

36378431

Request # 36378431**JUL 16, 2014****Email (PDF) To: ill@mccg.org**

Medical Center of Central Georgia
Health Resource Center Library
777 Hemlock St
MSC 147
Macon, GA 31208-6000

DOCLINE: Journal Copy

Title: Injury
Title Abbrev: Injury
Citation: 2012 Jul;43(7):1071-8. doi: 10.1016/j.injury.2012.01.027. Epub 2012 Feb 20
Article: A qualitative approach to recovery after open tibial fractur
Author: Trickett R;Mudge E;Price P;Pallister I
NLM Unique ID: 0226040 Verify: PubMed
PubMed UI: 22356720
ISSN: 0020-1383 (Print) 1879-0267 (Electronic)
Fill from: **Any format**
Publisher: Elsevier, Amsterdam :
Copyright: Copyright Compliance Guidelines
Authorization: Detra Walton
Need By: N/A
Maximum Cost: **Free**
Patron Name: Tracy Johns
Referral Reason: Not owned (title)
Library Groups: GaIN
Phone: 1.478.633-1232
Fax: 1.478.633-1998
Alt Delivery: Web(PDF)
Comments: **email to: ill@mccg.org**
Routing Reason: Received Jul 17, 2014 13:52 by GAULFC in Serial Routing - cell 2

This material may be protected by copyright law (TITLE 17,U.S. CODE)

Bill to: GAUMGA

Medical Center of Central Georgia
Health Resource Center Library
777 Hemlock St.
MSC 147
Macon, GA 31208-6000



A qualitative approach to recovery after open tibial fracture: The road to a novel, patient-derived recovery scale

R.W. Trickett^{a,*}, Elizabeth Mudge^b, Patricia Price^c, Ian Pallister^d

^a Department of Trauma and Orthopaedics, Abertawe Bro Morgannwg University Health Board, Morriston Hospital, Swansea, SA6 6NL, UK

^b Department of Dermatology and Wound Healing, Cardiff University School of Medicine, Heath Park, Cardiff, CF14 4XN, UK

^c School of Healthcare Studies, Cardiff University, Heath Park, Cardiff, CF14 4XN, UK

^d College of Medicine, Swansea University, Singleton Park, Swansea, SA2 8PP, UK

ARTICLE INFO

Article history:

Accepted 26 January 2012

Keywords:

Open tibial fracture
Outcome score
Qualitative
Recovery
Rehabilitation
Quality of life

ABSTRACT

Aim: The aim of this study was to describe how patients perceive their recovery following open tibial fractures using a qualitative approach.

Patients and methods: Following the appropriate ethical approval, adult patients with a diagnosis of open tibial fracture were recruited after completion of their surgical treatment and discharge from Morriston Hospital, a centre with orthopaedic surgical care. A purposive sampling method was employed to ensure that a range of injuries as well as clinical outcomes were included. All patients took part in an in-depth semi-structured interview, exploring aspects of their injury, treatment, rehabilitation and psychosocial and financial situations. Interviews were completed with two interviewers present and were recorded for verbatim transcription. Interview transcripts were analysed to identify items important to patients during their recovery.

Results: Nine patients with a mean injury to interview interval of 2.3 years were interviewed. A total of 538 items were identified and subsequently mapped onto 18 categories: pain; mobility; flexibility; temperature (effects on symptoms); fear; appearance; sleep; diet/weight; employment; social; finance; impact on others; self-care; recovery (patient perceptions of recovery); frustration; goal setting (by patients and health-care providers); and adaptation (both physical and mental).

Conclusion: There is a wide range of factors that our cohort found important during their recovery from open tibial fracture. Despite being considered as 'healed' by the medical staff, patients did not report a corresponding full recovery and return to pre-injury normality.

The categories identified will enable the development of a patient-reported recovery scale to be used in lower-limb trauma.

© 2012 Elsevier Ltd. All rights reserved.

Introduction

Tibial fractures represent a broad spectrum of injuries and are a significant burden on trauma services worldwide. Open injuries demand a careful and considered surgical approach, usually requiring the input of both orthopaedic and plastic surgical teams during multiple surgical procedures.¹ These injuries have greater potential for immediate and delayed complications and subsequent impact on quality of life.^{2,3} With the use of modern minimally invasive implant designs and microsurgical techniques, a greater proportion of severely injured lower limbs is salvageable.^{4–6} Consequently, the emphasis on measuring success of surgical treatment has shifted from salvage rate and minimisation of complications towards a more patient-focussed approach.

There is a paucity of descriptive studies concerning recovery following open tibial fracture,⁷ and our overall understanding of the lower-limb trauma patients' journey to recovery is limited in comparison to recovery in other patient groups, most notably the musculoskeletal oncology patient group. This group has been extensively investigated using qualitative methods^{8–10} and whilst there are marked similarities between the groups with regard to the surgical methods used in ablative and reconstructive surgery, the actual patient journey from injury/diagnosis through emergency and reconstructive treatment and then rehabilitation is very different. Despite this, methods of measuring outcome in musculoskeletal oncology patients have found their way into the trauma literature.¹¹

The Lower Extremity Assessment Project (LEAP) has noted that functional outcomes are generally poor in patients undergoing both amputation and salvage for severe lower-limb trauma, even over a long-term follow-up of 7 years.¹² The assessment of functional outcome is a complex process, a single component of

* Corresponding author. Tel.: +44 01792 703166.

E-mail address: ryan@trickett00.fsnet.co.uk (R.W. Trickett).

a vast array contributing to a patient's overall health, or absence of disability. The International Classification of Disabilities, Functioning and Health (ICF) of the World Health Organization (WHO) defines disability as an overall term describing negative aspects of four distinct patient-related components: body structures (discrete anatomical parts), body functions (including both physical, mental and sensory functions), activities (activities and tasks associated with daily living and self-care) and participation (social interaction and participation in the wider community).¹³ The restoration of normal bony and soft-tissue anatomy is a surgical goal, and the surrogate markers, used in both everyday clinical practice and much of the literature, are successful bony union with normal alignment and uneventful soft-tissue healing. Common functional outcome measures assess the body functions domain, but focus on the physical functioning: simple assessment of gait, range of movement, strength and balance are good examples. More in-depth region- or condition-specific assessments can also be used for particular injuries.^{14–17} Generic outcomes measures have been shown to be valid across multiple disease states and are useful for comparisons amongst populations.^{18–21} However, their use to measure outcomes and recovery following injury has been disputed²² and remains insufficiently responsive to monitor an individual's recovery.²³

The United States Food and Drug Administration has stated that in the development of novel patient-reported outcome measures, the item-generation stage should include input from the target population.²⁴ To facilitate this knowledge production, a qualitative approach should be used to explore patient perceptions in this field.²⁵ The use of qualitative research methods has recently been proposed to be a key component in the further development of trauma outcomes research.²⁶ An appreciation of outcomes important to patients and the involvement of patients during the knowledge production stages of a measurement tool is an essential but largely omitted stage in the development of many currently used outcome measures.²⁷

In reviewing the orthopaedic trauma literature, there are few studies using a qualitative approach to investigate recovery, although the methodology has been used to assess patients' experiences during the early postoperative stages following surgery for lower-limb fractures.²⁸ This study was an assessment of the experiences of nine patients following surgery for a lower-limb fracture in the setting of a district general hospital. Patients were invited to participate if they had undergone surgery for a lower-limb injury and were perceived preoperatively by the medical staff to have normal and complication-free expectations for recovery. The authors used a combination of patient diaries and a semi-structured interview to record these experiences, focussing on the acute phase of in-hospital recovery and the implications of the generated themes on practice on the trauma wards. The paper used a stress and coping model of recovery, grouping the themes into dealing with uncertainty (stressors), seeking control (appraising and coping) and subsequent return to normality (adaptation). These authors briefly describe fear in the 'dealing with uncertainty' phase. They state that the fear of incomplete recovery and permanent disability were inversely related to confidence levels and their mastery of crutches or walking aids. This confidence was in turn related to their subsequent fear of falling. Other patients reported fear of failure to return to work, recreation or future life plans. The fear factor was not explored further with regard to ultimate longer-term recovery.²⁸

A further study from Michigan used a similar qualitative approach and assessed patients with Gustilo–Anderson grade IIb and IIc tibial fractures at an average of 6.8 years post-injury. In this study, the authors identified that severe open tibial fractures had a

wide-ranging impact upon the patient's overall life, specifically physical functioning, pain, energy, work, family, body image, social life and the reaction of others to the injury.⁷

Whilst these studies have made a substantial contribution to the literature, helping us understand how patients experience their individual journey of recovery, qualitative methods can also be used as a knowledge-production step in the development of quantitative scales. For example, the Patient-Reported Impact of Scars Measure (PRISM) was developed using qualitative methods as the first step in scale development. The qualitative interviews provided source material to develop a patient-completed questionnaire.²⁹ This use of qualitative methodology is also evident in non-medical fields of scale development.³⁰

This study, by using a qualitative approach, aims to assess how patients perceive their recovery following open tibial fractures. The data will add to our knowledge and understanding of this process from the patient perspective, as well as providing a dataset from which to define a list of categories central to the future development of a novel, patient-derived recovery scale for use in lower-limb trauma.

Patients and methods

Following the appropriate local R&D and ethical approval from the South West Wales Research Ethics Committee, patients with open tibial fracture were recruited from the Open Lower Extremity Fracture (OLEF) database at Morriston Hospital, Swansea. The OLEF database records the demographic and operative details of all open lower-extremity fractures treated under the care of the orthopaedic and plastic surgical teams in Morriston Hospital. All patients were older than 16 years and able to provide informed written consent for participation. A purposive sampling methodology was used to ensure we sampled an appropriate range of injury severities and clinician-perceived clinical outcomes. All patients had been previously discharged from routine clinical follow-up. Patients were invited to participate by post and were provided with a standard information sheet detailing the aims of an overall project in assessing outcomes following severe lower-limb injury.

Once participation was agreed to, patients attended a follow-up appointment in a specific clinic set aside for the purpose of the study. All interviews were conducted in a private room within the Clinical Research Unit (CRU) on the grounds of Morriston Hospital. The CRU is a facility set aside for research purposes only, distinct from any clinical environments that the patients may have previously encountered. The patient interviews were conducted by two of the authors (RWT and EJM) – one with a background in trauma and orthopaedic surgery and the other with a background in qualitative research methods. The purpose of the interview was explained to the patients as being part of the process of understanding how patients recover following this type of injury.

Audiotaped interviews (of approximately 1-h duration) were conducted to explore the patients' personal perspective on their injury, treatment, rehabilitation and final outcomes. The use of open-ended questions and prompts, such as "Please tell us what happened to you" and "How did that make you feel?", allowed the patients to freely explore their story in their own words. An interview guide was developed to prompt the researchers to cover broad key topics, if these were not addressed by the patient – however, these prompts were rarely needed. Field notes were also taken whenever possible (e.g., on particular body language or obvious change in mood) to assist in the analysis stage. The interviews were ended once the patient confirmed that they had nothing additional to add. The audio

Table 1
Demographics, injury characteristics and surgical strategy in the interviewed sample.

ID	Gender	Age at injury (years)	Injury to interview interval (years)	Gustilo–Anderson grade	Definitive Fixation method	Soft tissue cover	Complications
1	Male	51.2	1.2	IIIb	IM ^b Nail	Fasciocutaneous flap	Delayed union
2	Male	49.4	2.4	IIIb	Circular external fixation	Local muscle flap and SSG ^a	Infected non-union treated with revision surgery and debridement
3	Male	29.7	2.7	I	Circular external fixation	Delayed primary closure	
4	Male	42.5	2.2	IIIb	Circular external fixation	SSG	Infected mal-union treated with debridement and revision circular external fixation
5	Female	29.9	2.7	IIIb	Circular external fixation	Local muscle flap	
6	Male	60.0	2.8	IIIb	IM Nail	Fasciocutaneous flap	Partial flap failure secondary to infection treated with SSG
7	Female	31.4	2.4	II	IM Nail	Fasciocutaneous flap	
8	Female	40.9	2.3	IIIa	Circular external fixation	Delayed primary closure	
9	Male	62.2	2.3	IIIb	N/A	Primary below knee amputation	

^a SSG – split skin graft.^b IM – intramedullary.

tapes were transcribed verbatim, and the content was confirmed by each of the patients.

Each member of the team studied the data independently and then as a group, developed and compared codes and reviewed the refined categories as data collection and analysis progressed using conventional content analysis, which is appropriate when existing theory on a phenomenon is limited.³¹ The decision was taken to interview one additional patient who had undergone an amputation, as the full range of clinical outcomes had not been represented in the initial purposive sample.

Results

A total of nine patients were interviewed, with both interviewers present for all interviews. There were six males and three females, with a mean age at injury of 44.1 years (29.7–62.2 years). All patients had been discharged from routine clinical follow-up and were considered to be 'clinically healed'. Patients were at least 15 months post-injury (mean injury to interview interval 2.3 years).

As the patients were purposively sampled, the group represented a broad range of injury of open tibial fractures from Gustilo–Anderson grade I to grade IIIb that had been stabilised using both extra-medullary and intramedullary devices.³² A spectrum of surgical outcomes was also ensured in the sample, including examples of recovery with good bony alignment and malunion, a variety of soft-tissue coverage procedures, including delayed primary closure (implying minimal soft-tissue damage and no donor-site morbidity), a variety of postoperative complications (infection, malunion and multiple revision surgeries) through to amputation (see Table 1).

The interviews explored the patients' recollections and perceptions of their experience throughout their surgical treatment and recovery, as well as their own feelings concerning the extent and fullness of their recovery. A total of 538 items were identified from the interviews, which largely took the form of direct patient quotes to maintain meaning and accuracy. The items were subsequently mapped onto 17 categories (examples given in Table 2). These categories were identified as pain; mobility; flexibility; temperature (effects on symptoms); fear; appearance; sleep; diet/weight; employment; social; finance; impact on others; self-care; recovery (patient perceptions of recovery); frustration; goal setting (by patients and health-care providers); and adaptation (both physical and mental).

Pain

Pain was the most common category identified, but it was expressed in a number of different ways. In the acute injury and perioperative phases, various descriptive words were used when referring to the pain:

"I used to say to her it's killing me" (Patient 2)

"... the pain was just absolutely horrendous, as I said it just felt like an explosion, a very hot feeling and I presume that was probably the blood seeping out." (Patient 8)

Those patients undergoing fine wire external fixation for their injury particularly emphasised this severe pain in the immediate postoperative period following frame application:

"Oh my God, well the nurse she just literally lifted my leg and twisted it and I sort of hit the ceiling then. But after that she sort of knew how painful it was." (Patient 8)

During the rehabilitation phase, patients gradually changed the description of the pain. 'Ache' was expressed as the description of the pain experienced in the later stages of recovery:

"Like a mild toothache, some days it's mild, some days it's dreadful" (Patient 4)

"No pain at all. You know you've broken it. It's... there's not a pain. It's, it's kind of like a tight feeling... I mean it's not a pain that I can't run; it's more like a bit of a dull ache afterwards." (Patient 5)

"... my leg starts to ache..." (Patient 7)

There was an observed transition from the initial pain following injury and surgery through to ache in the later stages.

Table 2
Examples of items and subsequent mapping onto categories.

Item	Category
"ache"	Pain
"constant... shooting"	Pain
"I'm frightened to do anything"	Fear
"have to watch where I walk"	Fear
"fear, more fear"	Fear
"ok... if it's nice and flat" [referring to walking ability]	Mobility
"can't get there quick enough"	Mobility
"I've put a lot of weight on"	Diet/weight
"£228 worse off"	Finance
"I'd never work again... working days are finished"	Employment
"wear tights all the time"	Appearance

"I just felt this explosion in my boot."

"...the pain was just absolutely horrendous."

"I took tramadol... because the pain... the pain there was awful, in my leg"

"I have a constant throbbing and ache." (All quotations from Patient 8)

The transition from experiencing 'pain' to 'ache' seemed to be a key stage in the patient's rehabilitation and often correlated with a return to work or an increase in general activity levels. For clarity, both 'pain' and 'ache' were placed in the pain category despite the fact that many patients clearly stated that the ache is not a pain. Many of the patients describing 'ache' in contrast to 'pain' differentiated between them by describing their use of analgesics. 'Pain' required the use of analgesia whilst 'ache' often did not:

"...like an ache, like toothache... not enough to need painkillers" (Patient 2)

One confounder of this observation was the apparent stoicism of the more elderly patients interviewed, many of whom denied the use of significant analgesia, even in the early stages of their recovery. Interestingly none of the patients interviewed were completely free of pain at all times.

Sleep

Pain had a considerable impact on patients' ability to sleep. This was observed to occur both acutely and in the longer term:

"...sleeping was a nightmare." (Patient 5)

"I couldn't sleep with it in the night because I had shooting pains from my toes, like from my ankle down to my toes and I just couldn't sleep with that then." (Patient 8)

Sleep was also inhibited by the presence of an external fixator device even when pain was not a specific issue:

"Sleeping in bed, it's awkward it is. Sleeping in bed is a bit of a problem." (Patient 2)

There also appeared to be a bi-directional relationship between pain and sleep in the patients interviewed. However, it did seem apparent that patients were less able to manage and cope with pain with less sleep.

Mobility

Mobility was also mentioned by all patients and seemed a key factor in their own perception of recovery. Patients described the progression from non-weight bearing through to full weight bearing with the support of walking aids and then unaided:

"My friend would push the wheelchair" (Patient 7)

"...here I am wheeling myself out on a Zimmer frame." (Patient 1)

"I can walk on this... I don't need the crutches all the time." (Patient 2)

Also emphasised by patients was the importance of being able to weight bear as marking their own perception of recovery. Four patients described the progression to being able to run as a core component of their improving mobility and a significant stepping stone to normality. Similarly, two patients described the inability to climb a ladder as a crucial aspect of their day-to-day mobility. The crucial step appeared to be a return to a defined pre-injury level of activity personal to each patient:

"I can't even run anymore" (Patient 1)

"[Have you recovered?] Yes it's over and done now. I can run." (Patient 2)

"I've got to sit on the floor. I can't climb the ladder." (Patient 4)

Flexibility

Flexibility was a component of the patients' description of mobility in addition to the ability to move oneself from one place to another:

"[The ankle] It takes a long time to warm up." (Patient 4)

"...the deciding factor... [that indicates recovery]... having a little bit, a lot more movement..." (Patient 6)

Temperature

Changes in temperature were described as having a profound effect on symptoms including pain and stiffness:

"I know it sounds a bit strange, but my leg aches in the cold weather, in the snow... In the summer it's fine but in the cold weather it takes a little bit of time to get going, it's a bit of a you know like a weakness and away I go like. It's not a potentially like I'm going to fall over sort of weakness it's just a sort of a little bit of a weakness... it's weird how cold weather affects it even though it's you know, fixed." (Patient 2)

"When it is cold and damp I can feel the pins that are in my leg." (Patient 4)

"I wear the leg warmer all the time because if my leg goes cold then it pains..." (Patient 7)

Fear

All patients described some aspect of fear during their recovery, regardless of initial injury circumstance, clinical course or adequacy of clinically perceived recovery. Fear was a prominent term used in all interviews and appeared to persist through to the final stages of recovery, even when patients had completed their treatment and rehabilitation:

"Fear. More fear I would say, that if I put my foot on the floor it was going to go" (Patient 2)

"Somebody might touch it" (Patient 8)

Overall, patients reported fear of many separate circumstances – of the initial injury, pain, complications, further surgery or further injury:

"[the initial injury]... pretty terrifying. But you didn't think of it at the time see you know...you didn't think of it at the time but after..." (Patient 9)

"[afraid of] falling over" (Patient 4)

"I'm frightened to do anything" (Patient 4)

Fear itself was described by one patient as an independent barrier to recovery:

"...fear is the main thing that stops you from doing stuff..." (Patient 2)

Fear also seemed to represent a barrier to mobility. Occasionally, this fear was sufficient to override pain as a cause of reduced or impaired mobility:

"[What limited your mobility initially was it the pain or something else?] Fear. More fear I would say, that if I put my foot

on the floor it was going to go. The pain wasn't really bad. I'm not a big bloke but these bars were really thin, so it was a bit like if I step awkwardly now it's going to go, tweak, and twist and tear the bone and then I realised how strong this cage is. (Patient 2)

However, the subsequent absence of fear appeared to be an important step in the patients' perception of their own recovery:

"... because there was no fear I just got on with cross training. I would do half an hour every day." (Patient 2)

Appearance

Appearance and cosmesis of the affected limbs were raised by many patients, both male and female, as something which they considered important during their recovery. All patients had undergone some soft-tissue plastic surgical procedure, but none had pursued subsequent cosmetic surgery to alter the appearance of their injured leg:

"Well, I wouldn't wear shorts. I wouldn't, I know I'd die if I had to go in my shorts to a party or a do." (Patient 4)

"I don't like to go out in shorts or anything like that anymore." (Patient 5)

"[Would you consider wearing shorts or a skirt?] No. In the house yes, but not out." (Patient 7)

"Oh yeah, I've always got it covered it up." (Patient 9)

Interestingly, whilst the appearance of the leg was clearly important, it was sometimes the fact that the appearance prompted curiosity and questions from others, rather than embarrassment of exposing the injured limb:

"The appearance doesn't bother me because I'm 63 and I am lucky that I have got my leg, so I am quite happy about that. But when you see other people looking and they say what's happened and you tell them and you know. But if I had a stocking on and you couldn't see the scar then I'd just say I've pulled a muscle. It's simple and that's that, that's what I do." (Patient 4)

Employment and finance

The inability to work had implications for many of the non-retired patients, with consequent financial implications. However, in many patients there was often a desire to return to work as soon as possible – both as a distraction during the day and as a signal of the gradual return to normality:

"... so I was motivated to get back to work because I wasn't getting paid." (Patient 2)

"I claim £85 a week for disability. But I'm about £228 a week worse off than if I had been working, you know. We are financially alright so I don't worry about the money, no, we don't have to scrimp and save or be penny pinching." (Patient 4)

One patient was unable to return to his previous occupation as a result of his injury but had managed to adapt and alter his hours and duties so he could remain involved:

"Whereas now, I just do show week, which is just front of house where I am able to sit down and do things from there whereas before I would have been working at three or four different societies." (Patient 3)

Recovery, goal setting, frustration and adaptation

We reviewed whether the patients' own perception of their progress and recovery could be aligned with the clinical assessments of the same. If this topic was not covered by the patient's own story, then they were asked how well they felt they had recovered. Some patients deferred the decision regarding recovery to their surgeon, stating that they felt recovered once the surgical team had confirmed satisfactory bony consolidation and soft-tissue healing. It is possible that this process was an act of seeking approval from an expert rather than a true abdication of responsibility:

"[with regards to completeness of recovery] when they signed me off and said that's it" (Patient 8)

This apparent deferral of responsibility was mirrored in the desire of patients to be set (and achieve) goals throughout their recovery. Often, these goals were set by supervising health-care professionals, but in many instances the goals were set by the patients themselves. These small steps were seen as important landmarks, indicating progress towards normality and in turn independent markers of recovery:

"... get out of the car..." (Patient 1)

"... making a cup of tea..." (Patient 2)

"... the goal was to get to the pub, actually to get a glass from the bar to the table" (Patient 3)

Often, it seemed to be the achievement of pre-set goals usually supervised by the physiotherapist, rather than the actual ability to perform a task that indicated success and progress:

"... felt it was over... have no plaster and I had to go to physio here, I had the water physio was it and that was that then, she was happy with me then." (Patient 7)

"You know like, you could see that you are going well like, you know, getting stronger. It won't be long you know they tell [physio] me." (Patient 9)

However, the failure to or delay in achieving these goals was seen as a cause of frustration and potentially impairing a patient's progress to recovery:

"It frustrates me because I think, it's something I want but I can't, you know." (Patient 3)

"But the frustrating thing was the time that it took." (Patient 1)

Other patients defined a specific moment that signalled their 'full recovery' rather than just a progression towards recovery; these were usually activities associated with returning to work or a particular activity important to the patient:

"Once I could work I was a lot better" (Patient 2)

"[Regarding full recovery] I suppose when I was running again" (Patient 5)

Understandably, patients also reported the importance of absence of pain and improving mobility as factors in their own recovery. However, these did not universally seem to be the determining factors in their ultimate perception of recovery:

"[Most important factor in full recovery] Work. Yes." (Patient 2)

"Without pain... I'd be happy [feel recovered]" (Patient 4)

Undoubtedly, recovery was accompanied by considerable changes, adaptation and coping strategies which were implemented both by the patient and those around him/her. These were

described as adaptations to overcome persistent limitations imposed by the injury:

"I know that you know that it's a case of I know that if I kneel down I'm going to be in pain so I don't kneel down, but since I've been back now I adapt, I've adapted. I paint skirting boards upside down now." (Patient 1)

These limitations could be perceived as permanent or temporary (such as clothing and footwear) modifications whilst being treated in an external fixator or a limited period of complete non-weight bearing in a wheelchair:

"I learned to adapt it's like I had a pair of leggings made that were sort of Velcro on the side and things like that, wearing clothes wasn't a problem." (Patient 5)

"I had a wheelchair and I used to Hoover because I didn't want it to get in the way of my life. Even to light the cooker I'd get down on a bean bag, light the cooker and then push myself back up on to my wheelchair." (Patient 7)

Physical adaptations were accompanied by coping strategies extending into other aspects of the patients' day-to-day life. This included their use of alcohol on a regular basis. Alcohol was a method of coping with the circumstances surrounding the injury, the physical symptom of pain or the broader negative effects of having a severe lower-limb injury:

"Every Friday we go out to the bowling club, my wife's secretary of the bowling club and I go with her and I have two units, two pints and a whisky, three or six units or whatever and I don't take the pills because I'll be well, you know..." (Patient 4)

Alcohol was also viewed in a negative regard and its influence avoided during recovery. However, in one incidence of this the patient reported that an altered diet had become a surrogate coping strategy:

"...so I stayed off the alcohol as well, I just cut straight off, but I still put on 2 stone, what's the score there you know. Ah all these sweets!" (Patient 2)

Whilst the development of these coping strategies had become part of the patients' "normality" they had developed following and as a result of the injuries and the resultant limitations that were imposed.

"...it stiffens up but that is normal, that I'm stiff" (Patient 6)

"I can't run... [Are you back to normal?] Oh yes" (Patient 7)

"Can't walk long distances... C'est la vie." (Patient 8)

"2 years down the line I do think that's it, it won't get any better... as long as it doesn't get worse... cope with it" (Patient 8)

There certainly appeared to be a discrepancy between normality, recovery and pre-injury functioning.

Impact on others and social

Finally, the impact of the injury on others was recognised by patients as being important. This reflected both the positive role that family had during recovery as well as the more direct implications on others from having a severely injured family member. In many instances, close family members were required in the early stages to provide physical assistance with day-to-day activities such as washing, cooking and cleaning. The input from family members and close friends could be viewed as both positive and negative:

"My wife would phone me and she'd say where are you? I said I'm on the bus to town. What? You've got a broken leg. Yes, yes I'll be

fine don't worry about it... But it was my drive to be independent again like." (Patient 2)

"...between the two of us it was getting to her if you know what I mean, but we've sorted that out now. [It's not easy?] No, for her and that's why we go away and take her on holiday more than anything for her benefit rather than mine, but we got over that because it was getting to her and I couldn't see it, but I did in the end, alright we are fine now." (Patient 4)

The impact on others was also reflected in the alterations to patients' social interactions and leisure time. Initially, the injury limited previously normal social interactions, such as visiting friends or going to the pub. However, as the patients recovered, regaining the physical ability and in some instances overcoming fear of crowded situations, they resumed their previous activities:

"...they put me in a taxi, a disabled taxi, got me up to the pub where she was landlady, sat me by the bar like this and of course there were crowds of party people banging me, doing this, banging and I thought what's the point. So I don't go to crowded public places if you like." (Patient 1)

"...I probably didn't go to the pub for about 4 months." (Patient 3)
"It wasn't so much the pub it is more the social life that is associated with it." (Wife of Patient 3)

Discussion

The topics of pain and mobility were central to all of the interviewed patients' descriptions of their recovery. This is in keeping with our experiences from managing these patients as well as the published literature.^{7,12,23,28,33–37} In some of our patients, the experience of pain and methods to alleviate pain became the focus of day-to-day life, particularly in the early treatment and rehabilitation phases. This is in line with findings from a similar study in North America.⁷ The symptom of pain impacts significantly on the other categories identified from these interviews and must be considered a core area during the patients' recovery.

In addition to pain, mobility is also a crucial factor during recovery. It was sometimes difficult during the interviews to determine whether a patient's mobility was impaired secondary to pain, stiffness or some other reason. For some, this reason was fear. Whilst it is difficult to determine exactly what the fear was directed towards, it is likely that the sensitisation to the pain experienced around the time of the injury and the original surgery strongly influenced the feeling of fear in the later stages of recovery.

Fear as a feature of recovery following injury has been described before in a similar population. Griffiths and Jordan describe fear of failure to recover fully and permanent disability as a factor during the early stages of recovery in their qualitative study.²⁸ Interestingly, they note that this fear seemed to be inversely proportional to an individual patient's mastery of walking aids, particularly crutches. In our study, we have observed a similar effect, with fear limiting mobility in patients, even once the pain and stiffness had started to resolve. However, Griffiths and Jordan excluded patients whom they felt were at risk of a complicated postoperative course or unlikely to achieve full recovery – implying that the patients interviewed had simple fractures – the exact opposite of our cohort of patients. Thus, the apparent importance of fear during recovery to many of our patients could be explained by the greater risks and uncertain prognosis associated with the injuries encountered.

In addition, the emergence of 'ache' as a separately used term to describe pain suggests that the nature of patient's pain changes during recovery. It is clear from analysing the interviews that the

patients progressed from 'pain' in the early stages to 'ache' in the later stages of recovery. In many cases, the transition from pain to ache correlated with an increase in activity or weight-bearing ability, return to work or other milestone during the recovery.

Few of the patients interviewed felt that they had returned to their pre-injury status. Whilst this is expected, as these injuries leave unavoidable physical scarring and are also likely to impact on mental health,³⁸ some patients also reported that they felt 'normal' again. This paradox may well be a result of a recalibration of the individual's own gauge of functioning and health. This effect has also been reported in oncological patients represented by the normalisation of ongoing symptoms and acceptance of ongoing restrictions.^{39,40} It is feasible that a similar effect occurs during the recovery of lower-limb trauma patients. As suggested by Shauer et al.,⁷ this may be responsible for the high satisfaction levels seen in these patients at late follow-up despite relatively poor measured functional outcomes.

The time point of acceptance of limitations may be important in determining how and when the patients themselves consider their recovery to be complete and could be used as an independent marker of recovery.

Conclusion

This qualitative approach to recovery following open tibial fractures has highlighted key areas that patients perceive as being important. Clearly, pain and mobility are central factors and maximising outcome in these areas are principal goals of fracture surgery. A generalised state of fear concerning the injured limb was also noticed, and it is likely that this fear could be directly targeted by allied health-care professionals as part of the rehabilitation process. It may be possible to use the absence of fear and the transition of pain to ache as important markers in the recovery process.

Perhaps most importantly, this study has highlighted that patients do not necessarily recover at the same point as clinicians think they do. There is a marked discrepancy amongst healing, recovery and normality:

"I thought that when it healed it would be back to normal."
(Patient 8)

This will consequently have an impact on these patients' reported functional outcomes, particularly as patients may never return to their pre-injury level of functioning.

The items and categories generated from our interviews reflect our patients' experiences during the recovery from their open tibial fractures. One of the core principles of qualitative research is that it is the investigations into an individual's experience and thus can only be applied to the population with caution. By using purposive sampling to ensure a range of injuries, clinical course and outcome, we have aimed to ensure that the experiences of these nine individuals in some way represent the experiences of the majority patients following open tibial fracture and possibly severe lower-limb injuries. This process provides face validity to the results gained and conclusions made.⁴¹

We feel that this qualitative investigation has determined the factors that patients view as important during their recovery. The development of a novel patient-centred recovery scale for use in severe lower-limb trauma is currently underway and we feel that these data will add to the robustness of this process.

Conflict of interest

The authors have no conflicts of interest to disclose concerning this study.

Role of funding source

This study (Project No. S-10-75T) was supported by the AO Foundation.

This study was supported by AO UK.

Support received was financial, and no input into the study design or results was sought or received.

References

- Nanchahal J, Nayagam D, Khan U, Moran C, Barrett S, Sanderson F, et al. *Standards for the management of open fractures of the lower limb*. London: RSM Press; 2009.
- Giannoudis PV, Nicolopoulos C, Dinopoulos H, Ng A, Adedapo S, Kind P. The impact of lower leg compartment syndrome on health related quality of life. *Injury* 2002;33:117–21.
- Giannoudis PV, Harwood PJ, Kontakis G, Allami M, Macdonald D, Kay SP, et al. Long-term quality of life in trauma patients following the full spectrum of tibial injury (fasciotomy, closed fracture, grade IIIB/IIIC open fracture and amputation). *Injury* 2009;40:213–9.
- Bosse MJ, MacKenzie EJ, Kellam JF, Burgess AR, Webb LX, Swiontkowski MF, et al. An analysis of outcomes of reconstruction or amputation after leg-threatening injuries. *N Engl J Med* 2002;347:1924–31.
- Gopal S, Majumder S, Batchelor AG, Knight SL, De Boer P, Smith RM. Fix and flap: the radical orthopaedic and plastic treatment of severe open fractures of the tibia. *J Bone Joint Surg Br* 2000;82:959–66.
- Gopal S, Giannoudis PV, Murray A, Matthews SJ, Smith RM. The functional outcome of severe, open tibial fractures managed with early fixation and flap coverage. *J Bone Joint Surg Br* 2004;86:861–7.
- Shauer MS, Aravind MS, Chung K. A qualitative study of recovery from type III-B and III-C tibial fractures. *Ann Plast Surg* 2011;66:73–9.
- Winterling J, Sidenvall B, Glimelius B, Nordin K. Expectations for the recovery period after cancer treatment – a qualitative study. *Eur J Cancer Care (Engl)* 2009;18:585–93.
- Taylor C, Richardson A, Cowley S. Restoring embodied control following surgical treatment for colorectal cancer: a longitudinal qualitative study. *Int J Nurs Stud* 2010;47:946–56.
- Gerber LH, Hoffman K, Chaudhry U, Augustine E, Parks R, Bernad M, et al. Functional outcomes and life satisfaction in long-term survivors of pediatric sarcomas. *Arch Phys Med Rehabil* 2006;87:1611–7.
- Naique SB, Pearce M, Nanchahal J. Management of severe open tibial fractures: the need for combined orthopaedic and plastic surgical treatment in specialist centres. *J Bone Joint Surg Br* 2006;88:351–7.
- MacKenzie EJ, Bosse MJ, Pollak AN, Webb LX, Swiontkowski MF, Kellam JF, et al. Long-term persistence of disability following severe lower-limb trauma. Results of a seven-year follow-up. *J Bone Joint Surg Am* 2005;87:1801–9.
- WHO. *Classification of functioning, disabilities and health (ICF)*. Geneva: World Health Organization; 2001.
- Irrgang JJ, Snyder-Mackler L, Wainner RS, Fu FH, Harner CD. Development of a patient-reported measure of function of the knee. *J Bone Joint Surg Am* 1998;80:1132–45.
- Irrgang JJ, Anderson AF, Boland AL, Harner CD, Kurosaka M, Neyret P, et al. Development and validation of the international knee documentation committee subjective knee form. *Am J Sports Med* 2001;29:600–13.
- Johanson NA, Liang MH, Daltroy L, Rudicel S, Richmond J. American Academy of Orthopaedic Surgeons lower limb outcomes assessment instruments. Reliability, validity, and sensitivity to change. *J Bone Joint Surg Am* 2004;86-A:902–9.
- Majeed SA. Grading the outcome of pelvic fractures. *J Bone Joint Surg Br* 1989;71:304–6.
- Dagum AB, Best AK, Schemitsch EH, Mahoney JL, Mahomed MN, Blight KR. Salvage after severe lower-extremity trauma: are the outcomes worth the means? *Plast Reconstr Surg* 1999;103:1212–20.
- EuroQol – a new facility for the measurement of health-related quality of life. The EuroQol Group, 1990/11/05 ed 1990.
- Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. *Med Care* 1992;30:473–83.
- McHorney CA, Ware Jr JE, Lu JF, Sherbourne CD. The MOS 36-item Short-Form Health Survey (SF-36): III. Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Med Care* 1994;32:40–66.
- Watson W, Ozanne-Smith J, Richardson J. Retrospective baseline measurement of self-reported health status and health-related quality of life versus population norms in the evaluation of post-injury losses. *Inj Prev* 2007;13:45–50.
- Polinder S, Haagsma JA, Belt E, Lyons RA, Erasmus V, Lund J, et al. A systematic review of studies measuring health-related quality of life of general injury populations. *BMC Public Health* 2010;10:783.
- FDA. *FDA document: guidance for industry. Patient-reported outcome measures: use in medical product development to support labelling claims*. Silver Spring, MD: Food and Drug Administration; 2006.
- Collingridge DS, Gantt EE. The quality of qualitative research. *Am J Med Qual* 2008;23:389–95.
- Gooberman-Hill R, Fox R, Chesser TJ. What can qualitative approaches bring to trauma outcome research? *Injury* 2011.

27. Suk M, Hanson B, Norvell D, Helfet D. *AO Handbook: musculoskeletal outcomes measures and instruments*. New York: Thieme; 2005.
28. Griffiths H, Jordan S. Thinking of the future and walking back to normal: an exploratory study of patients' experiences during recovery from lower limb fracture. *J Adv Nurs* 1998;**28**:1276–88.
29. Brown BC, McKenna SP, Solomon M, Wilburn J, McGrouther DA, Bayat A. The patient-reported impact of scars measure: development and validation. *Plast Reconstr Surg* 2010;**125**:1439–49.
30. Hansen K. Measuring performance at trade shows: scale development and validation. *J Business Res* 2002;**57**:1–13.
31. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. *Qual Health Res* 2005;**15**:1277–88.
32. Gustilo RB, Mendoza RM, Williams DN. Problems in the management of type III (severe) open fractures: a new classification of type III open fractures. *J Trauma* 1984;**24**:742–6.
33. Hunt SM, McKenna SP, McEwen J, Williams J, Papp E. The Nottingham Health Profile: subjective health status and medical consultations. *Soc Sci Med A* 1981;**15**:221–9.
34. Polinder S, van Beeck EF, Essink-Bot ML, Toet H, Looman CW, Mulder S, et al. Functional outcome at 2.5, 5, 9, and 24 months after injury in the Netherlands. *J Trauma* 2007;**62**:133–41.
35. Binkley JM, Stratford PW, Lott SA, Riddle DL. The Lower Extremity Functional Scale (LEFS): scale development, measurement properties, and clinical application. North American Orthopaedic Rehabilitation Research Network. *Phys Ther* 1999;**79**:371–83.
36. Engelberg R, Martin DP, Agel J, Obremsky W, Coronado G, Swiontkowski MF. Musculoskeletal Function Assessment instrument: criterion and construct validity. *J Orthop Res* 1996;**14**:182–92.
37. Martin DP, Engelberg R, Agel J, Snapp D, Swiontkowski MF. Development of a musculoskeletal extremity health status instrument: the Musculoskeletal Function Assessment instrument. *J Orthop Res* 1996;**14**:173–81.
38. McCarthy ML, MacKenzie EJ, Edwin D, Bosse MJ, Castillo RC, Starr A. Psychological distress associated with severe lower-limb injury. *J Bone Joint Surg Am* 2003;**85-A**:1689–97.
39. Jansen SJ, Stiggelbout AM, Nooij MA, Noordijk EM, Kievit J. Response shift in quality of life measurement in early-stage breast cancer patients undergoing radiotherapy. *Qual Life Res* 2000;**9**:603–15.
40. Visser MR, Oort FJ, Sprangers MA. Methods to detect response shift in quality of life data: a convergent validity study. *Qual Life Res* 2005;**14**:629–39.
41. Tracy SJ. Qualitative quality: eight “Big-Tent” criteria for excellent qualitative research. *Qual Inq* 2010;**16**:837–51.

[Click here to confirm that you have read the article and receive
Trauma Education Credit](#)