospital (SACH), Bright Vision Hospital (BVH), Ren Ci Hospital and Kwong Wai Shiu Hospital, providing a total of more than 1000 beds and plans are undertaken to build at least 2 more community hospitals by 2016.²⁰ Although there have been local studies on the determinants of length of stay²¹ and discharge-related issues,²²⁻²⁴ to date, there has been none investigating the profile of community hospital patient admissions on a national level. As such, we reviewed the profile and socio-demographic characteristics of all patient admissions in all community hospitals in existence then from 1996 to 2005 with the aim of studying the differences, if any, by hospital and year of admission. We believe that such a review would be useful to those involved in the planning and delivery of intermediate care in Singapore and other similar societies.

Materials and Methods

Data extraction was performed retrospectively from non-computerised medical records of all patients admitted to all community hospitals existent in Singapore from 2 January 1996 to 31 December 2005, of which there were only 4 (AMKTHKH, SLH, SACH and BVH) with one (BVH) opening only in late 2002. Four research nurses who were tasked with collecting the data underwent training and were supervised by the lead author. The data collection period was from November 2006 to August 2008.

The study was approved by the National University of Singapore Institutional Review Board and management of all community hospitals. The sampling frame for the study was all patients from all 4 community hospitals. Variables studied included the socio-demographic characteristics, clinical profile including the Charlson comorbidity index (CCMI),²⁵ and socio-economic status based on hospital bed class and means testing. During the study period in Singapore, only patients staying in C class (non air-conditioned, 8-bedded) or B2 class (non air-conditioned, 6-bedded) wards received subsidies from the government for cost of hospital stay; patients in higher class wards did not receive any subsidy. In 2001, means-testing was implemented at ILTC facilities for C and B2 class patients to ensure that subsidies were awarded according to patient and family's financial circumstance (i.e. the patient's total family income per capita).¹⁷ In this study, immediate family members were defined as spouse, children, grandchildren (or siblings if the patient is single) who are aged ≥ 18 years and able to provide care to the patient; potential caregivers were defined as anyone aged ≥ 18 years, living with the patient and is physically able to provide care to the patient (including foreign domestic worker); while primary caregiver was defined as the primary person providing physical care to the patient (including foreign domestic worker). Functional status was quantified using Shah-modified Barthel Index (BI)²⁶ and both admission and discharge BI were recorded. Length of stay (LOS) was calculated as the total number of inpatient days and time to rehabilitation was calculated as number of days between date of onset of principal diagnosis for admission and date of admission to community hospital.

Statistical Analysis

LOS and time to rehabilitation in the study were skewed, and were log transformed before further analysis. Pearson's chi-square test was used for univariate analysis of all categorical variables by type of community hospitals; and test for linear by linear association was used to assess trends in categorical variables by year of admission. For continuous variables such as geometric mean of time from onset of principal diagnosis for admission to date of admission and length of stay and BI scores, ANOVA was used to compare between hospitals and to generate beta coefficients for trends by year of admission. The same patient who was admitted more than once into community hospitals would be counted more than once when generating descriptive results (e.g. gender, ethnicity). However, for some variables like age, length of stay and BI scores, results will vary between different admissions for the same patient. As the profile of patient admissions is more important from a health services research perspective (e.g. for health policy and resource planning) than the individual patient, we opted to analyse

data by patients admissions and not by individual patient. All statistical analyses were performed using SPSS Version 17.0 (IBM Corp, NY, USA). Statistical significance was set at the conventional $P < 0.05$.

Results

For the purpose of anonymity, the 4 community hospitals

are referred to as Hospital A, B, C, and D. The total sample includes 19,360 admissions from all 4 community hospitals from 1996 to 2005. The socio-demographic and clinical information for all patient admissions are shown by hospital in Table 1 and Table 2 respectively, and the socio-demographic and clinical information for all patient admissions by year of admission are shown in Table 3 and Table 4 respectively.

Table 1. Socio-Demographic Characteristics of All Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 By Community Hospital (N = 19,360)

Characteristic	Total (%) (N = 19,360)	Community Hospital, n (%)				P value
		A (N = 9675)	B (N = 5012)	C (N = 3911)	D (N = 762)	
Age (years)						
≤70	6104 (31.5)	3309 (34.2)	1520 (30.3)	1005 (25.7)	270 (35.4)	<0.001
>70	13,256 (68.5)	6366 (65.8)	3492 (69.7)	2906 (74.3)	492 (64.6)	
Mean Age (SD)	74.1 (11.7)	73.3 (11.8)	74.9 (10.6)	75.4 (11.8)	73.0 (14.6)	-
Gender						
Male	8120 (41.9)	4087 (42.2)	2121 (42.3)	1590 (40.7)	322 (42.3)	0.341
Female	11,240 (58.1)	5588 (57.8)	2891 (57.7)	2321 (59.3)	440 (57.7)	
Ethnicity						
Chinese	17,112 (88.4)	8629 (89.2)	4404 (87.9)	3403 (87.0)	676 (88.7)	<0.001
Malay	1159 (6.0)	509 (5.3)	325 (6.5)	285 (7.3)	40 (5.2)	
Indian	842 (4.3)	433 (4.5)	226 (4.5)	144 (3.7)	39 (5.1)	
Others	247 (1.3)	104 (1.1)	57 (1.1)	79 (2.0)	7 (0.9)	
Marital status						
Single	1756 (9.1)	886 (9.2)	433 (8.7)	269 (6.9)	168 (22.0)	<0.001
Married	8002 (41.4)	3996 (41.4)	2121 (42.2)	1639 (41.9)	246 (32.3)	
Widowed	9018 (46.7)	4525 (46.9)	2299 (46.0)	1885 (48.2)	309 (40.6)	
Separated or divorced	551 (2.9)	248 (2.6)	149 (3.0)	115 (2.9)	39 (5.1)	
Type of hospitalization						
Rehabilitation	17,046 (88.0)	9014 (93.2)	4183 (83.5)	3199 (81.8)	650 (85.3)	<0.001
Subacute care	417 (2.1)	148 (4.3)	146 (2.9)	21 (0.5)	102 (13.4)	
Chronic sick	326 (1.7)	65 (0.7)	103 (2.1)	154 (3.9)	4 (0.5)	
Respite	1476 (7.6)	414 (4.3)	523 (10.4)	534 (13.7)	5 (0.7)	
Others	95 (0.5)	34 (0.4)	57 (1.1)	3 (0.1)	1 (0.1)	
Government subsidy level						
A	292 (1.5)	171 (1.8)	46 (0.9)	74 (1.9)	1 (0.1)	<0.001
B1	630 (3.3)	594 (6.1)	26 (0.5)	10 (0.3)	0 (0.0)	
B2+	830 (4.3)	813 (8.4)	12 (0.2)	5 (0.1)	0 (0.0)	
B2	6847 (35.4)	3313 (34.2)	828 (16.5)	2706 (69.2)	0 (0.0)	
C	10,761 (55.6)	4784 (49.4)	4100 (81.8)	1116 (28.5)	761 (99.9)	
Means test category*						
Not done	13,982 (71.9)	6417 (66.3)	4826 (96.3)	2682 (68.6)	3 (0.4)	<0.001
0%	3116 (16.1)	2050 (21.2)	81 (1.6)	808 (20.7)	177 (23.2)	
25%	332 (1.7)	216 (2.2)	7 (0.1)	55 (1.4)	54 (7.1)	
50%	789 (4.1)	420 (4.3)	25 (0.5)	144 (3.7)	200 (26.2)	
75%	1195 (6.2)	572 (5.9)	73 (1.5)	222 (5.7)	328 (43.0)	

*Data available from 2002 onwards

Table 1. Socio-Demographic Characteristics of All Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 By Community Hospital (N = 19,360) (Con't)

Characteristics	Total (%) (N = 19,360)	Community Hospital, n (%)				P value
		A (N = 9675)	B (N = 5012)	C (N = 3911)	D (N = 762)	
Number of visits						
1	15,904 (82.3)	8061 (83.3)	4078 (81.4)	3158 (80.7)	607 (79.9)	<0.001
2	2775 (14.3)	1351 (14.0)	711 (14.2)	589 (15.1)	124 (16.3)	
3	438 (2.2)	201 (2.1)	147 (2.9)	112 (2.9)	23 (3.0)	
4	139 (0.7)	43 (0.4)	53 (1.1)	35 (0.9)	8 (1.0)	
≥5	59 (0.3)	19 (0.2)	23 (0.4)	17 (0.4)	0 (0.0)	
Number of immediate family members						
0	1034 (5.4)	467 (4.8)	386 (7.7)	100 (2.6)	81 (10.6)	0.002
1	2076 (10.7)	1112 (11.5)	497 (9.9)	325 (8.3)	142 (18.6)	
2	2650 (13.7)	1368 (14.2)	583 (11.6)	557 (14.2)	142 (18.6)	
3	3058 (15.8)	1542 (16.0)	727 (14.5)	632 (16.2)	157 (20.6)	
4	2864 (14.8)	1442 (15.0)	749 (14.9)	597 (15.3)	76 (10.0)	
5	2299 (11.9)	1152 (12.0)	601 (12.0)	438 (12.3)	63 (8.3)	
6	1789 (9.3)	848 (8.8)	499 (10.0)	399 (10.2)	43 (5.6)	
7	1378 (7.1)	661 (6.8)	356 (7.1)	340 (8.7)	12 (2.8)	
8	930 (4.8)	434 (4.5)	269 (5.4)	212 (5.4)	15 (2.0)	
9	598 (3.1)	293 (3.0)	171 (3.4)	124 (3.2)	10 (1.3)	
≥10	643 (3.3)	315 (3.3)	174 (3.5)	142 (3.6)	12 (1.6)	
Number of potential caregivers						
0	1967 (10.2)	1100 (11.4)	537 (10.7)	189 (4.8)	141 (18.5)	<0.001
1	3676 (19.0)	1888 (19.5)	980 (19.6)	581 (14.9)	227 (29.8)	
2	6145 (31.7)	2922 (30.2)	1693 (33.8)	1359 (34.7)	171 (22.4)	
3	4975 (25.7)	2333 (24.1)	1290 (25.7)	1245 (31.8)	107 (14.0)	
4	1866 (9.6)	987 (10.2)	392 (7.8)	410 (10.5)	77 (10.1)	
≥5	731 (3.8)	445 (4.6)	120 (2.4)	127 (3.2)	39 (5.1)	
Relationship of primary caregiver to patient						
No primary caregiver	2877 (14.9)	1719 (17.8)	646 (12.9)	318 (8.1)	194 (25.5)	<0.001
Foreign domestic helper	6413 (33.1)	2743 (28.4)	1793 (35.8)	1718 (43.9)	159 (20.9)	
Child	3954 (20.4)	1988 (20.5)	1084 (21.6)	750 (19.2)	132 (17.3)	
Spouse	3592 (18.6)	1872 (19.3)	926 (18.5)	672 (17.2)	122 (16.0)	
Sibling	322 (1.7)	141 (1.5)	95 (1.9)	59 (1.5)	27 (3.5)	
Others (e.g. friend)	2074 (10.7)	1134 (11.7)	420 (8.4)	392 (10.0)	128 (16.8)	
Unknown	128 (0.7)	78 (0.8)	48 (1.0)	2 (0.1)	0 (0.0)	
Year of admission						
1996	910 (4.7)	364 (3.8)	95 (1.9)	451 (11.5)	NA	<0.001
1997	1974 (10.2)	1267 (13.1)	325 (6.5)	382 (9.8)	NA	
1998	2064 (10.7)	1234 (12.8)	420 (8.4)	410 (10.5)	NA	
1999	2096 (10.8)	1211 (12.5)	479 (9.6)	406 (10.4)	NA	
2000	1843 (9.5)	861 (8.9)	602 (12.0)	380 (8.9)	NA	
2001	1862 (9.6)	931 (9.6)	582 (11.6)	349 (8.9)	NA	
2002	1628 (8.4)	984 (10.2)	289 (5.8)	301 (7.7)	54 (7.1)	
2003	2004 (10.4)	800 (8.3)	794 (15.8)	293 (7.5)	117 (15.4)	
2004	2403 (12.4)	1040 (10.7)	794 (14.8)	354 (9.1)	260 (34.1)	
2005	2576 (13.3)	983 (10.2)	677 (13.5)	585 (15.0)	331 (43.4)	

Table 2. Clinical Characteristics of All Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 by Community Hospital (N =19,360)

Characteristics	Total (%) (N = 19,360)	Community Hospital, n (%)				P value
		A (N = 9675)	B (N = 5012)	C (N = 3911)	D (N = 762)	
Principal diagnosis for admission						
<i>Stroke</i>						
Infarct	5931 (30.6)	2938 (30.4)	1655 (33.0)	1212 (31.1)	126 (16.5)	
Haemorrhage	1100 (5.7)	448 (4.6)	403 (8.0)	224 (5.7)	25 (3.3)	
Both	151 (0.8)	45 (0.5)	60 (1.2)	41 (1.0)	5 (0.7)	
<i>Fracture</i>						
Hip	3416 (17.9)	1764 (18.2)	710 (14.2)	764 (19.5)	223 (29.3)	
Vertebral	589 (3.0)	305 (3.2)	115 (2.3)	153 (3.9)	16 (2.1)	<0.001
Others	992 (5.1)	510 (5.3)	249 (5.0)	195 (5.0)	38 (5.0)	
<i>Lower limb amputation</i>						
Below knee	319 (1.6)	186 (1.9)	87 (1.7)	35 (0.9)	11 (1.4)	
Above knee	71 (0.4)	41 (0.4)	18 (0.4)	8 (0.2)	4 (0.5)	
Others (forefoot & others)	37 (0.2)	15 (0.2)	13 (0.3)	9 (0.2)	0 (0.0)	
Others	6708 (34.6)	3423 (35.4)	1702 (34.0)	1270 (32.5)	314 (41.2)	
Charlson comorbidity index						
0	3270 (16.8)	1890 (19.5)	603 (12.0)	637 (16.3)	140 (18.4)	
1 – 3	8675 (44.8)	4271 (44.1)	2031 (40.5)	1984 (50.7)	392 (51.4)	
4 – 6	6443 (33.2)	3088 (31.9)	2015 (40.2)	1150 (29.4)	190 (24.9)	<0.001
>7	969 (5.0)	425 (4.4)	363 (7.2)	140 (3.6)	40 (5.2)	
Mean (SD)	-	1.21 (0.80)	1.42 (0.80)	1.20 (0.75)	1.17 (0.80)	<0.001
AIDS	20 (0.1)	20 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	<0.001
Cerebrovascular disease	9746 (50.3)	4487 (46.4)	2882 (57.5)	2078 (53.1)	299 (39.2)	<0.001
Chronic pulmonary disease	987 (5.1)	451 (4.7)	342 (6.8)	148 (3.8)	46 (6.0)	<0.001
Congestive heart failure	1343 (6.9)	613 (6.3)	313 (6.2)	317 (8.1)	100 (13.1)	<0.001
Connective tissue disease	361 (1.9)	193 (2.0)	97 (1.9)	43 (1.1)	28 (3.7)	<0.001
Dementia	2562 (13.2)	940 (9.7)	1109 (22.1)	412 (10.5)	101 (13.3)	<0.001
Hemiplegia	9189 (47.5)	4528 (46.8)	2880 (57.5)	1600 (40.9)	181 (23.8)	<0.001
Leukemia	57 (0.3)	10 (0.1)	47 (0.9)	0 (0.0)	0 (0.0)	<0.001
Lymphoma	62 (0.3)	0 (0.0)	55 (1.1)	2 (0.1)	5 (0.7)	<0.001
Myocardial infarct	763 (3.9)	307 (3.2)	258 (5.1)	160 (4.1)	38 (5.0)	<0.001
Peripheral vascular disease	1441 (7.4)	681 (7.0)	452 (9.0)	248 (6.3)	60 (7.9)	<0.001
Ulcer disease	2772 (14.3)	1204 (12.4)	919 (18.3)	543 (13.9)	106 (13.9)	<0.001
Diabetes						
With end organ damage	5778 (29.8)	2773 (28.7)	1670 (33.3)	1151 (29.4)	184 (24.1)	<0.001
Without end organ damage	1608 (8.3)	925 (9.6)	284 (5.7)	318 (8.1)	81 (10.6)	
Liver disease						
Mild	89 (0.5)	21 (0.2)	45 (0.9)	22 (0.6)	1 (0.1)	<0.001
Moderate or Severe	125 (0.6)	77 (0.8)	25 (0.5)	17 (0.4)	6 (0.8)	
Renal disease						
Mild	574 (3.0)	244 (2.5)	155 (3.1)	133 (3.4)	42 (5.5)	<0.001
Moderate or Severe	609 (3.1)	352 (3.6)	128 (2.6)	92 (2.4)	37 (4.9)	
Malignant tumour						
Non-metastatic	1227 (6.3)	684 (7.1)	263 (5.2)	229 (5.9)	51 (6.7)	<0.001
Metastatic	328 (1.7)	154 (1.6)	64 (1.3)	77 (2.0)	33 (4.3)	

Table 2. Clinical Characteristics of All Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 by Community Hospital (N =19,360) (Con't)

Characteristics	Total (%) (N = 19,360)	Community Hospital, n (%)				P value
		A (N = 9675)	B (N = 5012)	C (N = 3911)	D (N = 762)	
Hypertension	12,442 (64.3)	5928 (61.3)	3430 (68.4)	2630 (67.2)	454 (59.6)	<0.001
Hyperlipidaemia	5227 (27.0)	2456 (25.4)	1580 (31.5)	988 (25.3)	203 (26.6)	<0.001
Ischaemic heart disease (including myocardial infarct)	5243 (27.1)	2332 (24.1)	1448 (28.9)	1245 (31.8)	218 (28.6)	<0.001
Discharge destination						
Home	14,224 (73.5)	7206 (74.5)	3609 (72.0)	3006 (76.9)	403 (52.9)	
Acute hospital	2872 (14.8)	1460 (15.1)	681 (13.6)	612 (15.6)	119 (15.6)	
Nursing home	1930 (10.0)	822 (8.5)	658 (13.1)	254 (6.5)	196 (25.7)	
Another community hospital	55 (0.3)	19 (0.2)	15 (0.3)	15 (0.4)	6 (0.8)	<0.001
Sheltered home	64 (0.3)	35 (0.4)	10 (0.2)	9 (0.2)	10 (1.3)	
Discharge against advice	42 (0.2)	22 (0.2)	18 (0.4)	2 (0.1)	0 (0.0)	
Death in community hospital	67 (0.3)	16 (0.2)	18 (0.4)	10 (0.3)	23 (0.3)	
Others	106	95 (1.0)	3 (0.1)	3 (0.1)	5 (0.7)	
Time from onset of principal diagnosis for admission to date of admission (days)						
Geometric mean (range)	19.9 (0 to 11068)	17.4 (0 to 3066)	25.0 (0 to 2975)	19.8 (0 to 11068)	24.3 (0 to 348)	<0.001
Length of stay (days)						
Geometric mean (range)	28.1 (2 to 203)	24.7 (2 to 149)	34.7 (2 to 156)	28.2 (2 to 203)	34.3 (3 to 136)	<0.001
Admission Barthel Index score (units)						
Mean (SD)	46.5 (25.5)	48.1 (23.5)	53.5 (26.1)	36.3 (25.6)	38.3 (26.7)	<0.001
Discharge Barthel Index score (units)						
Mean (SD)	60.2 (28.0)	61.3 (25.5)	68.8 (26.7)	50.9 (30.8)	53.9 (31.9)	<0.001

SD: Standard deviation

Numbers may not add up to N because of missing data (rate of missing data across variables ranged from 0% to 0.1%)

Table 3. Socio-demographic Characteristics of all Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 (by Year of Admission) (N = 19,360)

Characteristics	Year of admission, n (%)										P for trend
	1996 (N = 910)	1997 (N = 1974)	1998 (N = 2064)	1999 (N = 2096)	2000 (N = 1843)	2001 (N = 1862)	2002 (N = 1628)	2003 (N = 2004)	2004 (N = 2403)	2005 (N = 2576)	
Age (Years)											
≤70	318 (34.9)	688 (34.9)	691 (33.3)	726 (34.7)	544 (29.5)	543 (29.1)	521 (32)	642 (32)	697 (28.9)	740 (28.7)	<0.001
>70	592 (65.0)	1283 (65.1)	1378 (66.7)	1369 (65.3)	1296 (70.5)	1319 (70.9)	1108 (68)	1361 (68)	1709 (71.1)	1834 (71.3)	
Age Mean (SD)											
	72.8 (12.0)	73.1 (12.4)	73.4 (12.0)	73.5 (11.5)	74.8 (11.3)	74.8 (10.7)	74.5 (11.5)	74.0 (11.9)	74.5 (11.3)	74.8 (11.7)	
Gender											
Male	368 (40.3)	823 (41.7)	911 (43.9)	888 (42.4)	744 (40.6)	814 (43.7)	706 (43.3)	861 (43)	957 (39.7)	1050 (40.8)	0.241
Female	543 (59.7)	1150 (58.3)	1159 (56.1)	1208 (57.6)	1096 (59.4)	1049 (56.3)	923 (56.7)	1140 (57.0)	1449 (60.3)	1525 (59.2)	
Ethnicity											
Chinese	823 (90.4)	1758 (89.1)	1851 (89.7)	1891 (90.2)	1650 (89.5)	1655 (88.9)	1428 (87.7)	1753 (87.5)	2077 (86.4)	2226 (86.4)	<0.001
Malay	44 (4.8)	95 (4.8)	102 (4.9)	88 (4.2)	93 (5.0)	103 (5.5)	110 (6.8)	129 (6.4)	182 (7.6)	213 (8.3)	
Indian	35 (3.8)	104 (5.3)	88 (4.3)	95 (4.5)	70 (3.8)	73 (3.9)	63 (3.9)	102 (5.1)	115 (4.8)	97 (3.8)	
Others	8 (0.9)	17 (0.9)	23 (1.1)	22 (1.0)	30 (1.6)	31 (1.7)	27 (1.7)	20 (1.0)	29 (1.2)	40 (1.6)	
Marital status											
Single	66 (7.3)	169 (8.6)	173 (8.4)	188 (9.0)	142 (7.7)	133 (7.1)	142 (8.7)	220 (11.0)	246 (10.2)	277 (10.8)	0.454
Married	380 (41.9)	807 (40.9)	904 (44.0)	882 (42.2)	803 (43.6)	807 (43.4)	666 (40.9)	813 (40.7)	941 (39.2)	999 (38.8)	
Widowed	429 (47.3)	952 (48.3)	918 (44.7)	973 (46.5)	847 (46.0)	881 (47.3)	770 (47.3)	904 (45.2)	1142 (47.5)	1202 (46.7)	
Separated or Divorced	32 (3.5)	43 (2.2)	59 (2.9)	49 (2.3)	50 (2.7)	40 (2.1)	49 (3.0)	61 (3.1)	74 (3.1)	94 (3.7)	
Type of hospitalization											
Rehabilitation	715 (78.6)	1641 (83.1)	1787 (86.6)	1818 (86.7)	1617 (87.7)	1696 (91.1)	1496 (91.9)	1793 (89.5)	2200 (91.5)	2284 (88.7)	<0.001
Subacute Care	21 (2.3)	43 (2.2)	31 (1.5)	39 (1.9)	25 (1.4)	7 (0.4)	10 (0.6)	32 (1.6)	25 (1.0)	93 (3.6)	
Chronic Sick	153 (16.8)	231 (11.7)	225 (10.9)	227 (10.8)	180 (9.8)	150 (8.1)	95 (5.8)	112 (5.6)	48 (2.0)	56 (2.2)	
Respite	15 (1.6)	40 (2.0)	16 (0.8)	7 (0.3)	12 (0.7)	4 (0.2)	16 (1.0)	49 (2.4)	121 (5.0)	138 (5.4)	
Others	6 (0.7)	19 (1.0)	5 (0.2)	5 (0.2)	9 (0.5)	5 (0.3)	11 (0.7)	18 (0.9)	12 (0.5)	5 (0.2)	
Government subsidy level											
A	33 (3.6)	54 (2.7)	38 (1.8)	39 (1.9)	25 (1.4)	30 (1.6)	18 (1.1)	15 (0.8)	15 (0.6)	25 (1.0)	<0.001
B1	68 (7.5)	137 (6.9)	98 (4.7)	98 (4.7)	63 (3.4)	47 (2.5)	38 (2.3)	25 (1.3)	27 (1.1)	30 (1.2)	
B2+	62 (6.8)	179 (9.1)	141 (6.8)	109 (5.2)	83 (4.5)	77 (4.1)	69 (4.2)	36 (1.8)	38 (1.6)	36 (1.4)	
B2	577 (63.4)	895 (45.3)	1000 (48.4)	1035 (49.4)	898 (48.7)	854 (45.9)	596 (36.6)	341 (17.0)	317 (13.2)	334 (13.0)	
C	170 (18.7)	709 (35.9)	787 (38.1)	815 (38.9)	774 (42.0)	854 (45.9)	907 (55.7)	1587 (79.0)	2007 (83.5)	2151 (83.5)	

Table 3. Socio-demographic Characteristics of all Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 (by Year of Admission) (N = 19,360) (cont'd)

Characteristics	Year of admission, n (%)										P for trend
	1996 (N = 910)	1997 (N = 1974)	1998 (N = 2064)	1999 (N = 2096)	2000 (N = 1843)	2001 (N = 1862)	2002 (N = 1628)	2003 (N = 2004)	2004 (N = 2403)	2005 (N = 2576)	
Means test category*											
Not done	NA	NA	NA	NA	NA	NA	1062 (65.2)	779 (38.9)	762 (31.7)	581 (22.6)	
0%	NA	NA	NA	NA	NA	NA	319 (19.6)	694 (34.6)	911 (37.9)	1187 (46.1)	
25%	NA	NA	NA	NA	NA	NA	42 (2.6)	71 (3.5)	109 (4.5)	110 (4.3)	<0.001
50%	NA	NA	NA	NA	NA	NA	74 (4.5)	182 (9.1)	265 (11.1)	267 (10.4)	
75%	NA	NA	NA	NA	NA	NA	131 (8.0)	278 (13.9)	355 (14.8)	431 (16.7)	
Number of visits											
1	842 (92.5)	1717 (87)	1690 (81.9)	1700 (81.1)	1487 (80.7)	1473 (79.1)	1320 (81.1)	1652 (82.4)	1949 (81.1)	2074 (80.5)	
2	63 (6.9)	221 (11.2)	311 (15.1)	320 (15.3)	273 (14.8)	303 (16.3)	242 (14.9)	267 (13.3)	378 (15.7)	397 (15.4)	
3	5 (0.5)	31 (1.6)	49 (2.4)	56 (2.7)	58 (3.1)	53 (2.8)	45 (2.8)	60 (3.0)	56 (2.3)	70 (2.7)	<0.001
4	0 (0.0)	4 (0.2)	10 (0.5)	13 (0.6)	19 (1.0)	19 (1.0)	14 (0.9)	18 (0.9)	14 (0.6)	28 (1.1)	
≥ 5	0 (0.0)	1 (0.1)	4 (0.2)	7 (0.3)	6 (0.3)	14 (0.8)	7 (0.4)	7 (0.3)	6 (0.2)	7 (0.3)	
Number of immediate family members											
0	38 (4.2)	137 (7.0)	113 (5.5)	103 (4.9)	88 (4.8)	88 (4.7)	68 (4.2)	145 (7.2)	122 (5.1)	132 (5.1)	
1	94 (10.4)	266 (13.5)	251 (12.2)	189 (9.0)	161 (8.7)	166 (8.9)	151 (9.3)	216 (10.8)	284 (11.8)	298 (11.6)	
2	126 (14.0)	298 (15.1)	280 (13.6)	305 (14.6)	245 (13.3)	220 (11.8)	201 (12.3)	287 (14.3)	340 (14.1)	348 (13.5)	
3	126 (14.0)	281 (14.3)	303 (14.8)	327 (15.6)	289 (15.7)	283 (15.2)	284 (17.4)	312 (15.6)	407 (16.9)	446 (17.3)	
4	132 (14.7)	264 (13.4)	281 (13.7)	298 (14.2)	292 (15.9)	295 (15.8)	251 (15.4)	320 (16.0)	357 (14.9)	374 (14.5)	
5	114 (12.7)	199 (10.1)	219 (10.7)	275 (13.1)	216 (11.7)	241 (12.9)	192 (11.8)	251 (12.5)	252 (10.5)	340 (13.2)	0.015
6	98 (10.9)	149 (7.6)	191 (9.3)	229 (10.9)	176 (9.6)	186 (10.0)	156 (9.6)	152 (7.6)	238 (9.9)	214 (8.3)	
7	79 (8.8)	131 (6.7)	166 (8.1)	136 (6.5)	156 (8.5)	149 (8.0)	118 (7.2)	120 (6.0)	156 (6.5)	167 (6.5)	
8	33 (3.7)	110 (5.6)	115 (5.6)	106 (5.1)	96 (5.2)	95 (5.1)	87 (5.3)	77 (3.8)	111 (4.6)	100 (3.9)	
9	23 (2.6)	66 (3.4)	61 (3.0)	64 (3.1)	58 (3.1)	64 (3.4)	55 (3.4)	55 (2.7)	74 (3.1)	78 (3.0)	
≥10	37 (4.1)	66 (3.4)	73 (3.6)	63 (3.0)	65 (3.5)	75 (4.0)	33 (2.0)	66 (3.3)	62 (2.6)	77 (3.0)	
Number of potential caregivers											
0	74 (8.1)	217 (11.0)	215 (10.4)	203 (9.7)	140 (7.6)	159 (8.5)	147 (9.0)	249 (12.4)	256 (10.7)	307 (11.9)	
1	185 (20.3)	427 (21.6)	432 (20.9)	370 (17.7)	269 (14.6)	267 (14.3)	297 (18.2)	411 (20.5)	479 (19.9)	539 (20.9)	
2	327 (35.9)	680 (34.4)	698 (33.8)	704 (33.6)	553 (30.0)	575 (30.9)	466 (28.6)	620 (30.9)	721 (30.0)	801 (31.1)	
3	202 (22.2)	436 (22.1)	492 (23.8)	522 (24.9)	570 (30.9)	553 (29.7)	445 (27.3)	497 (24.8)	612 (25.5)	646 (25.1)	0.328
4	72 (7.9)	155 (7.9)	164 (7.9)	206 (9.8)	221 (12.0)	224 (12.0)	207 (12.7)	165 (8.2)	248 (10.3)	204 (7.9)	
≥5	50 (5.5)	59 (3.0)	63 (3.1)	91 (4.3)	90 (4.9)	84 (4.5)	55 (3.4)	62 (3.1)	87 (3.6)	79 (3.1)	

Table 3. Socio-demographic Characteristics of all Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 (by Year of Admission) (N = 19,360) (cont)

Characteristics	Year of admission, n (%)										P for trend
	1996 (N = 910)	1997 (N = 1974)	1998 (N = 2064)	1999 (N = 2096)	2000 (N = 1843)	2001 (N = 1862)	2002 (N = 1628)	2003 (N = 2004)	2004 (N = 2403)	2005 (N = 2576)	
Relationship of primary caregiver to patient											
No primary caregiver	101 (11.1)	270 (13.7)	233 (11.3)	232 (11.1)	215 (11.7)	236 (12.7)	285 (17.5)	373 (18.6)	441 (18.4)	491 (19.1)	
Foreign domestic helper	194 (21.3)	490 (24.8)	580 (28.1)	736 (35.1)	776 (42.1)	791 (42.5)	581 (35.7)	657 (32.8)	766 (31.9)	842 (32.7)	
Child	225 (24.7)	476 (24.1)	531 (25.7)	455 (21.7)	346 (18.8)	300 (16.1)	293 (18.0)	374 (18.7)	480 (20.0)	474 (18.4)	<0.001
Spouse	241 (26.5)	431 (21.8)	460 (22.3)	401 (19.1)	310 (16.1)	301 (16.2)	277 (17.0)	336 (16.8)	403 (16.8)	432 (16.8)	
Sibling	12 (1.3)	19 (1.0)	33 (1.6)	37 (1.8)	21 (1.1)	24 (1.3)	21 (1.3)	46 (2.3)	50 (2.1)	59 (2.3)	
Others (e.g. friend)	125 (13.7)	258 (13.1)	205 (9.9)	223 (10.6)	162 (8.8)	202 (10.8)	169 (10.4)	209 (10.4)	256 (10.7)	265 (10.3)	
Unknown	12 (1.3)	30 (1.5)	22 (1.1)	12 (0.6)	13 (0.7)	8 (0.4)	2 (0.1)	9 (0.4)	7 (0.3)	13 (0.5)	

*Data available from 2002 onwards

Table 4. Clinical Characteristics of all Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 (by Year of Admission) (N = 19,360)

Characteristics	Year of admission, n (%)										P for trend
	1996 (N = 910)	1997 (N = 1974)	1998 (N = 2064)	1999 (N = 2096)	2000 (N = 1843)	2001 (N = 1862)	2002 (N = 1628)	2003 (N = 2004)	2004 (N = 2403)	2005 (N = 2576)	
Principal diagnosis for admission											
Stroke Infarct	389 (42.7)	724 (36.7)	738 (35.8)	803 (38.3)	668 (36.2)	657 (35.3)	502 (30.8)	545 (27.2)	482 (20.1)	423 (16.4)	
Haemorrhage	64 (7.0)	94 (4.8)	134 (6.5)	145 (6.9)	127 (6.9)	100 (5.4)	76 (4.7)	133 (6.6)	121 (5.0)	106 (4.1)	
Both	7 (0.8)	15 (0.8)	23 (1.1)	21 (1.0)	19 (1.0)	12 (0.6)	9 (0.6)	20 (1.0)	15 (0.6)	10 (0.4)	
Fracture											
Hip	118 (13)	290 (14.7)	347 (16.8)	333 (15.9)	297 (16.1)	322 (17.3)	284 (17.4)	360 (18.0)	514 (21.4)	596 (23.1)	
Vertebral	28 (3.1)	69 (3.5)	60 (2.9)	71 (3.4)	63 (3.4)	47 (2.5)	47 (2.9)	56 (2.8)	63 (2.6)	85 (3.3)	<0.001
Others	45 (4.9)	128 (6.5)	86 (4.2)	95 (4.5)	97 (5.3)	80 (4.3)	82 (5.0)	102 (5.1)	138 (5.7)	139 (5.4)	
Lower limb amputation											
Below knee	17 (1.9)	30 (1.5)	36 (1.7)	33 (1.6)	33 (1.6)	37 (2.0)	25 (1.5)	33 (1.6)	32 (1.3)	43 (1.7)	
Above knee	1 (0.1)	4 (0.2)	12 (0.6)	5 (0.2)	3 (0.2)	6 (0.3)	12 (0.7)	5 (0.2)	14 (0.6)	9 (0.3)	
Others (forefoot & others)	0 (0.0)	2 (0.1)	6 (0.3)	2 (0.1)	5 (0.3)	0 (0.0)	2 (0.1)	3 (0.1)	6 (0.2)	11 (0.4)	
Others	241 (26.5)	618 (31.3)	622 (30.1)	588 (28.1)	531 (28.8)	601 (32.3)	589 (36.2)	747 (37.3)	1018 (42.4)	1154 (44.8)	
Charlson comorbidity index											
0	143 (15.7)	380 (19.3)	345 (16.7)	311 (14.8)	254 (13.8)	288 (15.5)	269 (16.5)	309 (15.4)	431 (17.9)	540 (21.0)	
1 - 3	468 (51.4)	875 (44.3)	883 (42.8)	933 (44.5)	752 (45.6)	752 (40.4)	722 (44.3)	866 (43.2)	1119 (46.6)	1219 (47.3)	0.044
4 - 6	277 (30.4)	644 (32.6)	739 (35.8)	743 (35.4)	730 (36.4)	730 (39.2)	547 (33.6)	727 (36.3)	705 (29.3)	660 (25.6)	
> 7	22 (2.4)	75 (3.8)	97 (4.7)	108 (5.2)	92 (4.2)	92 (4.9)	90 (5.5)	102 (5.1)	148 (6.2)	157 (6.1)	
AIDS	0 (0.0)	0 (0.0)	3 (0.1)	8 (0.4)	3 (0.2)	0 (0.0)	1 (0.1)	4 (0.2)	0 (0.0)	1 (0.0)	0.289
Cerebrovascular disease	533 (58.6)	1036 (52.5)	1111 (53.8)	1119 (53.4)	1057 (57.4)	1049 (56.3)	826 (50.7)	992 (49.5)	1028 (42.8)	995 (38.6)	<0.001
Chronic pulmonary disease	39 (4.3)	88 (4.5)	113 (5.5)	145 (6.9)	87 (4.7)	68 (3.7)	80 (4.9)	113 (5.6)	131 (5.5)	123 (4.8)	0.948
Congestive heart failure	68 (7.5)	150 (7.6)	123 (6.0)	145 (6.9)	135 (7.3)	142 (7.6)	108 (6.6)	133 (6.6)	166 (6.9)	173 (6.7)	0.521
Connective tissue disease	8 (0.9)	22 (1.1)	41 (2.0)	43 (2.1)	23 (1.2)	26 (1.4)	34 (2.1)	53 (2.6)	60 (2.5)	51 (2.0)	<0.001
Dementia	70 (7.7)	219 (11.1)	277 (13.4)	308 (14.7)	262 (14.2)	297 (16.0)	198 (12.2)	295 (14.7)	339 (14.1)	297 (11.5)	0.052
Hemiplegia	512 (56.3)	1022 (51.8)	1073 (52.0)	1133 (54.1)	997 (54.1)	1007 (54.1)	772 (47.4)	925 (46.2)	913 (38.0)	835 (32.4)	<0.001
Leukemia	1 (0.1)	2 (0.1)	1 (0.1)	1 (0.1)	2 (0.1)	1 (0.1)	0 (0.0)	4 (0.2)	4 (0.2)	41 (1.6)	<0.001
Lymphoma	0 (0.0)	0 (0.0)	1 (0.0)	2 (0.1)	2 (0.1)	1 (0.1)	1 (0.1)	7 (0.3)	6 (0.2)	42 (1.6)	<0.001
Myocardial infarct	31 (3.4)	48 (2.4)	78 (3.8)	69 (3.3)	65 (3.5)	65 (3.5)	69 (4.2)	86 (4.3)	106 (4.4)	146 (5.7)	<0.001
Peripheral vascular disease	39 (4.3)	121 (6.1)	147 (7.1)	164 (7.8)	131 (7.1)	126 (6.8)	123 (7.6)	172 (8.6)	192 (8.0)	226 (8.8)	<0.001
Ulcer disease	109 (12.0)	222 (11.2)	290 (14.1)	275 (13.1)	237 (12.9)	267 (14.3)	279 (17.1)	336 (16.8)	343 (14.3)	414 (16.1)	<0.001

Table 4. Clinical Characteristics of all Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 (by Year of Admission) (N = 19,360) (Contd)

Characteristics	Year of admission, n (%)										P for trend
	1996 (N = 910)	1997 (N = 1974)	1998 (N = 2064)	1999 (N = 2096)	2000 (N = 1843)	2001 (N = 1862)	2002 (N = 1628)	2003 (N = 2004)	2004 (N = 2403)	2005 (N = 2576)	
Diabetes											
With end organ damage	242 (26.6)	566 (28.7)	647 (31.3)	654 (31.2)	585 (31.7)	587 (31.5)	487 (29.9)	645 (32.2)	688 (28.6)	677 (26.3)	0.740
Without end organ damage	63 (6.9)	141 (7.1)	146 (7.1)	151 (7.2)	129 (7.0)	138 (7.4)	141 (8.7)	160 (8.0)	269 (11.2)	270 (10.5)	
Liver disease											
Mild	2 (0.2)	9 (0.5)	6 (0.3)	8 (0.4)	8 (0.4)	10 (0.5)	5 (0.3)	6 (0.3)	24 (1.0)	11 (0.4)	<0.001
Moderate or severe	0 (0.0)	7 (0.4)	8 (0.4)	6 (0.3)	19 (1.0)	14 (0.8)	11 (0.7)	14 (0.7)	23 (1.0)	23 (0.9)	
Renal disease											
Mild	21 (2.3)	38 (1.9)	37 (1.8)	47 (2.2)	57 (3.1)	55 (3.0)	58 (3.6)	65 (3.2)	88 (3.7)	108 (4.2)	<0.001
Moderate or severe	11 (1.2)	39 (2.0)	48 (2.3)	43 (2.1)	45 (2.4)	46 (2.5)	59 (3.6)	81 (4.0)	111 (4.6)	126 (4.9)	
Malignant tumour											
Non-metastatic	40 (4.4)	108 (5.5)	106 (5.1)	112 (5.3)	107 (5.8)	135 (7.3)	114 (7.0)	134 (6.7)	190 (7.9)	181 (7.0)	<0.001
Metastatic	8 (0.9)	20 (1.0)	40 (1.9)	32 (1.5)	19 (1.0)	30 (1.6)	25 (1.5)	46 (2.3)	56 (2.3)	52 (2.0)	
Hypertension	550 (60.4)	1054 (53.4)	1207 (59.2)	1240 (59.2)	1212 (65.8)	1252 (67.2)	1080 (66.3)	1394 (69.6)	1667 (69.4)	1786 (69.3)	<0.001
Hyperlipidaemia	101 (11.1)	254 (12.9)	369 (17.9)	459 (21.9)	460 (25.0)	529 (28.4)	531 (32.6)	711 (35.5)	836 (34.8)	977 (37.9)	<0.001
Ischaemic heart disease (including myocardial infarct)	237 (26.0)	489 (24.8)	464 (22.5)	540 (25.8)	506 (27.5)	524 (28.1)	462 (28.4)	635 (31.7)	656 (27.3)	730 (28.3)	<0.001
Discharge destination											
Home	685 (75.3)	1440 (72.9)	1472 (71.3)	1566 (74.7)	1386 (75.2)	1378 (74)	1243 (76.4)	1374 (68.6)	1743 (72.5)	1937 (75.2)	
Acute hospital	130 (14.3)	301 (15.2)	355 (17.2)	297 (14.2)	287 (15.6)	283 (15.2)	214 (13.1)	292 (14.6)	369 (15.4)	344 (13.4)	
Nursing home	85 (9.3)	195 (9.9)	201 (9.7)	194 (9.3)	136 (7.4)	177 (9.5)	152 (9.3)	292 (14.6)	246 (10.2)	252 (9.8)	
Another community hospital	5 (0.5)	5 (0.3)	12 (0.6)	2 (0.1)	7 (0.4)	8 (0.4)	3 (0.2)	6 (0.3)	1 (0.1)	6 (0.2)	0.090
Sheltered home	0 (0.0)	3 (0.2)	3 (0.1)	5 (0.2)	9 (0.5)	4 (0.2)	2 (0.1)	9 (0.4)	22 (0.9)	7 (0.3)	
Discharge against advice	0 (0.0)	1 (0.1)	7 (0.3)	5 (0.2)	2 (0.1)	2 (0.1)	3 (0.2)	7 (0.3)	2 (0.1)	13 (0.5)	
Death in community hospital	2 (0.2)	7 (0.4)	3 (0.1)	6 (0.3)	6 (0.3)	5 (0.3)	2 (0.1)	14 (0.7)	15 (0.6)	7 (0.3)	
Others	3 (0.3)	22 (1.1)	11 (0.5)	21 (1.0)	10 (0.5)	5 (0.3)	9 (0.6)	10 (0.5)	5 (0.2)	10 (0.4)	

Table 4. Clinical Characteristics of all Patient Admissions to Singaporean Community Hospitals from 1996 to 2005 (by Year of Admission) (N = 19,360) (Cont)

Characteristics	Year of admission, n (%)										β coefficient*	P value
	1996 (N = 910)	1997 (N = 1974)	1998 (N = 2064)	1999 (N = 2096)	2000 (N = 1843)	2001 (N = 1862)	2002 (N = 1628)	2003 (N = 2004)	2004 (N = 2403)	2005 (N = 2576)		
Number of immediate family members												
Mean (SD)	4.22 (2.51)	3.91 (2.64)	4.11 (2.60)	4.16 (2.47)	4.26 (2.51)	4.43 (2.53)	4.26 (2.50)	3.89 (2.51)	3.98 (2.47)	3.98 (2.46)	-0.016	0.015
Number of potential caregivers												
Mean (SD)	2.17 (1.23)	2.03 (1.20)	2.07 (1.20)	2.20 (1.24)	2.40 (1.23)	2.35 (1.24)	2.28 (1.26)	2.05 (1.24)	2.15 (1.26)	2.05 (1.23)	-0.003	0.328
Charlson comorbidity index												
Mean (SD)	1.20 (0.72)	1.20 (0.80)	1.30 (0.80)	1.31 (0.80)	1.30 (0.75)	1.33 (0.80)	1.30 (0.80)	1.31 (0.80)	1.23 (0.81)	1.20 (0.82)	-0.004	0.044
Time from onset of principal diagnosis for admission to date of admission (days)												
Geometric mean (range)	17.0 (0 to 2993)	19.1 (0 to 3520)	20.9 (0 to 2975)	22.2 (0 to 4151)	20.1 (0 to 2941)	18.6 (0 to 2175)	19.0 (0 to 2494)	23.1 (0 to 2891)	18.5 (0 to 5570)	19.1 (0 to 11068)	-0.002	0.420
Length of stay (days)												
Geometric mean (range)	29.7 (4 to 156)	27.7 (3 to 145)	29.2 (4 to 203)	29.4 (3 to 148)	28.7 (2 to 138)	27.0 (2 to 137)	27.7 (3 to 178)	29.2 (4 to 143)	27.0 (3 to 133)	26.7 (2 to 152)	-0.008	<0.001
Admission Barthel Index score (units)												
Mean (SD)	41.0 (24.9)	45.1 (25.5)	44.8 (25.3)	48.5 (26.7)	47.8 (26.0)	46.2 (26.0)	46.2 (25.0)	44.6 (25.4)	48.1 (25.0)	48.4 (24.5)	0.380	<0.001
Discharge Barthel Index score (units)												
Mean (SD)	51.8 (30.0)	55.5 (27.2)	56.0 (27.0)	61.0 (28.0)	60.8 (28.0)	60.6 (27.7)	61.1 (28.0)	59.4 (28.3)	63.8 (28.1)	64.2 (27.3)	1.040	<0.001

Numbers may not add up to N because of missing data (rate of missing data across variables ranged from 0% to 0.1%)

*Unstandardised

All Patient Admissions

Sociodemographic Characteristics (Table 1)

The mean age of all patient admissions was 74.1 years (SD = 11.7) and 58.1% comprised female patients. All 4 ethnic groups were represented in the sample, with Chinese making up the majority (88.4%). Majority (46.7%) was widowed and 41.4% were married; 9.1% were single and 2.9% were separated or divorced. Rehabilitation was the main purpose for admission (88.0%) while respite care was the second most common reason for admission (7.6%). Most (91.0%) were admitted to the subsidised wards. Since means-testing was started in 2002, the majority of patient admissions were not means-tested (71.9%). Of 5432 who were means-tested, 57.4% were not eligible for government subvention; 22%, 14.5% and 6.1% qualified for the 75%, 50% and 25% subvention, respectively. The majority (82.3%) was first admissions and only 3.2% were admitted 3 or more times. Almost 84% had 2 or more immediate family members while 5.4% had none. In terms of caregiver status, 14.9% had no primary caregiver to look after them, while one third (33.1%) stated a foreign domestic helper as their primary caregiver, followed by children (20.4%) and spouse (18.6%).

Clinical Characteristics (Table 2)

The principal diagnoses for admission were strokes (37.1%) and fractures (26.0%). The most common discharge destination was to the patient's own home (73.5%). The geometric mean length of stay for all patient admissions was 28.1 days (range, 2 to 203), while the geometric mean time to rehabilitation was 19.9 days (range, 0 to 11,068) and the mean admission and discharge BI were 46.5 units (standard deviation, SD = 25.5) and 60.2 units (SD = 28.0).

By Hospital (Tables 1 and 2)

Hospital C had the oldest mean age of patient admissions of 75.4 (SD = 11.8) years. Although the ethnic distribution between hospitals was statistically different, this was attributable to small differences in proportions among the non-Chinese ethnicities. Hospital D had the highest proportion of singles admitted (22.0% vs 6.9% to 9.2%). C-class patients (those with the highest subsidy) formed the largest percentage of admissions except in Hospital C where a majority came from the B2 class (69.2% vs 0 to 34.2%). Hospital D had the most subacute care patient admissions (13.4% vs 0.5% to 4.3%) while Hospital C had the most patient admissions for respite care (13.7% vs 0.7% to 10.4%). Hospital D had the highest proportion of patient admissions with no potential caregiver (18.5% vs 4.8% to 11.4%) or no immediate family members (10.6% vs 2.6% to 7.7%), and the lowest reliance on foreign

domestic workers as a primary caregiver (20.9% vs 28.4% to 43.9%). Not surprisingly, the discharge destination for a significant proportion of patient admissions in Hospital D was to nursing homes (25.7%) compared to other community hospitals (6.5% to 13.1%). For the principal diagnosis for admission across all 4 community hospitals, Hospital D had the lowest percentage of stroke cases (20.5% vs 35.5% to 42.2%) and the highest percentage for fractures (36.4% vs 21.5% to 28.4%) while Hospital B had the reverse (stroke: 42.2% vs 20.5% to 37.8%; fractures: 21.5% vs 26.7% to 36.4%). The comorbidity burden was highest in Hospital B (mean CCMI score 1.42 vs 1.17 to 1.21); Hospital B also had the longest geometric mean time from date of onset of principal diagnosis for admission to date of admission (25.0 days vs 17.4 to 24.3 days); as well as the longest geometric mean length of stay (34.7 days vs 24.7 to 34.3 days). Hospital C had the lowest mean admission BI (36.3 units vs 38.3 to 53.5 units) and the lowest mean discharge BI score (50.9 units vs 53.9 to 68.8 units), while Hospital B had the highest mean admission BI score (53.5 units vs 36.3 to 48.1 units) and the highest mean discharge BI score (68.6 units vs 50.9 to 61.3 units).

By Year of Admission (Tables 3 and 4)

The mean age for patient admissions has been increasing over the years, rising from the mean of 72.8 years (SD = 12) in 1996 to 74.8 years (SD = 11.7) in 2005. The proportion of females admitted over the 10-year period has been consistently higher than males. The annual trends in ethnic makeup are detailed in Figure 1. There was a gradual decrease in Chinese (90.4% in 1996 to 86.4% in 2005) and a steady increase in Malay patient admissions over the years (4.8% in 1996 to 8.3% in 2005), but the Chinese percentage was still disproportionately higher and the Malay percentage lower when compared with the national ethnic distribution of Chinese (78%) and Malay (12%). The proportion of rehabilitation cases increased from 78.6% in 1996 to 88.7% in 2005, peaking to 91.1% and 91.9% in 2001 and 2002 respectively. The proportion of C Class patient admissions (those with the highest level of government subsidy) has been steadily increasing over the 10-year period from 18.7% in 1996 to 83.5% in 2005, while the proportion of Class B2 patient admissions has declined correspondingly from 63.4% in 1996 to 13.0% in 2005 (Fig. 2). With the introduction of means-testing in 2002, the proportion of patients who did not undergo means-testing decreased from 65.2% in 2003 to 22.6% in 2005. However, out of those who were means-tested, the proportion who failed to qualify for government subvention remained largely stable (319/556 = 57.4% in 2002, 694/1225 = 56.7% in 2003, 911/1640 = 55.5% in 2004 and 1187/1995 = 59.5% in 2005). Over the years, the number of potential

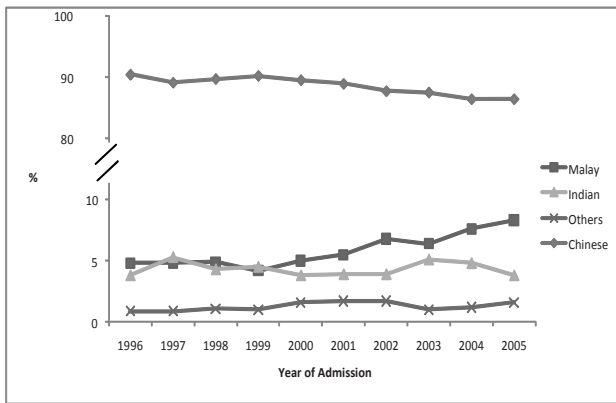


Fig. 1. Ethnicity of all patients admissions in Singaporean community hospitals from 1996 to 2005, by year of admission.

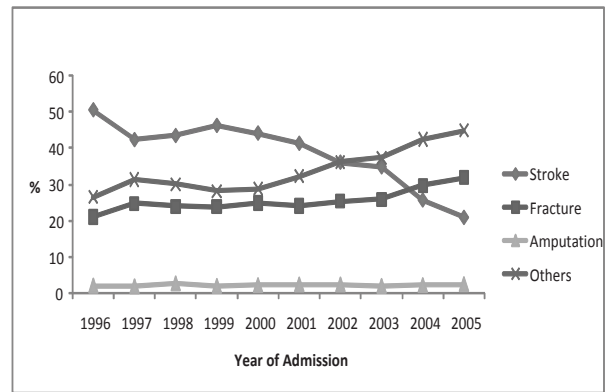


Fig. 4. Primary diagnosis for all patient admissions in Singaporean community hospitals from 1996 to 2005, by year of admission.

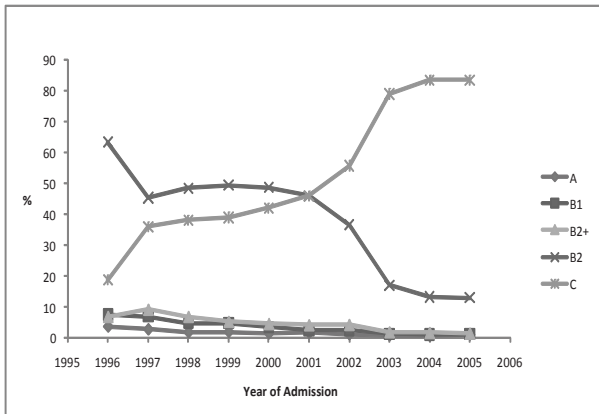


Fig. 2. Government subsidy levels of all patient admissions in Singaporean community hospitals from 1996 to 2005, by year of admission.

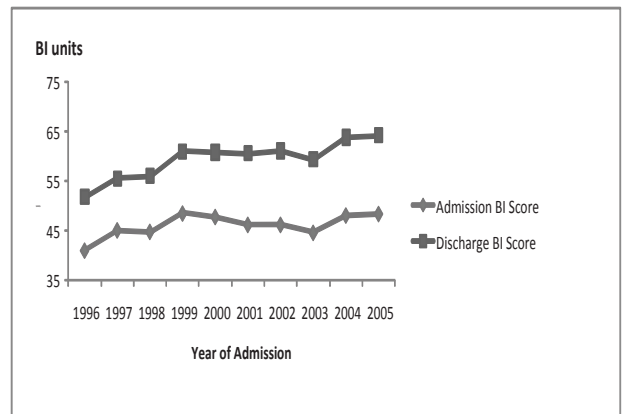


Fig. 5. Mean admission and discharge BI score for all patient admissions in Singaporean community hospitals from 1996 to 2005, by year of admission.

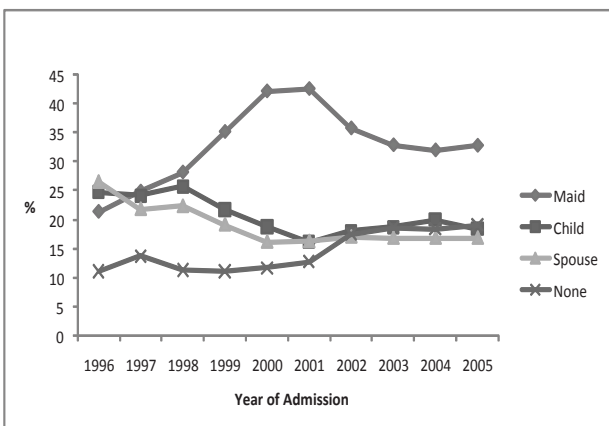


Fig. 3. Relationship of primary caregiver to patient for all patient admissions in Singaporean community hospitals from 1996 to 2005, by year of admission.

caregivers has remained stable even though number of immediate family members has been decreasing, with a mean of 4.22 (SD = 2.51) in 1996 to a mean of 3.98 (SD = 2.47) in 2005. Dependence on foreign domestic workers as primary caregivers increased steadily from 21.3% in 1996 to 32.7% in 2005, peaking at 42.1% and 42.5% in 2000 and 2001 respectively (Fig. 3). There was no rising trend of discharge to nursing homes. The proportion of stroke cases has been decreasing (50.5% in 1996 to 20.9% in 2005) while those of fractures have been steadily increasing (21.0% in 1996 to 31.8% in 2005) (Fig. 4). However, CCMI score has largely remained unchanged (borderline *P* value of 0.044). Over the 10-year period, the geometric mean length of stay has decreased from 29.7 days (range, 4 to 156) to 26.7 days (range, 2 to 152) while the geometric mean time from onset of principal diagnosis for admission to admission to community hospital has remained relatively unchanged (*P* = 0.420). Both mean admission and discharge BI scores

have been increasing from 41.0 (SD = 24.9) and 51.8 (SD = 30.0) respectively in 1996 to 48.4 (SD = 24.5) and 64.2 (SD = 27.3) respectively, in 2005 (Fig. 5).

Discussion

There were significant differences in the profile of patient admissions in Singaporean community hospitals from 1996 to 2005, both by community hospital and by year. Rehabilitation was the main purpose for admission to community hospitals (88.0%). This is quite different from other studies; in the UK, subacute care is the most common reason for admission to community hospitals;²⁷ they also have higher proportion of patients admitted for respite care (31%) and correspondingly lower proportion admitted for rehabilitation (22%).⁵ The proportion of admissions for respite care to community hospitals in the UK may have increased over time, as suggested by a 1975 study on one community hospital where 12% of admissions were for respite care²⁸ and another study 20 years later in 1995 on 8 community hospitals where 31% of admissions were for respite care.⁵ Respite care is a key service in UK, and can be accessed in a variety of settings, such as day centres, family placement schemes, and institutional care.²⁹ In Singapore, there is demand for respite care³⁰ but only a minority of caregiver support providers offer it.³¹ The reduced role of respite care in the Singaporean context could be due to limited supply, absence of subsidies for respite care and cultural sensitivities; in Asian societies, respite care can be culturally sensitive due to perceptions of decreased filial piety when institutionalising the elderly.^{32,33}

There were also intriguing differences in caregiver status for patient admissions to community hospitals in our urbanised Asian society. In the UK study, 38% of patients admitted to community hospitals lived alone⁵ compared with around 10% in our study. Moreover, foreign domestic workers were identified as the most common primary caregiver in the Singaporean context (33.1%) which is strikingly different from the UK situation where the spouse was the most common primary caregiver (31.4%).⁵ This observation persisted over 10 years, suggesting that it is a long-standing societal phenomenon. It is possible that shrinking family size, increasing employment rates or greater disposable household incomes locally have led to decreased availability of family members as primary caregivers, leading to dependence on foreign domestic workers.³⁴ In addition, the cost of employing a foreign domestic worker in Singapore is relatively lower than in UK and this has also probably contributed to Singaporeans' increasing dependence on foreign domestic workers as primary caregivers. In Singapore, there were over 100,000 foreign maids in the late 1990s, with 75% from the Philippines and 20% from Indonesia.³⁵ However,

the trend of migrant workers being over represented in long-term care is not a new one in developed countries.³⁶ Nevertheless, this is usually in the context of skilled nurses and other allied healthcare professionals working in long-term care institutions, not unskilled foreign domestic workers employed as caregivers within the community. The employment of live-in foreign domestic workers as carers for the elderly has become commonplace in Singapore.^{37,38} This trend is also occurring in other urbanised Asian societies like Hong Kong and Malaysia. There has been little study on the effects of employing foreign domestic workers as caregivers. Studies in Hong Kong and Singapore found that employment of a domestic helper predicted reduced institutionalisation of the elderly.^{39,40} In contrast, a study from Malaysia suggested that the employment of maids did not alleviate caregiver burden for carers of dementia patients.⁴¹ Most foreign domestic workers do not have formal training in eldercare and there are significant language and cultural barriers between caregivers and the elderly, both of which may reduce quality of care given and increase stress. Given the underappreciated role of foreign domestic workers in caring for the elderly in these societies, more studies are needed on the effectiveness of these carers on functional outcomes and their value and impact on patients and their families, as well as the sustainability of such arrangements.

Our finding that there were significant differences in the profile of patient admissions between community hospitals is similar to UK studies which demonstrate great variability between community hospitals located in the same region.^{5,42} This could be accentuated in Singapore because community hospitals are run by VWOs (Voluntary Welfare Organisations) with different ethos and missions. These differences in missions were to some extent reflected in the results—for example, Hospital D with its admission criteria focussed on the poor and needy, saw the highest proportion of patient admissions with indicators of lower socio-economic status and without primary caregivers. As not all community hospitals are the same, different hospitals may need varying degrees of public support and ancillary services to meet patients' needs and remain viable. The proportion of the different types of care offered would also vary according to medical capabilities. For example, Hospital D had more subacute care patient admissions because of the availability of the relevant resources to provide this higher level of care when it opened in 2003. Hospital D was run by a VWO up to 2011 when the hospital was transferred to the Ministry of Health because the VWO faced significant challenges in sustaining medical capabilities to provide care to patients. Hence, doctors referring patients to these hospitals should not adopt a “one size fits all” approach, but should consider the individual needs of these patients in the context of the varying capacities of different community hospitals.⁴³

In terms of trends in admissions to Singaporean community hospitals over the 10-year period, the mean age of patient admissions has been increasing steadily. Demand for intermediate care is likely to grow in the foreseeable future as the proportion of elderly in the national population is projected to increase from 9% in 2009 to 19% in 2030.¹⁸ The proportion of stroke cases has been decreasing while those of fractures have been increasing; this may be a result of the changing trends in incidence of stroke and osteoporotic fractures or selection bias of patients admitted to community hospitals. Further research is needed to test these hypotheses. Over the period of 10 years, the mean length of stay has decreased while admission and discharge BI scores have increased. Although the mean length of stay at 28.1 days was longer than estimates from community hospitals in the UK (14 to 20 days),^{5,28,42} this could be due to the focus on rehabilitation among our local community hospitals which requires more time compared to subacute or respite care. The decreasing length of stay also suggests that community hospitals in Singapore are not in danger of becoming mere long-stay geriatric units, a criticism sometimes levelled at community hospitals.⁴² Admission BI scores have been increasing over the 10-year period—whether this is a result of changing functional status after acute disabling conditions or selection of less disabled patients for admission also needs further research. Nevertheless, discharge BI scores were consistently higher (indicating greater independence) than admission BIs over the 10-year period, suggesting that Singaporean community hospitals have been generally successful in rehabilitation to some extent. The discharge destination for 73.5% of patient admissions was patient's own home and this is similar to estimates of 67% to 76% in UK community hospitals.^{5,28}

Our study has several limitations. As most of the data reported in this study were descriptive, we were unable to establish a causative relationship for the trends reported in this study. Furthermore, the data in this study were retrospective and limited to the 1996 to 2005 period, and hence it may not reflect the current situation. Since then, there have been several changes in the intermediate and long-term care sector in Singapore; most notably, another 327 community hospital beds were added, which were not included in this study. Lastly, the descriptive data presented are based on patient admissions and not by individual patient, although the majority of admissions were first admissions (82.3%).

In conclusion, community hospitals play an integral role in the intermediate care landscape of Singapore's healthcare system, and their importance is likely to grow in our ageing society. However, there are significant differences in the profile of patient admissions to these hospitals in our urbanised Asian society, compared with

their counterparts in the UK. Such differences include a greater focus on rehabilitation and lesser focus on sub-acute/respite/palliative care which are priorities in societies like the UK; as well as intriguing differences in caregiver profile, particularly a heavy dependence on foreign domestic workers as primary caregivers. We hope that this information on socio-demographic profile and clinical characteristics of patient admissions may provide health practitioners and policymakers with a broader perspective of temporal changes that have occurred within these hospitals, and help in projecting future healthcare service needs.

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