

Effectiveness of ‘rehabilitation in the home’ service

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Abstract

Objectives. Rehabilitation in the home (RITH) services increasingly provide hospital substitution services. This study examines clinical outcomes in a large metropolitan RITH service in Western Australia.

Methods. The 2010 database of Fremantle Hospital RITH service was interrogated to identify the clinical profile of cases, length of stay (LOS) and clinical outcomes. Negative outcomes included death or unexpected hospital readmission. Multiple logistic regression modelling was used to explore associations with negative outcomes. This study was reviewed by the Institutional Review Board which deemed it not to require ethics approval.

Results. There were 1348 cases managed by RITH: 70.6% were aged ≥ 65 years; elective joint replacement (29.7%), medical conditions (20%), stroke (13%), hip fractures (10%) were major contributors. The majority (93.3%) were discharged after a median of 9 days. Negative outcomes occurred in 90 cases (6.7%), including five deaths (0.4%) and 85 readmissions (6.3%). Independent associations with negative outcomes included older age (odds ratio (OR) (95% CI); 1.02, $P=0.006$), orthopaedic conditions (OR 1.91, $P=0.004$) and longer inpatient LOS (OR 1.96, $P=0.003$). Age above 80 years was independently associated with risk of negative outcome (OR 2.99, $P=0.004$).

Conclusions. RITH had a low rate of negative outcomes. The database proved useful for monitoring quality of service provision.

What is known about the topic? Rehabilitation in the home environment has proven cost effective for multiple conditions, particularly stroke and elective joint surgery, among others, facilitating better quality of life, with reduced rates of delirium and mortality. Overall there are few negative outcomes and death is rare.

What does this paper add? Although RITH services are widely utilised as bed substitution services, there is scant literature on clinical outcomes while within the service. This study focuses on frequency of good and poor clinical outcomes in a well-established RITH service in Western Australia, suggesting pattern recognition of an at-risk cohort by identifying potentially useful predictors of poor outcome.

What are the implications for practitioners? RITH services are a safe alternative for many, including older people. Health administration databases are useful tools to monitor clinical outcomes. Clinical indicators such as older age, long hospital stay and orthopaedic diagnoses may be useful predictors of poor outcomes in such services.

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Introduction

In Australia there has been an increased demand for post-acute and rehabilitation services¹ and the demand for hospital efficiencies has led to the use of alternative rehabilitation environments.^{2–4} Although trials of rehabilitation in the home environment indicate cost effectiveness for many conditions, there is lack of robust evidence toward comparability of the effect of the hospital versus alternative environments.^{2,5,6} The evidence is strongest for stroke⁷ followed by elective joint surgery^{1,8,9} and several other conditions.^{1,8–11} Rehabilitation in the home (RITH) schemes generally aim to provide short-term,

person-centred care in selected cases. In comparison with inpatient care, improvements may be seen in quality of life,¹¹ delirium incidence and mortality rates.^{1,10–14} Efficiencies derive from freeing up hospital beds and passing on indirect costs from ‘hotel-type’ services back to the patient.

RITH services are established in several Australian states, including metropolitan Perth. These services are increasingly being asked to treat a wide range of conditions from medical and surgical services in patients with a wide age range, including geriatric patients and patients following elective/emergency surgery, neurological and general medical conditions, including

cancer and geriatric syndromes. There are relatively few reports of clinical outcomes but this is important as the scope of RITH services increases. Good outcomes have been reported with orthopaedic conditions¹² and deaths during rehabilitation have been rare.^{12,13} Potential negative outcomes could include failure to improve or decline in cognitive or physical function, with the requirement for hospital readmission. Potential causes for negative outcomes could include exacerbation of pre-existing illnesses, a complication of rehabilitation such as a fall or fracture, or a new illness.¹²

The aim of this study was to utilise an existing health administrative database to assess clinical outcomes in a large metropolitan RITH service, in particular to determine the frequency of poor clinical outcomes and whether potentially useful predictors of poor outcomes could be identified.

Methods

The South Metropolitan Area Health RITH service in Perth, Western Australia commenced in 2005. The service was designed to provide multidisciplinary rehabilitation in the home in the post-acute phase of illness. Patients are assessed for suitability while they are hospital inpatients. After hospital discharge, they enter a RITH virtual ward and care includes home-based rehabilitation, multidisciplinary team meetings, medical registrar cover and active discharge policies from the service. The RITH service includes all conventional allied health services but not nursing. Once the intensity of rehabilitation services is reduced to less than one visit per week for each therapist, the patient is discharged from the virtual ward but can still receive services at a lower frequency, usually until they can attend local outpatient services. The virtual ward concept was introduced to solve an administrative funding problem.

The RITH administrative database for the calendar year 2010 (January 1 to 31 December) that included all cases managed by the Fremantle Hospital RITH service was reviewed to assess referral rates, referral sources, clinical diagnostic categories, demographic profiles, time to first review, length of stay (LOS), multidisciplinary modalities utilised and outcome of intervention. Routine cognitive data and functional outcome measures at entry and discharge from RITH were not available, hence not included in the manuscript. Data on LOS within the hospital and the RITH service was available but not analysed further. Positive outcome was defined as successful discharge from the virtual ward and negative outcome by either death or unplanned hospital readmission during the patient's stay in the virtual ward. Rehabilitation goals are judged by the therapists to have been achieved if they return to pre-morbid function and capable of living in the community. Cases are frequently referred to outpatient clinics for further rehabilitation after discharge from RITH.

Hospital case records of all cases with negative outcomes were retrospectively scrutinised to determine the diagnosis of the condition that led to the unplanned readmission and whether there were identifiable avoidable factors during the initial hospital or RITH admission that could have prevented the negative outcome. Potential problems related to the initial diagnosis, complications of the presenting condition, the potential for recurrence and the adequacy of discharge planning were

considered. This study was reviewed by the Institutional Review Board which deemed it not to require ethics approval.

Statistical analysis

The computer package IBM SPSS Statistics 19 (IBM Corporation, Armonk, NY, US) was used for statistical analysis. Data are presented as proportions and mean \pm s.d. and analyses used Chi-squared tests and Student's *t*-test. Multiple logistic regression analyses (stepwise entry and removal with $P < 0.05$ and > 0.10 , respectively) was used to investigate potential independent associates of poor outcome using only pre-RITH factors. To assist with the analysis, admission diagnoses were grouped, hospital stays were dichotomised to < 14 days or ≥ 14 days and we compared young age groups (< 50 years) with older age groups (≥ 50 years). A two-tailed significance level of $P < 0.05$ was used throughout.

Results

Patient characteristics and outcomes

A total of 1348 cases were managed by the RITH service during 2010 (see Table 1). They included children and young adults but the majority (70.6%) were aged ≥ 65 years. A few were from low-level residential care (1.3%) and most (60.7%) lived with a spouse or other family member. A small proportion ($< 5\%$) were referred direct from emergency departments or from outpatient clinics (run by the RITH consultants) to avoid an expected hospital admission. There was a wide range of admission diagnostic categories but the four main contributors were elective joint replacement, general medical conditions, stroke and hip fractures that accounted for 72.9% of the cases. The median (interquartile

Table 1. Demographic and clinical information on 1348 patients treated by the Rehabilitation in the Home Service during 2010
RITH, rehabilitation in the home

Patient demographics	n (%)
Age groups (years)	
<50 years	124 (9.2)
50–59 years	137 (10.2)
60–69 years	277 (20.7)
70–79 years	407 (30.4)
80+ years	396 (29.5)
Female gender	779 (57.8)
Community dwelling	1330 (98.7)
Living with partner	716 (53.1)
Living with others	102 (7.6%)
Major diagnostic categories	
Elective orthopaedic	400 (29.7)
General medical	269 (19.9)
Cerebrovascular disease	176 (13.1)
Hip fracture	138 (10.2)
Other orthopaedic	129 (9.6)
Other neurological	86 (6.4)
Falls	67 (4.9)
General surgical	54 (4.0)
Malignancy	29 (2.2)
Clinical outcomes	
Successful discharge from RITH	1258 (93.3)
Unplanned readmission	85 (6.3)
Death	5 (0.4)

range, IQR) LOS for the hospital inpatient and RITH admissions were 7 (4–17) and 9 (5–16) days respectively. The majority of cases (93.3%) had positive outcomes with successful discharge to the community and 78.7% of these were judged to have achieved rehabilitation goals at discharge. There were 14.6% of the cohort referred to outpatient services on discharge; however, for less intensive therapy, characteristics of this group were not analysed. Negative outcomes occurred in 90 cases (6.7%), mainly due to unplanned readmission (85 cases, 6.3%) and there were five deaths (0.4%) that occurred at home during the RITH admission.

The unexpected deaths were due to acute myocardial infarction (three cases) and stroke (one case) and one not unexpected death due to malignancy. The majority of hospital readmissions were judged to be related to the initial hospital presentation (72/85 cases); there were eight cases with complex, multiple comorbid chronic conditions rendering early readmission not unexpected and in only three cases were there new conditions that lead to hospital readmission (hospital records could not be accessed in two cases). There appeared to be many contributory factors leading to re-hospitalisation and often more than one in any individual. The commonest identified factors included recurrence of the presenting condition (24 cases: chest infection, chronic obstructive airways disease, heart failure), complications of the presenting condition (17 cases: pain, immobility, poor wound healing/infection), diagnostic issues (16 cases: syncope/seizures misdiagnosed as falls, persistent delirium, abdominal sepsis) and inadequate social support at home (eight cases).

Factors associated with negative outcomes

Demographic and clinical data in patients with negative outcomes were compared with those with positive outcomes (see Table 2). With univariate statistics, negative outcomes were significantly associated with older age, longer inpatient LOS, longer RITH LOS, and the requirement for multiple allied health input during RITH. The combination of all orthopaedic conditions (elective and trauma) was also associated with negative outcomes (negative vs positive: 8.5% vs 4.8%, $P=0.007$).

With multiple logistic regression analysis and only entering significant pre-RITH variables, negative outcomes were significantly and independently associated with: advanced age (odds ratio (OR) 1.02; 95% CI 1.01–1.04 for each year; $P=0.006$), inpatient hospital stay > 14 days (OR 1.96; 95% CI 1.27–3.04; $P=0.003$) and an orthopaedic admission (OR 1.91; 95% CI 1.22–2.99; $P=0.004$). Multiple logistic regression was repeated with age groups substituted for age. In this model, after controlling for orthopaedic diagnostic grouping and long hospital stay, compared with the lowest risk group (age < 50), being 80 years or older was significantly associated with higher risk of negative outcome (60–69 years: OR 2.00 (95% CI 0.87–4.59; $P=0.10$); 70–79 years: OR 2.05 (95% CI 0.95–4.45; $P=0.07$); 80+ years: OR 2.99 (95% CI 1.41–6.35; $P=0.004$)).

Discussion

The main findings of this study of RITH activity based at a large metropolitan hospital show a high rate of success in a large and varied case load, from multiple clinical departments, with a low rate of adverse events and very low death rate. The RITH service predominantly catered to an older population with multiple

Table 2. Comparison of positive versus negative clinical outcomes (death or unplanned readmission) in patients treated by a Rehabilitation in the Home service
RITH, rehabilitation in the home

Patient characteristics	Positive outcome ($n=1258$)	Negative outcome ($n=90$)	P -value
Age <65 years (%)	30.4	15.6	0.003
Age >65 years (%)	69.6	84.4	
Female gender	58.1	53.3	0.38
Admission diagnosis (%)			
Elective joint surgery	29.3	35.5	0.16
Medical conditions	20.4	13.3	
Stroke	13.4	8.8	
Hip fracture	9.8	16.6	
Other orthopaedic conditions	9.5	11.1	
Other neurological conditions	6.5	4.4	
Fall	4.8	6.6	
Surgical conditions	4.2	1.1	
Cancer	2.1	2.2	
Length of hospital stay (%)			
≤14 days	53.3	28.9	<0.001
>14 days	46.7	71.1	
Time to initiation of RITH service (%)			
≤2 days	85	93.3	0.07
>2 days	15	6.6	
Length of RITH stay (%)			
≤7 days	40.7	56.7	0.01
>7 days	59.3	43.3	
No. allied health services (%)			
0	0.6	2.2	0.003
1	70	53.3	
2	26.6	42.2	
3	2.8	2.2	

comorbidities requiring post-acute care, which seemed to work well for the majority, suggesting good case selection and safe management by the service. These findings are comparable to reports from Victoria and a previous report from our service indicating similarities in demographic features, referral sources, clinical case mix and clinical effectiveness.^{13,14} There were some differences compared with the Victorian experience, notably the high rate of admission for elective joint surgery and shorter LOS in the present study.¹³ This latter difference could be an artefact of the use of the virtual ward concept with many cases having longer periods of rehabilitation provided at lower levels of intensity.

The case review of those with negative outcomes suggested many and varied reasons that led to readmission with complex concurrent illnesses as the main drivers. Our analysis indicated several risk factors for negative outcomes that may be useful for prevention purposes. In particular, older patients with long hospital stays and those with orthopaedic diagnoses were associated with poor outcome, potentially describing an 'at-risk' elderly population entering the RITH service. They also were more likely to require multiple allied health services, which is consistent with case complexity but might also serve as an indicator of potential difficulties. A major limitation of this study was lack of data on cognition and functional outcome measures, hence functional change and impact of poor cognition on

rehabilitation could not be assessed. Also reduction in total hospital LOS was not assessed. Data limitations limit any conclusions that can be drawn, but the findings suggest that advanced age, possibly associated with geriatric syndromes such as cognitive dysfunction and/or complications during their hospital stay, contributes to the risk of adverse events after discharge.

The strengths of the present study include the use of an administrative database with a complete dataset in a large consecutive sample of RITH cases and the availability of good-quality data on several clinically relevant variables. Study limitations include the lack of detailed information on the clinical/functional status of the patients, including their pre-morbid status, carer availability and previous medical history. This latter point is relevant as many cases appeared to have had previous and possibly recurrent hospital admissions. Studies of post-acute care are likely to continue to be required as case selection may continue to develop given ongoing pressures on the healthcare system. The use of the RITH database appears to be an excellent clinical tool to monitor the quality of the service.

In summary, this study indicates that the RITH service as currently run is largely safe and effective for the majority of patients admitted into the program. Studies of post-acute services can provide useful information that may be able to guide and improve hospital care, and health administration databases can be useful for monitoring clinical outcomes. Further studies exploring more detailed clinical parameters may be able to improve the identification of at risk patients.

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