The disability status of injured patients measured by the functional independence measure (FIM) and their use of rehabilitation services

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The type and severity of disability following major trauma was evaluated using the Functional Independence Measurement (FIM) in 93 patients brought to the Royal London Hospital (RLH) by helicopter. The range of values for FIM is from 18 (dependent) to 126 (fully independent) in the six sections of self-care, sphincter control, mobility, locomotion, communication and social cognition. The sections are divided into 18 separate items and graded 1–7. Forty-eight patients were discharged directly to home with a median FIM score of 124; 11 were transferred to another acute hospital with a median FIM of 63 and seven went to rehabilitation unit with a median FIM of 58. At six months, 79 per cent of the patients reported no disability and 89 per cent of the original 93 patients were at home with a median FIM of 126. The mean amount of rehabilitation provided at the RLH for all patients was 11 h 20 min with a mean in-patient length of stay of 14 days. The actual and optimal amount of therapy for rehabilitation worked out at less than 1 h per day in the acute hospital. FIM is a useful, practical and simple methodology for recording disability in the acute hospital. It provides a measure for assessing the original disability, its progress and residual limitations. Nurses, doctors and therapists can use it for establishing care plans and goals as well as deciding the transfer of the patient to the most appropriate place for future care.

Introduction

The correct treatment of injured patients aims to reduce unnecessary mortality and to decrease the ensuing amount of disability. The quantification of mortality is simple but the measurement of disability is difficult. Trauma care is evaluated by the ensuing mortality and morbidity, using them as outcomes which then have a cost put on them. It therefore becomes essential to quantify disability, even though the measurement methods are difficult and controversial. In previous papers, the reasons were given for adopting the functional independence measures (FIM) originating from Buffalo, New York (Figure 1). FIM consists of 18 separate items and is divided into six sections: self-care, sphincter control, mobility (transfers), locomotion, communication and social cognition (including social integration, problem solving and memory). Each item is separately graded according to a 7-point scale, 1

![Functional Independence Measure (FIM)](image)

Figure 1. Functional independence measure. Copyright 1990 Research Foundation of the State University of New York.
was acceptable for a close relative or friend to answer on
were recorded. In addition they were asked whether they
injury and interviewed by the research occupational
services. If the patient had difficulty participating in an
would have liked more rehabilitation from any of the
in the patient's notes so that it was easily available to all
staff. The last in-hospital FIM was completed by the
research occupational therapist within 48 h of discharge or
transfer in consultation with a minimum of two other
professionals working closely with the patient. The
research occupational therapist was familiar with recording
all the scores thus ensuring consistency in approach and
accuracy in recording of information. Assessments were
based on observations made by staff over the past week as
to what the patient actually was able to do for himself;
rather than what he thought he could do.
The amount of rehabilitation provided to each patient in
the acute hospital by physiotherapy, occupational therapy,
dietetics and speech therapy was recorded by these
professionals for each patient and collated weekly. This
evaluation only recorded the quantity of rehabilitation
provided to the nearest half hour and not the nature of the
interventions because treatment techniques differ widely
between diagnoses.

Methodology
Only those injured patients who were brought directly
from the scene of an accident accompanied by a doctor
were included in this study. They were all brought by the
Helicopter Emergency Medical Service (HEMS) to the
Royal London Hospital and were followed using FIM in
the acute hospital stage and then subsequently at 3 and 6
months after the original injury. A total of 601 helicopter
missions over Greater London were completed during a
6-month period in 1992 resulting in 100 patients meeting
the entry criteria for the study. One patient stabilized at
the RLH and immediately transferred to a specialist burns
centre was excluded. A further six were lost to follow up,
all male and without head injuries; two of no fixed
abode, one was a Gypsy, one each went home to Ireland,
France and Cornwall with no forwarding address. Each
patient was assessed at 3 and 6 months after the date of
injury and interviewed by the research occupational
therapist, either face to face or by telephone. Whenever the
FIM form was completed, patient's use of rehabilitation
services, rehabilitation deficiencies and refusal of services
were recorded. In addition they were asked whether they
would have liked more rehabilitation from any of the
services. If the patient had difficulty participating in an
interview due to communication or cognitive difficulties, it
was acceptable for a close relative or friend to answer on
their behalf only if they had regularly been in contact with
the patient three times a week or more for a minimum total
of 12 h per week. The parents of children under 16 years
old were interviewed with the child present. Additionally
at the 3 month interview a pre-injury FIM was completed
to record any pre-injury disability or use of rehabilitation
services which then provided a baseline for monitoring
recovery in each patient.

Demographic data was collected for each patient including
cause of injury, length of stay, nature of injuries which were coded according to the International
Classification of Diseases (ICD 9), and operations by the latest Office of Population Censuses and Surveys coding
manual. Additionally the abbreviated injury scale (AIS) of each individual injury was recorded so that the injury
severity score (ISS) could be calculated. Patient's disability status and use of rehabilitation services were recorded (a)
during their RLH stay, (b) at 3 months and (c) at 6 months
after injury. In the acute hospital, FIM was recorded each
week and the results entered on to a cumulative FIM form
in the patient's notes so that it was easily available to all
staff. The last in-hospital FIM was completed by the
research occupational therapist within 48 h of discharge or
transfer in consultation with a minimum of two other
professionals working closely with the patient. The
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Results
Of the 93 patients in the study, 70 per cent were male and
30 per cent female with a mean age of 37.5 years and range
from 1–92. No one had a disability which limited their
activities nor received treatment from any of the rehabili-
tation services prior to their injuries. Blunt injuries greatly
outnumbered the penetrating injuries (11 per cent), which
were mainly due to stab wounds during assaults (Figure 2).
All the suicides and attempted suicides were caused by
jumping either from high buildings and bridges or under
trains. The overall mortality rate in hospital was 29 per
cent with a mean ISS score of 36 (range 21–75). No patients
died in the 6 month period after discharge and before the
final interview. The mean length of stay of patients from admission to discharge home (73 per cent of
patients) was 13.5 days (range 1–85 days). For patients
transferred to other acute hospitals, the mean was 34 days
(range 4–134 days) and for these transferred to a rehabili-
tation unit (10 per cent) 32 days (range 5–100 days). Of the
93 patients, 27 died in hospital, of whom 18 died on the
day of admission; 15 of these did not receive any
rehabilitation therapy.
A further 12 received no therapy because their injuries were relatively minor (ISS range 0-9). This left 66 patients for a detailed study with FIM.

**FIM on discharge from the RLH (Figure 3)**
The normal range of FIM measured numerically is from 18 (dependent) to 126 (fully independent). On leaving the RLH, the 48 patients (73 per cent) discharged directly to their homes had a median FIM score of 124 (range 85-126), and 11 patients transferred to another acute hospital had a median FIM score of 63 (range 22-126). Seven patients went directly to a rehabilitation unit with a median FIM score of 58 (range 48-122) and of these five had spinal injuries and two had head injuries. Three patients were transferred from the RLH to their local hospitals with FIM scores above 85 (the lowest FIM score of those discharged home). One patient had no family or friends who could supervise him in certain activities and therefore needed to achieve a higher level of independence before he could be discharged home. One was a 14-year-old child whose parents both worked and needed more time to organize themselves so that one parent could be at home with the child. The other patient was transferred to a prison hospital with facial injuries.

**FIM at 3 months after the original injury (Figure 3)**
At 3 months after injury, the percentage of patients at home had risen from 73 per cent to 80 per cent. The median FIM was 126 (range 102-126) for 53 patients at home, 94 (range 27-120) for the six in hospital and 115 (range 48-125) for the seven patients in a rehabilitation unit (Figure 3).

**FIM at 6 months after the original injury (Figure 3)**
By 6 months 89 per cent of the original 93 patients were at home. The 59 patients at home then had a median FIM of 126 (range 114-126), two in hospital had FIM scores of 22 and 71 and the five patients in rehabilitation units had a median score of 77 (range 48-126).

Both the bottom of the range FIM scores in hospital at 3 and 6 months after injury were for the same patient. This apparent increase in disability was due to secondary complications of infections and emboli following the original injury. Although the FIM scores appear low (27 and 22), the patient was not in a persistent vegetative state as described by the Glasgow Outcome Scale. The bottom of the range FIM scores in the rehabilitation units of 48 at both 3 and 6 months were due to the same tetraplegic patient who also suffered secondary complications which slowed recovery. At 6 months after injury, there were two in-patients who had FIM scores above the lowest discharge FIM score of 85. One patient was paraplegic and still in a rehabilitation unit because of the lack of wheelchair-adapted housing; the other had a head injury, but was still confused on occasions thus requiring further rehabilitation.

**Figure 4.** Disabilities at 3 and 6 months after the initial injury. Patients could report more than one specific disability.
Rehabilitation services in the acute hospital (RLH)

The mean amount of in-patient rehabilitation from all four services, occupational therapy, physiotherapy, dietician and speech therapy was 11 h 20 min, with a mean length of stay of 14 days (range 1–134), including those who died. Of the total amount of therapy given in the 6-month period (1109 h), physiotherapy comprised 79 per cent, dietician 10 per cent, occupational therapy 6 per cent and speech therapy 4 per cent. However, of the original 93 patients, 15 were too ill to have therapy before death (ISS range 21–75) and 12 patients did not require rehabilitation in hospital due to the minor nature of their injuries (ISS range 0–9). Excluding these 27 patients, the remaining 66 patients received a mean amount of rehabilitation of 10 h 13 min during a mean stay of 19 days. Whichever way the result is calculated, patients received just under 1 h of therapy per day.

Rehabilitation treatment time shortfall was estimated by the respective professional staff concerned and the mean for all patients was 53 min. Shortfall from the optimum was due to any one or combination of the following: inadequate resources, staff sickness, staff training and staff holidays with reduced cover. Excluding the 15 patients who died and the 12 who had minor injuries, the mean rehabilitation time shortage was 79 min. Rehabilitation shortages formed only 7.5 per cent of the perceived optimum amount of rehabilitation treatment time as judged by the rehabilitation professionals. Even with a generous assessment by the professionals of the shortfall in rehabilitation, the average amount of therapy per patient still remains below 1 h per day in the acute hospital.

Overall, the demand on rehabilitation services decreased during the 6 months following injury. The patients who needed the greatest amount of rehabilitation at 6 months were those with either head injuries (head AIS range 3–5) or spinal injuries requiring daily rehabilitation for at least 1 h from one or more rehabilitation services. At 3 months, 50 per cent of patients were back under general practitioner care, 30 per cent were attending out-patient clinics and 20 per cent were in-patients. By 6 months 39 per cent were attending out-patient clinics, and the number of in-patients had decreased to 11 per cent of those discharged home were attending out-patient clinics. However 8 per cent of patients were on one or more waiting lists for different types of rehabilitation at 3 months, and by 6 months this remained largely unchanged with 6 per cent of patients still on rehabilitation waiting lists. None of the patients refused rehabilitation during the 6 months following their injury but on the contrary some would have wanted more rehabilitation, if available, at 3 months (9 per cent) and at 6 months (2 per cent) after injury. The most common problems found within the 6-month follow-up period are shown in Figure 4 and of these, anxiety, depression and post-traumatic stress syndrome were not being medically treated. Only two patients had been prescribed medication and no one was counselling them.

Discussion

The management of trauma is complex and involves many disciplines. The phases of care are best divided into (a)
prevention, (b) pre-hospital and in-hospital life-saving treatment, and (c) rehabilitation. At the RLH, the HEMS was developed to combine medical expertise with the speed and efficiency of helicopter transport in the prehospital phase. But an equally important component of the care is the in-hospital multidisciplinary approach by the acute services both in the Emergency Room phase and with the multidisciplinary theatres, the ICU and the trauma unit. The fact that 27 of the 93 patients died in hospital, of whom 18 actually died on the day of admission, demonstrates how ill the majority of these patients were, with an overall mortality of 29 per cent.

The World Health Organization (WHO) provided definitions of impairment, disability and handicap in 1980s. In terms of trauma, the injury severity scores (AIS and ISS) could be used as a basis for measuring impairment defined as 'any loss or abnormality of psychological, physiological or anatomical structure of function' at the level of the organ. In simplistic terms the original injury is the impairment. Disability and handicap are terms often used interchangeably, but they should be viewed as quite separate entities. Handicap is more difficult to measure since it covers both the individual's adaptation to his environment and also society's inability to adapt to the individual, both locally and nationally. Consequently the practical result is that most people concentrate on disability rather than handicap measurement.

Disability, as defined by WHO¹, is based on observable behaviour and is any restriction or lack of ability to perform an activity within the range considered normal for a human being which incorporates the areas of personal self-care, household, community, work and leisure activities. The easiest of these to measure must be personal self-care including eating and dressing. These are two areas least affected by the environment and other people, and the first areas in which improved ability is seen after trauma.

Disability measurements are controversial and legion in number, but in a previous article the reasons for choosing FIM were described². In this study, FIM was found to be useful for measuring disability in trauma victims. All patients could be assessed regardless of diagnosis; it is repeatable in an acute hospital setting and at subsequent follow-up interviews in different environments. The average time taken to complete the form was 10 min for each patient, it was easily reproducible and found to be efficient. FIM was acceptable to the ill patients and did not interfere with treatment.

Other advantages of FIM which became clear during this study are that it:

1. helps to co-ordinate medical and therapy efforts;
2. establishes a method of monitoring progress;
3. offers a measurement against which goals can be established;
4. provides a basis for allocating resources for the different therapists;
5. aids the planning of discharge policies;
6. helps to identify potential rehabilitation problems;
7. facilitates the measurement and monitoring of disability specifically in the long-term head and spinal injury patients;
8. acts as a useful measurement of progress for the family and the patient himself.

It is suggested that the FIM is completed for all trauma patients as soon as possible after the original injury, repeated weekly during the acute hospital phase and that this form should form an integral part of the medical notes for all to use (Figure 6). If the results of FIM are kept in the patient's notes as a cumulative weekly form, it enables the doctors and nurses to use the same language in assessing progress and making care plans. The important goal of trauma care is to save lives and return the patient to his home and family with as little disability as possible. This process, in its essential components, can be easily followed using FIM, which gives a good measurement of disability against which rehabilitation effort can be matched. The essential question of whether more therapy produce less disability can only be answered when good measurement techniques exist.

References