

ORIGINAL ARTICLE

Trends in Length of Stay, Functional Outcomes, and Discharge Destination Stratified by Disease Type for Inpatient Rehabilitation in Singapore Community Hospitals From 1996 to 2005

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Abstract

Objective: To determine the trends in length of stay (LOS), rehabilitation functional outcome, and discharge destination of patients admitted for inpatient rehabilitation from 1996 to 2005 and stratified by disease in Singapore.

Design: Retrospective national data were extracted from medical records of community-based inpatient rehabilitation admissions in Singapore from 1996 to 2005.

Setting: Four community hospitals.

Participants: There were 12,506 first admissions for rehabilitation; 40.6% were for stroke, 30.4% for fracture, 2.9% for lower limb (LL) joint replacement, 2.3% for LL amputation, 1.9% for cancer, 1.8% for falls, 1.6% for pneumonia, and 18.5% for other illnesses. The overall mean age \pm SD was 73.2 \pm 11.5 years.

Interventions: Not applicable.

Main Outcome Measures: LOS, rehabilitation outcomes (rehabilitation effectiveness [R-effectiveness], rehabilitation efficiency [R-efficiency], relative functional efficiency [Relative-FE]), and discharge destination.

Results: The overall median LOS for all disease groups decreased by 16.2% (37 to 31d) from 1996 to 2005. The sharpest decline in LOS among the 8 disease groups was observed in the LL amputation group. The overall mean \pm SD admission and discharge activities of daily living scores were 45.6 \pm 25.7 and 60.3 \pm 28.9, respectively; median R-effectiveness was 28.8%, median R-efficiency was 12.9/30d, and median Relative-FE was 27.7%/30d. From 1996 to 2005, mean R-effectiveness increased by 184% (14% to 40%), R-efficiency increased by 104% (9 to 19 units/30d), and Relative-FE increased by 145% (21% to 51%/30d). Among all inpatient admissions, most were discharged home (78.2%),

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10.9% were discharged to an acute hospital, and 9.8% were discharged to nursing or sheltered homes, with no significant change during the 10-year period.

Conclusions: Rehabilitation outcomes of patients admitted to Singapore's community hospitals have improved between 1996 and 2005 despite a decreasing LOS. Discharge destinations have largely remained unchanged over this period.

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Inpatient functional rehabilitation is often necessary for patients with conditions such as stroke, fractures, lower limb (LL) amputations, and cancer. In the United States, length of stay (LOS) for inpatient rehabilitation has declined over the past 2 decades,^{1–4} while admission and discharge functional dependency has increased in tandem during the same period.^{1,2} Compared with the United States,¹ LOS for stroke rehabilitation is much longer in Asian countries such as Japan,^{5,6} Korea,⁷ Hong Kong,⁸ Taiwan,⁹ and Thailand,¹⁰ with Japan having an LOS 5 times longer than the United States.⁶ In Singapore, inpatient LOS was previously shown to be positively correlated with the cost of stroke hospitalization in community hospitals.¹¹ Currently, there are limited studies comparing the trends of LOS and rehabilitation outcomes across different disease conditions, especially in Asian countries such as Singapore with rapidly aging demographic profiles.

Inpatient rehabilitation services in Singapore are generally offered in 2 types of hospitals: acute and community hospitals. According to our Ministry of Health (MOH) guidelines, rehabilitation units in acute hospitals are intended to cater mainly to younger patients with the aim of returning them to the workforce, while community hospitals are intended to cater mainly to the long-term care of older patients with the aim of returning them to a home environment.¹² Most patients admitted to community hospitals for rehabilitation are transferred from acute hospitals. Community hospitals are required to provide frequent physician involvement (at least 1 consultation every 2d), 24-hour rehabilitation nursing, and rehabilitative therapy sessions twice a day for an average of 1 hour per session. Rehabilitative therapy sessions include physical, occupational, and speech therapy where appropriate.

Because of the increasing elderly population in Singapore, it is predicted that there will be an increased incidence of disabling conditions and a consequent increased demand for rehabilitation services and nursing homes if the patients are unable to return to their own homes.¹³ We conducted retrospective analyses of patients admitted to all community hospitals in Singapore for inpatient rehabilitation from 1996 to 2005. We aimed to determine the trends in LOS, rehabilitation outcomes,

and discharge destination (1) for all inpatient rehabilitation admissions and (2) stratified by primary diagnosis at admission for this period.

Methods

Data extraction

Retrospective data were extracted manually for all patients admitted for rehabilitation into the 4 community hospitals in Singapore from noncomputerized medical records (January 2, 1996, to December 31, 2005) by 4 research nurses who were trained and supervised by the second author (G.K.). Data extraction from medical records was done from November 2005 to August 2008. Training of all research nurses occurred over a period of 1 week, and the transcription of case notes into the prescribed form was periodically audited. Paper records were entered directly into a standardized scanner-readable form to minimize data entry error and read by a Scansys optical scanner.³ Multiple iterations of data cleaning and verification were performed by the chief research nurse. A 10% random sample of patients was subsequently analyzed by an independent physician for data extraction accuracy by comparing the data with discharge summaries from referral and community hospitals. The error rate was .07%. The study was approved by the National University of Singapore Institutional Review Board and ethics committees of the 4 community hospitals.

Data management

Only first admissions for rehabilitation were included in our study. The independent variables studied were age, type of community hospital, number of admissions, initial Barthel score, subsidy class, ethnicity, type of religion, and caregiver availability. A caregiver was defined as any person aged ≥ 18 years, living with the patient and physically able to provide care to the patient (including foreign domestic workers). In Singapore, only patients staying in C class (non-air-conditioned 8-bed) or B2 class (non-air-conditioned 6-bed) wards receive government subsidization for hospital stay (75% and 50% subsidization, respectively); patients in higher class (air-conditioned 4-bed to single-bed) wards do not receive subsidization. We dichotomized government subsidization levels into C class versus B2 class and above, as C class patients best represented the lower socioeconomic class in our population.

All analyses were stratified into 8 principal diagnoses for admission: stroke, fracture, LL amputation, LL joint replacement, falls, cancer, pneumonia, and others. We included both ischemic and hemorrhagic cerebrovascular events under "stroke"; limb fractures included the LL only; LL amputation included forefoot, below-knee, and above-knee amputation; LL joint replacement included hip and knee joint replacement; falls included all cases

List of abbreviations:

Absolute-FG	absolute functional gain
ADL	activities of daily living
BI	Barthel Index
CI	confidence interval
IQR	interquartile range
LL	lower limb
LOS	length of stay
MOH	Ministry of Health
R-effectiveness	rehabilitation effectiveness
R-efficiency	rehabilitation efficiency
Relative-FE	relative functional efficiency

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