CHAPTER 9

HOME-BASED REHABILITATION OBSERVATIONAL STUDY

9.1 Introduction

The introduction of Home-Based Rehabilitation (HBR) in 1997 continued to be evaluated following the abandonment of the HBR randomised controlled trial (RCT) described in the previous chapter. The model of care and process of recruitment of patients remained the same for patients admitted for home-based care as had been applied in the RCT. A project officer from the Division of General Practice was appointed to collect data and remained under the author's supervision throughout the period of this descriptive study.

9.2 Methods for descriptive and cohort home-based study

Patients admitted to HBR who were referred from either Greenwich Hospital or from Royal North Shore Hospital were included in the study. The period of the study was from 1997 to 1999, and included all patients treated with HBR within that period including the sample recruited for the HBR randomised controlled trial. All patients fulfilled the criteria listed in Table 8.1.

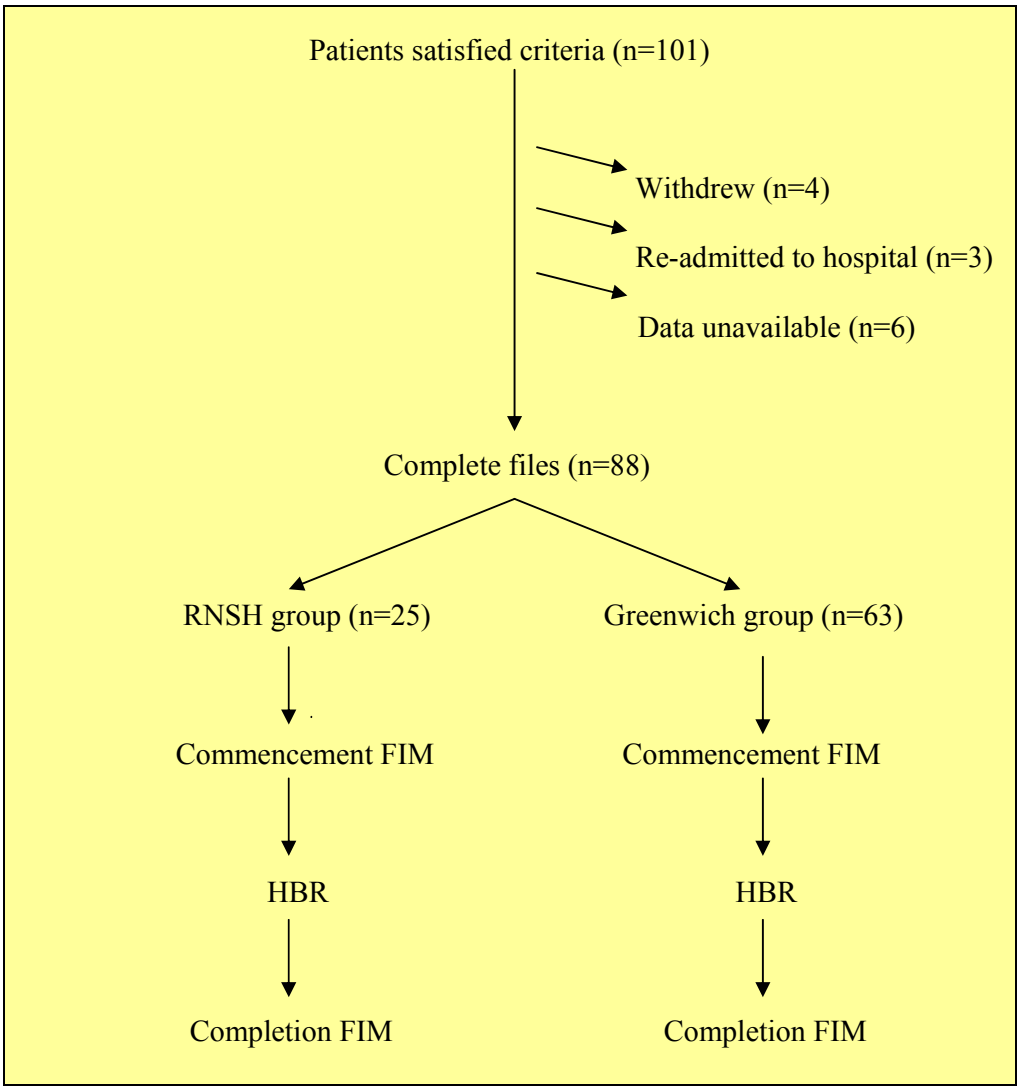
The Functional Independence Measure (FIM) was administered by the project officer to patients on admission to, and discharge from, the HBR service. Data relating to length of stay in inpatient (acute and rehabilitation) and HBR care were collected as a guide to resource utilisation. There was no control group in this descriptive study.

A qualitative survey of the attitudes, experiences and perceptions of selected HBR patients, rehabilitation staff at Greenwich Hospital, and GPs attending HBR patients was performed by an independent reviewer appointed by the Division of General Practice. Structured interviews were conducted at home or by telephone.

These interviews were designed to reflect issues arising from the study objectives, and so a report of the findings is included in this chapter (Table 9.6). The core issues and questions for this qualitative survey were developed by the author as Program Director, a GP appointed by the Division of GPs, the project officer, and the independent reviewer (Appendix 3).

A retrospective cohort study was performed to see if the profiles demonstrated in Figure 9.2 and 9.3 were the same for two selected subgroups. These two groups were comprised of those referred to HBR from RNSH and those from Greenwich Hospital. The sample of 25 patients from RNSH represents those who have been referred directly to home-based rehabilitation from an acute hospital bed. The other group consists of those patients referred after a period of inpatient rehabilitation at Greenwich Hospital as detailed in the flow diagram (Figure 9.1).

Figure 9.1 Schematic flow diagram of Greenwich vs RNSH patients



9.3 Results of HBR descriptive study

Patients were enrolled between the dates of 1 May 1997 and 13 April 1999. In total, 102 patients were transferred to HBR from Greenwich Hospital and Royal North Shore Hospital with 101 records retrieved for analysis. Four patients chose to withdraw from the HBR service. Three of these were readmitted to acute hospital care and one died prior to completion of HBR. There were a further six patients with incomplete functional data. This resulted in a final sample of 88 patients available for functional (FIM score) analysis. The mean age of all patients (n=101) was 76.8 years (SD 7.6). The mean age of females (n=25) was 77.6 years (SD 7.3) and the mean age of males (n=76) was 74.4 years (SD 7.8). The numbers of patients and their diagnoses are listed in Table 9.1.

Table 9.1 **Gender and diagnosis; n=101**

Gender	**Diagnosis**						**Total**
	Stroke	Fracture Neck of Femur	Other Ortho-paedic	Joint Replace-ment	Ampu-tation	Other Medical	
Male	4	7	1	2	6	5	25
Female	10	24	18	11	2	11	76
Total	14	31	19	13	8	16	101

The largest groups were women with fractured necks of femur, other orthopaedic conditions and joint replacement. A moderate number (n=14) of patients were referred for HBR with stroke. Overall 76 patients were admitted to HBR from Greenwich Hospital, 25 from RNSH.

Functional outcomes

The sample (n=88) with complete FIM scores was compared at the commencement and at the completion of rehabilitation using a paired t test.

The mean total FIM score at commencement of HBR was 108.7 (SD 10.3) and improved significantly by 9.4 FIM points to a mean total FIM score of 118.1 (SD 6.5) at completion of HBR ($p<0.001$, 95% CI 7.7 to 11.5). The mean total FIM motor score (sum of motor sub-units) at commencement of HBR was 75.1 (SD 9.8) and improved by 8.9 points to a final mean total FIM motor score of 84.0 (SD 5.8), which was statistically significant ($p<0.001$, 95% CI 7.2 to 11.0). The mean total cognitive score (sum of cognitive sub-units) at commencement was 33.6 (SD 2.2) and was significantly improved by 0.5 points from the mean total cognitive score of 34.1 (SD 1.9) at completion of HBR ($p=0.002$, 95% CI 0.2 to 0.8).

The mean FIM motor sub-unit scores all improved significantly ($p <0.05$), except for the sub-unit for "bladder management" (see Table 9.2). There were significant though modest changes in the cognitive sub-unit scores for memory ($p=0.028$) and social ($p=0.019$) scores from commencement to completion of rehabilitation.

Table 9.2 **Home-based rehabilitation FIM commencement to completion; n=88**

Item	Commencement Mean (SD)	Discharge Mean (SD)	Mean Difference	95% Confidence interval	p value
Eating	6.8 (0.6)	7.0 (0.2)	0.2	0.1 to 0.3	0.003
Grooming	6.6 (0.9)	7.0 (0.1)	0.4	0.2 to 0.5	<0.001
Bathing	5.2 (1.1)	6.2 (0.9)	1.0	0.7 to 1.3	<0.001
Dressing upper	6.2 (1.4)	6.7 (0.9)	0.5	0.2 to 0.7	0.002
Dressing lower	5.1 (1.5)	6.4 (1.0)	1.3	0.9 to 1.6	<0.001
Toileting	5.9 (1.2)	6.7 (0.5)	0.8	0.5 to 1.0	<0.001
Bladder Mgt	6.6 (0.9)	6.8 (0.5)	0.2	-0.1 to 0.4	0.073
Bowel Mgt	6.4 (0.5)	6.7 (0.4)	0.3	0.2 to 0.4	<0.001
Bed, chair w'chair transfer	5.9 (1.3)	6.8 (0.6)	0.9	0.6 to 1.1	<0.001
Toilet transfer	5.7 (1.0)	6.5 (0.6)	0.8	0.6 to 1.1	<0.001
Tub/shower transfer	5.5 (1.0)	6.1 (0.8)	0.6	0.4 to 0.9	<0.001
Walk/w'chair locomotion	5.6 (0.8)	6.0 (0.7)	0.4	0.2 to 0.6	<0.001
Stairs locomotion	3.5 (2.0)	5.3 (1.6)	1.8	1.4 to 2.2	<0.001
Comprehension	6.8 (0.4)	6.9 (0.3)	0.1	-0.1 to 0.2	0.208
Expression	6.9 (0.4)	7.0 (0.3)	0.1	-0.0 to 0.2	0.254
Social	6.8 (0.5)	6.7 (0.4)	-0.1	-0.2 to 0.0	0.019
Problem solving	6.6 (0.8)	6.7 (0.7)	0.1	-0.1 to 0.3	0.325
Memory	6.6 (0.7)	6.7 (0.6)	0.1	0.0 to 0.2	0.028
Cognitive score	33.6 (2.2)	34.1 (1.9)	0.5	0.2 to 0.8	0.002
Motor Score	75.1 (9.8)	84.0 (5.8)	8.9	7.2 to 11.0	<0.001
FIM total score	**108.7 (10.3)**	**118.2 (6.4)**	**9.4**	**7.7 to 11.5**	**<0.001**

The construct of the FIM is as an ordinal scale of 1 to 7 [136]. A score of 5 indicates supervision is needed for the task. A score above 5 indicates ability to perform without assistance from another person, although equipment may be required. Thus the sub-unit motor score improvements although significant were largely inconsequential to patient function unless the improvement was greater than or equal to 1.0 FIM point. There were three sub-units which demonstrated an improvement of 1.0 FIM point or greater. The first of these was "lower body dressing" which had a mean FIM score of 5.1 (SD 1.5) at commencement and 6.4 (SD 1.0) at completion of HBR. This was a significant improvement of 1.3 FIM points ($p<0.001$, 95% CI 0.9 to 1.6). The second was "bathing", which had a mean FIM score at commencement of 5.2 (SD 1.1) with a significant increase of mean FIM score of 1.0 point to a mean FIM score of 6.2 (SD 0.9) points at completion ($p<0.001$, 95% CI 0.7 to 1.3). The third and largest increase of 1.8 FIM points was for "stair locomotion". The mean FIM score at commencement of HBR was 3.5 (SD 2.0) with a significant increase to a mean score of 5.3 (SD 1.6) at completion ($p<0.001$, 95% CI 1.4 to 2.2).

The FIM totals data were also analysed using the non-parametric Mann-Whitney U Test, Wilcoxon Signed Ranks Test, and χ^2. The differences were found to be similar in terms of significance or otherwise for the FIM motor and FIM total scores. All results are reported using a t test.

The plotting of a graphical profile of the FIM is one way that has been recommended to understand the patterns of disability for patients in performing FIM items[137]. This technique is also used in quality management to assess complex range of indicators. It is similar in this respect to a balanced score card

or anthropometric profiles used in assessing sportsmen [138, 139]. Changes in "lower body dressing", "bathing" and "stair locomotion" are clearly identified on a graphical representation of the before and after FIM profiles in Figures 9.2 and 9.3.

Figure 9.2 **FIM profile - transfer to HBR; n=88**

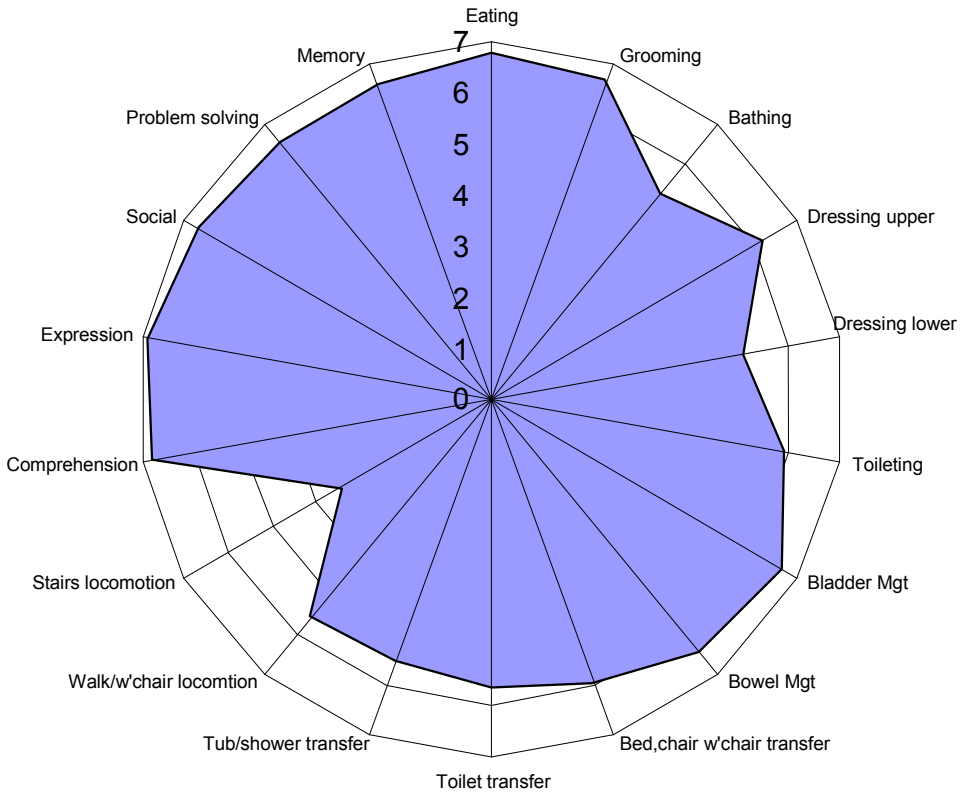
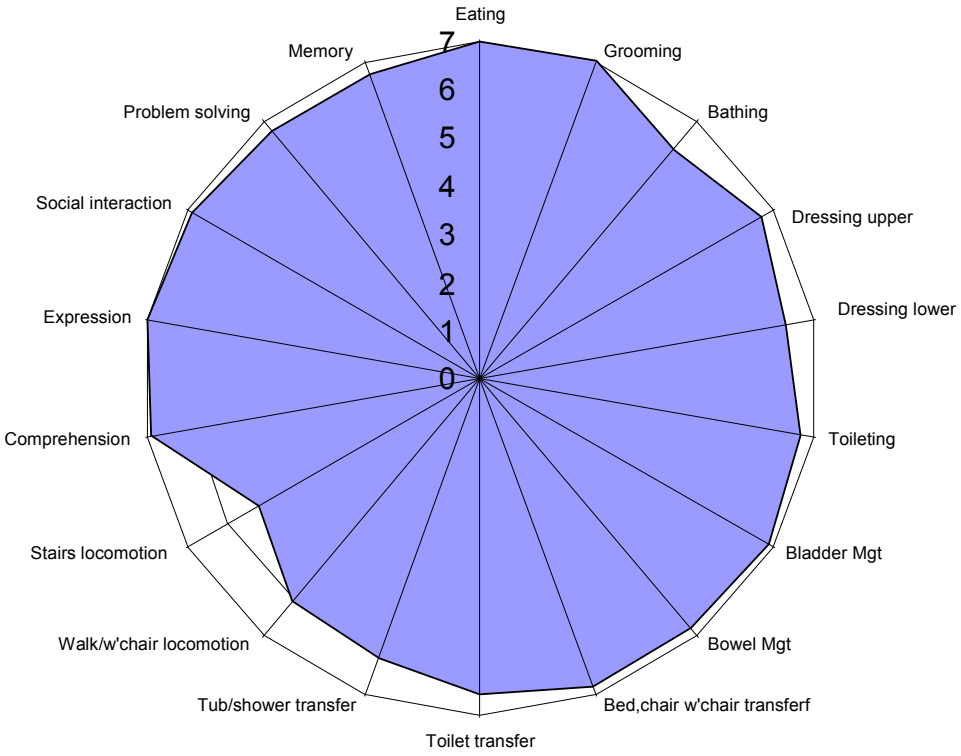


Figure 9.3 **FIM profile – Completion of HBR; n=88**



9.4 Results of Greenwich and RNSH sub-set analysis

The two HBR groups, Greenwich and RNSH, had similar mean age and sex distribution. The mean ages for these groups were 76.2 (SD8.6) and 78.2 (SD 9.2) respectively. There were 25% males participants in the Greenwich group and 36% in the RNSH group (see Table 9.3).

The FIM commencement score was 110.3 (SD 10.5) for the Greenwich sample and 104.4 (SD 8.4) for the RNSH sample, a significant difference of 5.9 points (p=0.014, 95% CI 1.2 to 10.5). This difference was explained by the total motor score, as there was no significant difference in the total cognitive scores for either group.

Table 9.3 **Summary of data for Greenwich and RNSH samples**

Item	Greenwich; n=63	RNSH; n=25
Age & Sex		
Males (Average age)	16 (73.9 SD 9.7)	9 (73.4 SD 8.5)
Females (Average age)	47 (79.4 SD 8.6)	16 (81.1 SD 8.5)
All (Average Age)	63 (78.2 SD 9.2)	25 (76.2 SD 8.6)
Functional Data		
Commencement FIM	110.3 (SD 10.5)*	104.4 (SD 8.4)*
Completion FIM	117.4 (SD 0.9)	120.3 (SD 4.4)
Length of HBR (days)	18.8 (SD 7.2)	18.2 (SD 6.4)
Diagnosis		
Stroke	11 (17%)	2 (8%)
Fracture Neck of Femur	20 (32%)	5 (20%)
Other/orthopaedic	12 (19%)	4 (16%)
Joint Replacement	7 (11%)	4 (16%)
Amputation	5 (8%)	0 (0%)
Other/Medical	8 (13%)	10 (40%)

*These values display a significant difference in means of 5.9 points (p=0.014, 95% CI 1.2 to 10.5).

The two groups showed similar FIM profiles at commencement with the three lowest scores in the motor sub-units of "bathing", "dressing lower body" and "stairs locomotion" evident in graphical profiles in Figures 9.4 and 9.5. The RNSH group was significantly lower for motor sub-units; "bed chair and wheelchair transfers" ($p<0.001$), "toilet transfers" ($p=0.001$) and "tub and shower transfers" ($p=0.011$). The score of 2.0 (SD1.6) for "stairs locomotion" in the RNSH group was significantly lower than the score of 4.0 (SD 1.8) in the Greenwich group ($p=<0.001$, 95% CI 1.2 to 2.9).

The mean length of stay on HBR for the Greenwich group was 18.8 days (SD 7.2), which was not significantly different from the RNSH group of 18.8 days (SD 7.2). At the completion of HBR there appeared to be a slightly better performance from the RNSH group with a Total FIM score of 120.3 (SD 4.4) when compared to the score of 117.3 (SD 6.8) in the Greenwich group which was not significant (Table 9.5). There were no significant differences in any of the FIM total scores or motor sub-unit scores between the Greenwich and RNSH groups at the completion of HBR. There were significant though small differences in the cognitive sub-units of "memory" ($p=0.048$) and "problem solving" ($p=0.040$). These are shown graphically in Figures 9.6 and 9.7.

Table 9.4 Comparison of Greenwich and RNSH, FIM scores pre-HBR

Item	Greenwich; n=63	RNSH; n=25	Mean Difference	95% Confidence Interval	p value
Eating	6.7 (0.7)	7.0 (0.2)	-0.3	-0.6 to 0.0	0.083
Grooming	6.6 (0.9)	6.7 (0.7)	-0.1	-0.5 to 0.3	0.766
Bathing	5.3 (1.2)	5.2 (1.0)	0.1	-0.5 to 0.6	0.843
Dressing upper	6.3 (1.4)	6.0 (1.2)	0.3	-0.3 to 0.9	0.348
Dressing lower	5.2 (1.7)	4.8 (0.9)	0.4	-0.3 to 1.1	0.269
Toileting	6.0 (1.3)	5.6 (0.9)	0.4	-0.1 to 0.9	0.129
Bladder Mgt	6.7 (0.7)	6.6 (1.2)	0.1	-0.3 to 0.5	0.745
Bowel Mgt	6.6 (0.6)	6.2 (0.4)	0.4	0.2 to 0.6	0.002
Bed, chair w'chair transfer	6.3 (1.2)	5.0 (0.8)	1.3	0.7 to 1.8	<0.001
Toilet transfer	5.9 (1.0)	5.1 (0.8)	0.8	0.3 to 1.2	0.001
Tub/shower transfer	5.6 (1.0)	5.0 (0.7)	0.6	0.1 to 1.1	0.011
Walk/w'chair locomotion	5.7 (0.8)	5.2 (0.9)	0.5	0.2 to 0.9	0.003
Stairs locomotion	4.0 (1.8)	2.0 (1.6)	2.0	1.2 to 2.9	<0.001
Comprehension	6.8 (0.4)	6.9 (0.3)	-0.1	-0.3 to 0.1	0.191
Expression	6.9 (0.4)	6.9 (0.3)	0.0	-0.2 to 0.1	0.726
Social interaction	6.8 (0.5)	6.7 (0.6)	0.1	-0.1 to 0.3	0.419
Problem solving	6.5 (0.9)	6.8 (0.5)	-0.3	-0.7 to 0.1	0.104
Memory	6.5 (0.8)	6.8 (0.5)	-0.3	-0.6 to 0.1	0.126
Total Motor	76.9 (10.0)	70.4 (7.7)	6.5	2.2 to 10.9	0.004
Total Cognitive	33.4 (2.3)	34.1 (2.0)	-0.7	-1.7 to 0.4	0.211
Total FIM	**110.3 (10.5)**	**104.4 (8.4)**	**5.9**	**1.2 to 10.6**	**0.014**

Figure 9.4 FIM profile - transfer to HBR (Greenwich patients); n=63

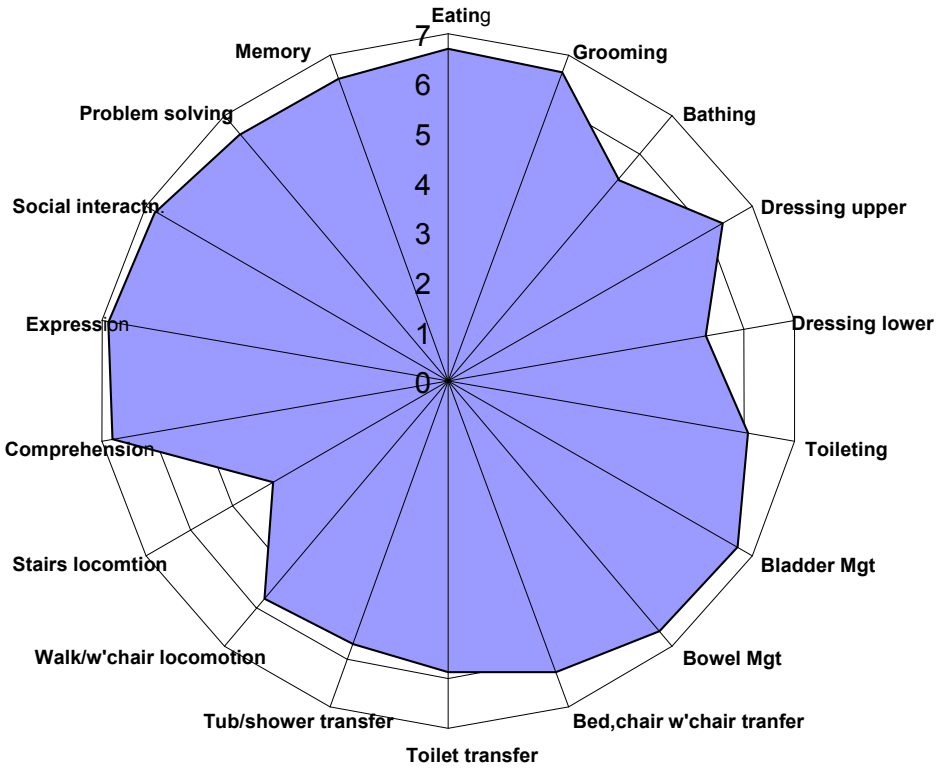


Figure 9.5 FIM profile - transfer to HBR (RNSH patients); n=25

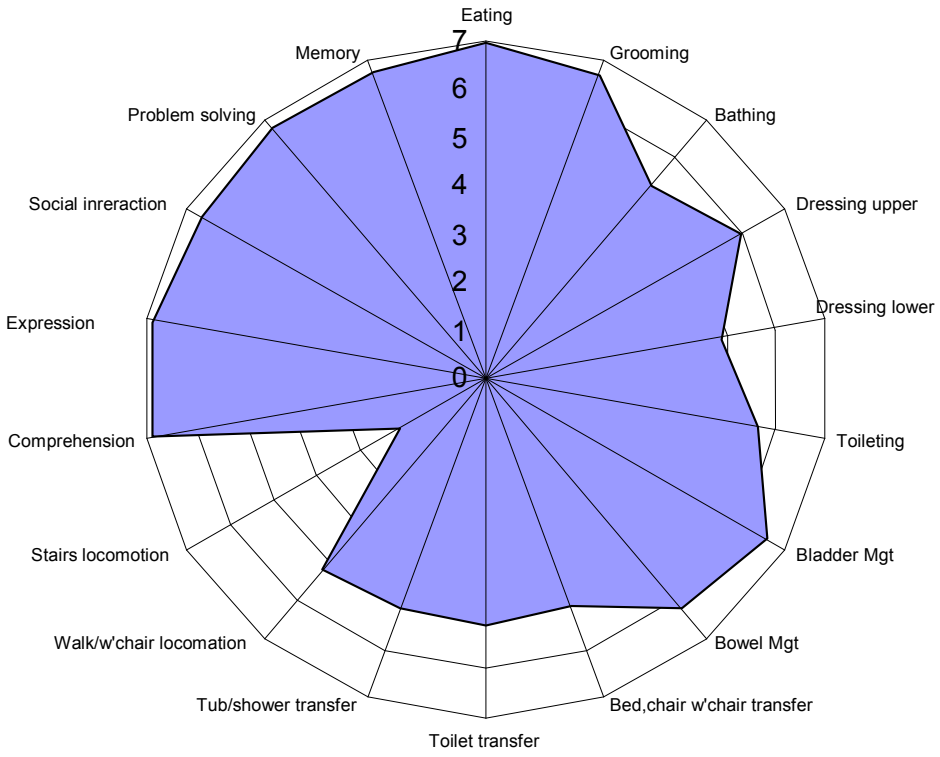


Table 9.5 **Comparison of Greenwich and RNSH, FIM scores on completion of HBR**

Item	Greenwich	RNSH	Mean Difference	95% Confidence Interval	p value
Eating	7.0 (0.2	7.0 (0.0)	0.0	-0.1 to 0.1	0.272
Grooming	7.0 (0.1)	7.0 (0.0)	0.0	-0.1 to 0.1	0.532
Bathing	6.1 (1.0)	6.4 (0.7)	-0.3	-0.7 to 0.1	0.186
Dressing upper	6.7 (1.0)	6.8 (0.5)	-0.1	-0.5 to 0.3	0.617
Dressing lower	6.4 (1.1)	6.4 (0.6)	0.0	-0.4 to 0.5	0.879
Toileting	6.7 (0.5)	6.6 (0.5)	0.1	-0.1 to 0.3	0.329
Bladder Mgt	6.8 (0.6)	7.0 (0.2)	-0.2	-0.4 to 0.1	0.147
Bowel Mgt	6.8 (0.4)	6.6 (0.5)	0.2	-0.1 to 0.3	0.189
Bed,chair w'chair transfer	6.8 (0.7)	6.8 (0.4)	0.0	-0.3 to 0.2	0.709
Toilet transfer	6.5 (0.6)	6.6 (0.5	-0.1	-0.4 to 0.1	0.182
Tub/shower transfer	6.0 (0.9)	6.4 (0.5)	-0.4	-0.8 to 0.0	0.028
Walk/w'chair locomotion	6.0 (0.7)	6.2 (0.4)	-0.2	-0.6 to 0.1	0.069
Stairs locomotion	5.0 (1.7)	5.9 (0.8)	-0.9	-1.6 to -0.2	0.017
Comprehension	6.9 (0.4)	6.9 (0.3)	0.0	-0.2 to 0.1	0.505
Expression	7.0 (0.3)	7.0 (0.2)	0.0	-0.1 to 0.1	0.902
Social interaction	6.9 (0.4)	6.8 (0.5)	0.1	-0.2 to 0.3	0.863
Problem solving	6.6 (0.8)	6.9 (0.4)	-0.3	-0.7 to 0.1	0.040
Memory	6.6 (0.7)	6.9 (0.4)	-0.3	-0.6 to -0.0	0.048
Total Motor	83.6 (6.2)	85.7 (3.4)	-2.1	-4.8 to 0.5	0.106
Total Cognitive	33.9 (1.9)	34.6 (1.6)	-0.7	-1.6 to 0.2	0.120
Total FIM	**117.4 (6.8)**	**120.3 (4.4)**	**-2.9**	**-5.8 to 0.1**	**0.058**

Figure 9.6 FIM profile -- Greenwich patients completing HBR; n=63

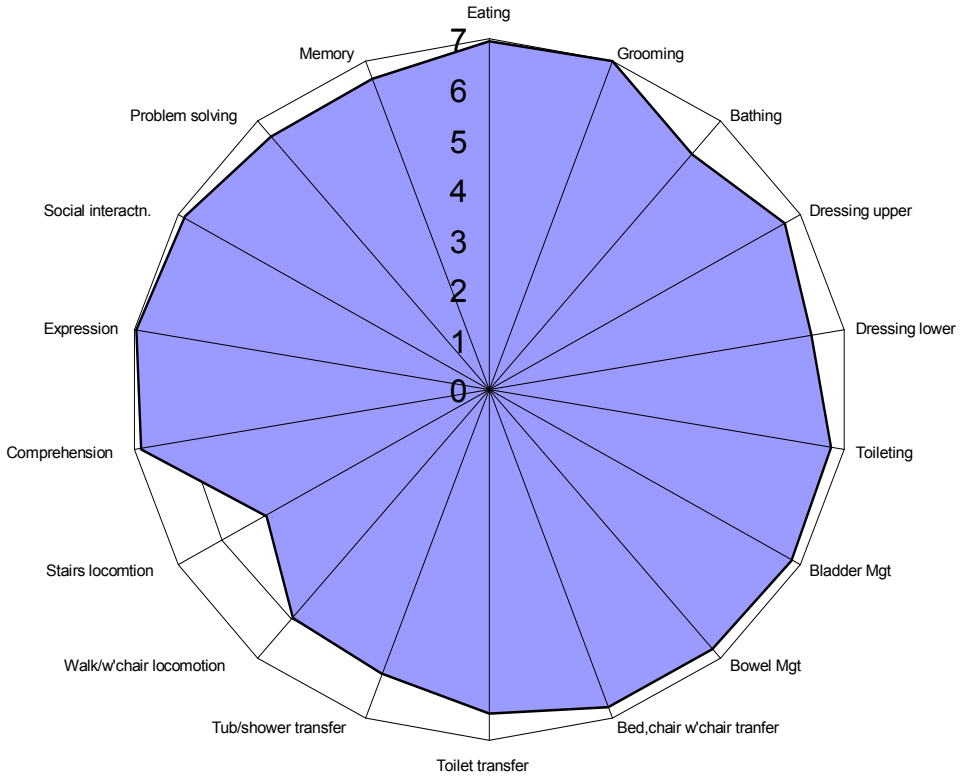
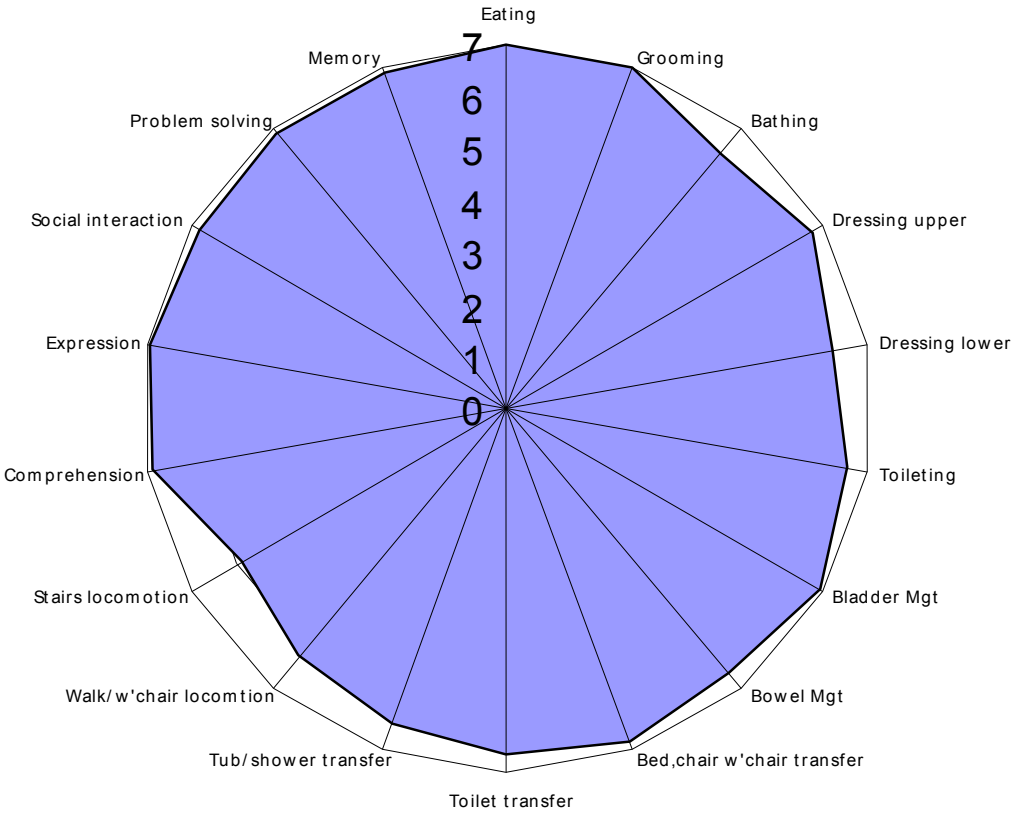


Figure 9.7 **FIM profile -- RNSH patients completing HBR; n=25**



9.5 Patient, GP and staff satisfaction qualitative survey

Between December 1997 and April 1999, 22 patients were interviewed by phone or home visit one to two months after completion of home-based rehabilitation. Patients were selected to represent all six designated impairment groups. Six patients had been transferred to HBR from RNSH and sixteen from Greenwich Hospital. Five patients (22%) were male and 17 (79%) were female. Two patients were unable to complete interviews due to cognitive or language difficulties.

Fifteen GPs were selected for interview, the conditions being current financial membership of the Northern Sydney Division of General Practice and participation in HBR. Two GPs had attended one patient each, whilst the remaining GPs had attended between two and five patients. Patients represented each of the six designated impairment groups.

Twenty staff at Greenwich Hospital and the HBR team were interviewed to ascertain their perceptions and experiences of the Home-Based Rehabilitation program. The role of staff not directly attached to the HBR team was to identify possible recruits via the regular team meetings. Medical and social work staff and the HBR Case Manager were directly involved in patient recruitment on a regular basis.

The semi-structured interview and details of responses are in Appendix 3. The results are summarised below in Table 9.6.

Table 9.6 Summary of survey data of patients (n=20), GPs (n=15) and staff (n=20)

Patient questions with positive reply		**Patient Questions with negative replies**	
Understood the concept	19	Did not understand the concept	1
Satisfactory experience of HBR	18	Unsatisfactory experience of HBR	2
GP visited as expected	16	GP did not visit as expected	4
Satisfaction with HBR team	20	Dissatisfied with HBR team	0
Patient positive comments		**Patient negative comments**	
Nurse case manager support for care Appropriate rehabilitation goals Comfort of home Restored social and family activities Reduction in stress to family and carers Control of own environment		Social isolation Complications may be overlooked Greater motivation in hospital	
GP question positive reply		**GP question negative reply**	
Satisfied with the service	14	Dissatisfied	1
GP positive comments		**GP negative comments**	
Specialist support Careful selection of patients Nurse case manager Early GP involvement Familiar environment for patient Decrease risk of patient "sick role" Reduced risk of complications Enhance confidence of patient		Ongoing education (positive or negative) Compliance with guidelines Twice weekly home visits Potential inappropriate patients	
Staff positive comments		**Staff negative comments**	
GP involvement GP accreditation with interest in rehab Appropriate patient goals Appropriate functional improvement Patient control Patient confidence Cost benefits		GP delay in hospital assessment Less allied health input Inappropriate patients Delays in assessment	

Note: the interview of patients and GPs contained several questions requiring a *yes* or *no* response.

9.6 Record of safety issues / adverse events

A continuous quality review process was put in place throughout the project to prevent recurrence of any adverse event that might have occurred during the course of the study. There was recording of safety issues under the titles of "clinical" and "process" adverse events. There were four clinical adverse events recorded between May 1997 and April 1999 as listed below:

1) One refracture, which was deemed to be due to the patient not complying with a prescribed exercise program (i.e. extending self beyond limits imposed by physiotherapist).
2) A myocardial infarction occurred following transfer direct from RNSH to HBR. The physiotherapy program had not yet commenced.
3) A hip replacement was required for a patient transferred to HBR following pin & plate for a fractured neck of femur. Failure of the surgical procedure led to patient being re-admitted to hospital for total hip replacement.
4) Exacerbation of infective discitis in a patient re-admitted to the acute hospital from HBR following increased pain.

There were twelve process adverse events and safety issues logged by the Case Manager during the course of the program as listed below:

1) Dissatisfaction with number of physiotherapy services - insufficient visits and no follow-up.
2) Suspension of previous Home and Community Care (HACC) services while patients was on HBR.

3) Palliative care services more appropriate for two patients initially assessed as suitable for HBR.
4) RNSH discharged patient without notifying HBR team, insufficient instruction given to patient and carer.
5) Home modification incorrectly installed and insufficient instruction given to patient.
6) Two incidents where carers were not notified of patients' transfer to HBR.
7) Delay in GPs visiting patients in hospital prior to transfer to HBR.
8) Some GPs unaware of the objectives of HBR – non-accredited GPs, GPs who are not members of the Division of GP.
9) Patient's carer with impaired cognitive function - difficulties in coping with caring role.
10) Delays in home-assessment by occupational therapists due mainly to lack of motor vehicles.
11) Inadequate bathroom facilities making maintenance of personal hygiene difficult.
12) Four patients withdrew from the program after being transferred to HBR. All four patients refused on-going care provided by rehabilitation team.

9.7 Discussion and conclusions

The analysis indicated that patients referred directly to HBR from an acute hospital had significantly lower FIM scores for transfers and stair-climbing abilities compared to the group referred to HBR from a rehabilitation hospital. Both groups showed deficits in bathing and lower body dressing. They both experienced a similar length of stay on HBR with equivalent functional

outcomes. These findings suggest that the observation of HBR as an "add on" to existing rehabilitation in the previous RCT may have also applied to those patients transferred from inpatient rehabilitation to HBR in this study. These patients may have already been suitable for discharge home, even in the absence of the HBR service.

This study has identified a group of patients with a defined profile who may be suitable for substitution of inpatient rehabilitation by direct referral from an acute hospital to HBR. Patients with this profile include those with difficulties in bathing, dressing the lower body, and stair locomotion. These difficulties do not hinder HBR. This is because care is provided within the home where dressing lower body, as far as putting on socks and laced shoes, and external stairs are not an issue. These patients are otherwise intact in motor and cognitive function. The availability of a daily visit by the nurse provides assistance with bathing. Problems with access to medical care or therapy are overcome by availability of GP and multidisciplinary team members visiting the patient's home.

The HBR service was very acceptable to most patients if sufficient support was available according to the satisfaction survey. Staff were also happy with the service, although they demonstrated some difficulties in restructuring work practices to community care instead of hospital care. Physiotherapists and occupational therapists were able to delegate routine physical therapy to the HBR nurse after assessment.

The adverse event profile is of some concern, although it appears that all but one of the four clinical events were unavoidable. The other three were not related to

the home environment. The number of process issues identified was mostly associated with the problems of a new system and changed work practices. They were of low severity and all could be rectified.

General practitioners were involved at each stage of the study. It appears that GPs set realistic inclusion criteria for patients but unrealistic goals for their own involvement. Unfortunately they were unable to deliver consistent hospital assessment of patients prior to discharge, or regular home visiting, and defaulted to phone and fax communication with the HBR nurse. This communication and the trust developed between the nurse/case manager and GP appeared satisfactory for service delivery. The nurse position was considered pivotal to the operation of the HBR service.

The principles of shared care have been demonstrated in this HBR model, with patients and carers participating in an active role with treatment. Nursing and allied health staff have shared the provision of physical therapy for HBR patients. General practitioners involved in this study have learnt the basic principles of rehabilitation with the support of a multidisciplinary team. This is a new concept for the rehabilitation team to incorporate the GP as an active member providing input to assessment in the acute, and to home treatment in the sub-acute phase of rehabilitation.