**Patient experiences of rehabilitation following traumatic complex musculoskeletal injury**

**– A mixed methods pilot study.**

**Abstract**

*Introduction*

The aim of this pilot study was to measure patient reported outcomes and evaluate their rehabilitation experience following traumatic complex musculoskeletal injury (CMSK) injury.

*Methods*

A mixed methods prospective observational study was undertaken between December 2015 and March 2018 to explore patient reported outcomes following CMSK injury sustained as a result of major trauma; and perception of their rehabilitation and its impact on their recovery. The participants were asked to complete a series of outcome measures at 18-months post injury. The data was anonymised and analysed by the lead researcher.

*Results*

Thirty patients were recruited into the study (19 males, 11 females) between 23 and 76 years of age (median 52 years). Their injury profile was split between open fractures 30%, pelvic fractures 23%, multiple fractures 27% and polytrauma 20%. The majority (60%) reported moderate disability at 18-months post injury with 50% returning to full time employment. Patients with multiple or open fractures reported the worst outcomes. There was no relationship between frequency, quantity or duration of physiotherapy and outcome. However, 77% reported supplementing their NHS rehabilitation with other interventions such as gym membership, hydrotherapy and psychological therapies. The thematic analysis showed that patients considered intensity, quality and coordinated timely access to rehabilitation as the most important factors.

*Conclusion*

From a patient perspective, the current NHS rehabilitation provision does not appear to meet their complex needs. In addition to physical and vocational rehabilitation, patients wanted effective pain management and psychological support. Strengthening current therapy services and involving other sectors (e.g. Citizen’s Advice) could help achieve this. Early access to an intensive multidisciplinary rehabilitation programme was perceived to have positive benefits and improve outcomes.

**Keywords:** Musculoskeletal injury, major trauma, rehabilitation, functional outcome, health status

**Introduction**

Major trauma is a significant cause of death and disability particularly in the working population [1]. In England, 45000 people are affected by major trauma every year. The success of trauma systems and advances in medical management has improved the odds of survival by 19% [2]. Consequently, there has been a significant increase in years lived with disability [3] and a rise in the social and economic burden connected with musculoskeletal trauma [4]. In the UK the NHS spends £0.4 billion treating major trauma patients and this figure does not account for ongoing social, care and rehabilitation costs [5].

Patients who sustain complex musculoskeletal (CMSK) injury account for over half of hospital admissions following major trauma [6]. CMSK can be defined as multiple fractures, open fractures, high energy pelvic injuries and polytrauma with related orthopaedic injury. These injuries can cause considerable disability and suffering for patients with a lasting impact on their overall health and quality of life both mentally and physically [7].

Rehabilitation after traumatic injury is focussed on helping the individual regain optimum function and independence as quickly as possible. The improved survival rates have increased the need for effective rehabilitation. Experience from the military has shown excellent outcomes with investment in rehabilitation provision [8]. Evidence from international and UK clinical practice has shown that early, intensive rehabilitation significantly improves function, pain, quality of life and mental health outcomes [9, 10]. There is a strong scientific evidence base for many aspects of vocational rehabilitation and the cost-benefits for the individual and wider society [11].

Patients with neurological deficits following major trauma have access to specialised rehabilitation services funded by NHS England or Clinical Commissioning Groups (CCGs). The current pathway for CMSK trauma is to refer from the Major Trauma Centre (MTC) to outpatient or community therapy services local to the patient. This is usually a single discipline with patients often only able to access physiotherapy. Previous audit data has shown patients are seen for 20-30 minutes, fortnightly and some are limited to six sessions because of the service commissioned by some CCGs. Treatment can be disjointed with different injuries managed by different therapists and other healthcare practitioners due to expertise and funding arrangements. This can mean a patient with multiple injuries may have more than three appointments with different clinicians managing their injuries. This can lead to a lack of coordination and intensity in their rehabilitation and recovery [12, 13].

Several national reviews have acknowledged a system wide gap in the provision of major trauma rehabilitation [5, 14, 15]. Patients recovering from major trauma report dissatisfaction with their rehabilitation and ongoing care: *“I do feel as though may be some people might feel they are being neglected (…), they might feel as though they have sort of been put out to pasture"* [16]. These findings reflect the current evidence base which suggests a lack of provision in rehabilitation services and inequalities in access for this patient group. Inadequate rehabilitation results in higher complication rates [17] and poorer outcomes [5, 18], including delayed return to work and leisure activities [19].

When patients have been asked what they think is most important for their recovery, it is to be pain free, independent and to participate in society (physically and mentally) be it through relationships, work, education, and/or leisure activities. To determine patient outcomes in this study, these factors needed to be reflected in the measures chosen. The validated measures used cover the required domains and are well recognised in clinical studies. The European Quality of life questionnaire (EQ-5D) is a standardised tool for use as a measure of health outcome [20]. It covers five dimensions (mobility, self-care, usual activities, pain or discomfort and anxiety or depression) and identifies whether the patient has no problems, moderate problems or severe problems. The EQ Visual Analogue Scale (EQ VAS) is a self-rated state of health from 0 (worst health) to 100 (best health). The Short Musculoskeletal Function Assessment (SMFA) questionnaire asks how the individual is managing with their injury that week [21]. It contains a function index and bother index. The function index has four categories: daily activities, emotional status, arm and hand function, and mobility. Service users were involved in the design of the short questionnaire on type and intensity of rehabilitation. The questionnaire was used in a previous survey, feedback was received and amendments made to the form.

The aim of this study was to capture patient experience following traumatic CMSK injury:

1. To assess outcome through patient reported measures
2. To evaluate rehabilitation experience using a patient questionnaire

**Methods**

A mixed method prospective observational cohort study was undertaken between December 2015 and March 2018 to explore patient reported outcomes following traumatic CMSK injury and their rehabilitation experience. The recruitment period was prolonged due to maternity leave taken in 2017. The study was approved by the East of England (Cambridgeshire and Hertfordshire) Ethics Committee (IRAS 171268, REC 15/EE/0300). A purposive sample was used with a total of 30 patients recruited from one MTC over a 1-year period. 30 was a pragmatic target based on limited time and resource constraints. Potential participants were identified using an internal rehabilitation database. The inclusion criteria were adults (over 18 years of age) with CMSK injury as defined by their Injury Severity Score (ISS ≥ 9) and Rehabilitation Complexity Scale- extended trauma (RCS-ET ≥ 9) who were under the care of a Consultant Orthopaedic Surgeon at St. George’s Hospital London and 18-months following the date of injury. Patients with cognitive impairments, acute mental health diagnoses or those who were unable to read/write in English were excluded from the project.

As this was a pilot study, no power calculation was required. The lead researcher approached 50 potential participants. 30 were recruited into the study, 4 declined to participate and 16 verbally agreed but did not return the outcome measures. The outcome measures were collected at a single point in time so all 30 participants recruited completed the study.

Potential participants were sent by post or email a Patient Information Sheet to inform them of the purpose of the study and then telephoned by the lead researcher to see if they were willing to take part. Dependent on preference, the outcome measures were completed and collected from the participant at an orthopaedic clinic appointment or sent in the post as some patients were out of the MTC catchment area. The following outcome measures were used:

Primary measure

* EQ5D [20]

Secondary measures

* Employment or education status
* Visual analogue pain scale (0-10)
* Short musculoskeletal function assessment (SMFA) [21]
* Short questionnaire on type and intensity of rehabilitation
* Record of complications as documented in the patient’s orthopaedic clinic letters

Once the outcome measures were returned, the lead researcher anonymised the information and inputted the data onto a password protected database saved on a secure drive. For the data analysis descriptive statistics were used so no statistics package was required. Thematic analysis was used for the qualitative elements of the questionnaire [22]. No participants withdrew from the study but there were four incomplete datasets and this is reflected in the results.

**Results**

*Patient characteristics*

The median age of participants was 52 years with more men than women recruited. The majority were in fulltime employment or education before their injury occurred. The four who were not employed described themselves as retired (n=3) or a housewife (n=1). Road traffic collision was the primary mechanism of injury (*table 1*).

**Table 1 Patient characteristics**

**Gender**

Male 19

Female 11

**Median age** (range) 52 (23-76) years

**Mechanism of injury**

RTC 21

Fall 9

**Type of injury**

Open fracture 9

Pelvic fracture 7

Multiple fractures 8

Polytrauma 6

**Median ISS** (range) 13 (9-57)

**Median RCS-ET Admission** (range) 15 (9-24)

**Median RCS-ET Discharge** (range) 6 (4-11)

***Outcome Scores***

*Employment or education status*

At 18 months post injury, half of the patients (n=15) had returned to full time work. Two people were supported by employers to change their role with a reduction in manual labour: forklift truck driver to warehouse manager and mechanic to driver. The four people who were not employed pre injury reported their occupation as unchanged. One person gave no response.

Of those who had not returned to full time work (n=8) there was a mixed picture. Two people were on a staged return, two planned to return to work soon, one person remained on sick leave, and three had become unemployed with one person declared homeless. There was no relationship between age, gender, ISS, RCS-ET or complications and the person’s ability to return to work. However, there did appear to be a relationship with pain and type of injury. 26 participants completed the VAS for pain. Most people scored their pain as mild (n=14) to moderate (n=6). For those who had returned to work the median score = 1. In comparison, the people unable to return to work had a median score = 6. The participants with multiple and/or open fractures reported worse outcomes with 41% (n=7) unable to return to work compared to 8% (n=1) with polytrauma or pelvic injuries.

*EQ5D*

Patients consistently reported a moderate impact on mobility, activity, pain and anxiety regardless of their age, ISS, RCS-ET or type of injury. The only exception was self-care where the majority of patients reported no problems. However, the EQ-VAS identified some trends. Outcomes tended to be slightly worse in the older person. Those in their 40s reported significantly better health status than anyone else but the sample was very small (n=4). ISS and RCS-ET did not have any bearing whereas type of injury did. Patients with multiple fractures and open fractures reported worse health states than those with polytrauma or pelvic injuries. Those patients back in employment had significantly better scores than those who had not returned to work (EQ-VAS 74.4 vs 43.1). The main factors causing concern were mobility, activity and pain where the majority scored severe.

*SMFA*

To analyse the SMFA, patient scores are standardised against normative values for the general population. High scores indicate poor function (range 0-100). The majority of patients were worse than the general population across all categories except emotional status as demonstrated in *table 2*. Multiple fractures had the worst outcome in all categories related to the function index (FI) with a median score of 40. There was a trend towards older patients reporting worse outcomes for activities of daily living. There was no connection with age, gender, RCS-ET or ISS. In fact, patients with lower ISS scores (ISS=9) reported some of the worst outcomes. The bother index (BI) identifies how much patients are bothered by their functional problems. The results were worse for patients with multiple fractures and open fractures, with nine out of eleven people reporting an index score of ≥40. Participants who had returned to full time work scored better in all categories (FI = 18.6, BI = 27.2) than those who had been unable to return to work and/or become unemployed since the trauma (FI = 55.4, BI = 63.0).

**Table 2 Analysis of the Short Musculoskeletal Function Assessment**



**Key:**

ADL – activities of daily living

Emotion – emotional status

A/H – arm and hand function

Mobility – mobility status

Function – function index (calculation of combined responses to ADL, emotion, A/H and mobility)

Bother – bother index (calculation of ‘bother’ factors i.e. how much the injury bothers a person over a week period)

*Type & intensity of rehabilitation*

The majority of patients received physiotherapy (n=26) after discharge from hospital. The other disciplines were psychology (n=12), occupational therapy (n=8) and hydrotherapy (n=2). 23 patients (77%) supplemented their NHS provision with private services e.g. consultant appointments, MRI scan, physiotherapy, hydrotherapy, orthotics and podiatry; exercise e.g. gym membership, swimming, cycling, running and Pilates; and psychological support e.g. neuropsychology, CBT and meditation. In terms of frequency, length and duration of rehabilitation this predominantly referred to physiotherapy as the service most people had access to. The median frequency of treatment sessions was fortnightly with 30 minutes as the average length of session. The duration of rehabilitation was variable from <1month to >12 months. The group who felt they had ‘too little’ rehabilitation said a lack of therapy did affect their outcome. This included all the people who had been unable to return to work. However, it was unclear what quantifies ‘too little’ as there was no relationship between frequency, quantity or duration of physiotherapy and outcome.

The thematic analysis showed that patients considered intensity, quality and coordinated timely access to rehabilitation as the most important factors. Additional themes included lack of support after discharge from hospital, limited access to psychology and unclear prognosis/ timeframes for recovery. Several participants reported disappointment and frustration at their rehabilitation experience:

*“I needed physio, OT, counselling and personal trainer none of which I received through NHS. NHS saved my life then abandoned me once discharged from hospital.”*

*“I have had to fight for every scrap of rehab beyond the bare minimum and even finding rehab I could pay for has been a struggle. This has resulted in an extremely slow physical rehab and increased the strain on my mental wellbeing following the trauma.”*

*“When someone has suffered life changing injuries, it is unacceptable to expect them to independently manage their rehab with no support.”*

Three patients had access to an intensive 3-week multidisciplinary rehabilitation programme and felt they would not have made the same degree or speed of recovery without this intervention. The Trauma Network implemented this programme to improve rehabilitation for patients with polytrauma/ CMSK injuries following major trauma. However, current capacity is limited and CCG funding is approved on a case by case basis.

The questionnaire asked participants to comment on what additional support they would have liked to assist their recovery. The main areas identified were access to gym or exercise programmes, pain management, meeting people who have been through a similar trauma and psychological support. The 71 preferences highlighted by the 30 participants are summarised in *figure 1*.

**Figure 1 Participants’ views on additional support to assist recovery**

*Complications*

Seven patients experienced no complications during their recovery. The remaining 23 patients had a total of 29 complications documented *(table 3*). There was no correlation between patient characteristics in terms of age, gender or ISS and the incidence of complications. However, there was a link with injury type. The majority of patients with open fractures (8/9), multiple fractures (7/8) and polytrauma (5/6) experienced complications whereas pelvic injury was less common (3/7). The complications recorded for the open fracture group were all associated with limb reconstruction e.g. pin site infection, broken metalwork, grafts, and revision surgery. The patients with no complications all reported lower pain scores VAS =0-3 (median=1) compared to VAS =0-8 (median=3).

**Table 3 Types of complications**

Limb reconstruction 8

Peripheral nerve injury 5

Chronic pain 4

Delayed/non-union 4

Infection 3

Bowel problems 2

Other 4

Heterotrophic ossification, tinnitus, post traumatic lymphoedema, sexual dysfunction

**Discussion**

Despite the success of major trauma networks in improving patient survival, the evidence suggests that there is still substantial disability and suboptimal outcomes for patients who sustain CMSK injury. How this relates to the rehabilitation they receive merits further investigation and discussion.

The majority (60%) of participants in this study reported a moderate impact on quality of life at 18-months post injury. Their main concerns were restricted mobility and activity levels, pain and anxiety/depression. These results mirror the current evidence base which reports a moderate impact on quality of life and mood at 12-months and 18-months post traumatic injury [23-25]. In particular, the relationship between pain and depression/anxiety and the impact on recovery after orthopaedic trauma [26, 27]. Crichlow [28] found a 45% rate of depression in orthopaedic trauma patients. O’Donnell [29] suggested introducing PTSD/depression screening at 1-week and 3-months post injury to identify patients with increased risk of disability and to allow early intervention.

Those unable to return to work reported worse outcomes and health states. Only 50% of participants had returned to full time work by 18-months. This is similar to other studies which report rates of 64% at 12-months and 51% at 24-months post injury [30, 31]. There is no conclusion regarding prognostic factors for return to work following orthopaedic trauma [32]. However, there is some consensus that good pain management, early effective rehabilitation and psychological support will prevent long-term disability and help the individual return to work [4, 23, 33].

There was no correlation between ISS or RCS-ET and outcome, which suggests these tools are not predicative in this patient group. In fact, those with a low ISS (ISS =9) reported some of the worst outcomes. Type of injury appears to be a more useful predictive marker. Participants who sustained multiple fractures and/or complex open fractures reported worse outcomes than those with polytrauma or pelvic injuries. However, the literature suggests it is the person’s psychological and social characteristics and their comorbidities which help predict outcome rather than the injury itself [34, 35]. These factors were not explored in this study.

It is difficult to quantify the relationship between rehabilitation and patient reported outcomes. Subjectively, participants who felt they received ‘too little’ therapy felt this had a negative impact on their recovery. But both groups (‘too little’ and ‘about right’) reported similar frequency, length and duration of treatment sessions. What is clear is that NHS provision did not meet the patients’ perceived needs with 77% of participants supplementing their NHS treatment with other interventions. The participants views on additional support required to assist their recover – exercise/gym, pain management, psychological support – is also reflected in the evidence which promotes early physical, vocational and psychological rehabilitation including pain management [9, 23]. This additional support could be achieved through strengthening current community and outpatient therapy services and early involvement of organisations such as Citizen’s Advice, local leisure centres and peer support groups.

Three participants had access to an intensive multidisciplinary rehabilitation programme which the South West London & Surrey Trauma Network has implemented specifically for patients with polytrauma/ CMSK injuries. These participants felt the intensity and quality of their rehabilitation enabled them to achieve a better recovery, including earlier return to work and leisure activities. Although these findings reinforce the evidence already available [9, 10, 36] and existing models of good practice such as the military; this approach to CMSK rehabilitation is not common practice within the NHS. Most patients do not have access to this type of service. Consequently, this study recommends future research into this area of rehabilitation:

1. To compare conventional physiotherapy versus an intensive multidisciplinary rehabilitation programme and the patients’ experience and outcomes.
2. A cost-effectiveness analysis of an intensive multidisciplinary rehabilitation programme for CMSK patients.

This study clearly had its limitations. It was a single centre study with a small purposive sample size and there were four incomplete data sets for some of the outcome measures. The thematic analysis was completed by a single researcher with the risk of confirmation bias. Due to limited time and resources it was not possible to increase the recruitment number or expand beyond one MTC. It proved difficult to follow people up at 18-months as many had been discharged by their orthopaedic consultant. At this time point, people seem to be moving on with their lives and are perhaps less motivated to participate in a study at this stage of their recovery.

**Conclusion**

Patients who sustain CMSK injuries reported moderate disability at 18-months post injury, including delayed or inability to return to work. From a patient perspective, the current NHS rehabilitation provision does not appear to meet their complex needs. In addition to physical and vocational rehabilitation, patients wanted effective pain management and psychological support. Strengthening current community therapy services and involvement of organisations such as Citizen’s Advice could help achieve this. Early access to an intensive multidisciplinary rehabilitation programme was perceived to have positive benefits and better outcomes. However, this requires further investigation in comparison to conventional rehabilitation pathways and cost-effectiveness modelling.

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