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# Mental disorder in limb reconstruction: Prevalence, associations and impact on work disability

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ABSTRACT

*Objective:* This cross-sectional survey aimed to assess the prevalence of depression, anxiety, post-traumatic stress disorder (PTSD), and drug and alcohol dependence in a limb reconstruction population and examine associations with demographic and functional variables.
*Methods:* As part of routine clinical care, data were collected from 566 patients attending a tertiary referral centre for limb reconstruction between April 2012 and February 2016. Depression, anxiety, post-traumatic stress disorder (PTSD), and alcohol and drug dependence were measured using standardised self-report screening tools.
*Results:* 173 patients (30.6% CI 26.7–34.4) screened positive for at least one of the mental disorders assessed. 110 (19.4% CI 16.2–22.7) met criteria for probable major depression; 112 (19.9% CI 16.6–23.2) patients met criteria for probable generalised anxiety disorder; and 41 (7.6% CI 5.3–9.8) patients met criteria for probable PTSD. The prevalence of probable alcohol dependence and probable drug dependence was 1.6% (CI 0.6–2.7) and 4.5% (CI 2.7–6.3), respectively. Patients who screened positive for depression, anxiety and PTSD reported significantly higher levels of pain, fatigue, and functional impairment. Depression and anxiety were independently associated with work disability after adjustment for covariates (OR 1.98 (CI 1.08–3.62) and OR 1.83 (CI 1.04–3.23), respectively).
*Conclusion:* The high prevalence and adverse associations of probable mental disorder in limb reconstruction attest to the need for routine psychological assessment and support. Integrated screening and management of mental disorder in this population may have a positive impact on patients' emotional, physical and occupational rehabilitation. A randomised controlled trial is needed to test this hypothesis.


## 1. Introduction

The process of limb reconstruction is often prolonged, painful and disabling, with functional outcomes equivalent to those of amputation [1]. It is surprising therefore that the mental health of patients undergoing this procedure has seldom been studied. Research conducted in other orthopaedic trauma populations suggests that mental health problems are common. In general orthopaedic trauma, high levels of depression and anxiety have been reported. Crichlow et al. assessed 161 patients 3–12 months after injury and found that 45% met criteria for moderate to severe depression [2]. De Morales et al. assessed 70 orthopaedic trauma inpatients and found that 46% met criteria for anxiety and 34% met criteria for depression [3]. Wiseman et al. also measured trauma patients' mental health during hospital admission ($n = 201$) and showed that 37% had symptoms of depression above the normal range and 59% had symptoms of anxiety [4]. Among patients who have undergone limb amputation, estimates of the prevalence of depression range from 28%–63%, and estimates of the prevalence of anxiety range from 25%–57%. [5–7].

To our knowledge, only one study has assessed mental disorder specifically in patients undergoing limb reconstruction. Scott et al. conducted a cross-sectional survey of patients receiving limb reconstruction as a result of accidental injury and found that 43% of patients met criteria for possible anxiety, 36% met criteria for possible depression, and 8% met criteria for post-traumatic stress disorder (PTSD) [8]. Time since injury was not reported, but the authors presented mean depression, anxiety and PTSD scores in three subgroups at different stages of treatment: patients who currently had a fixator (a frame fixed to the bone using wires and screws to bring a fracture into alignment) ($n = 48$); patients who had the fixator removed for 2–12 months (n = 48); and patients who had the fixator removed for 18–36 months ($n = 41$). Scott et al. reported no significant differences in depression, anxiety and PTSD symptomatology between these groups. The study suggests that levels of mental

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disorder among limb reconstruction patients are high. However, the results are undermined by methodological weaknesses: the sample size was small ($n = 107$) and the authors did not report the threshold for defining cases of depression and anxiety.

Besides causing emotional suffering, mental disorders may exacerbate patients' physical symptoms and impair functioning. For example, depression is associated with increased pain, fatigue and disability [9], poorer treatment adherence [10], and adverse health behaviours [11] in patients accessing physical healthcare services. There is also good evidence from orthopaedic populations that poor mental health negatively impacts key physical outcomes following surgery, including pain severity and physical functioning [12–14]. Prolonged work absence incurs considerable personal and societal costs and is another important rehabilitation outcome following surgery [15]. Poor mental health has been linked to reduced occupational functioning [16,17], however, the causal pathway from injury to work disability is complex, and more research is needed to determine whether the observed association between mental disorder and work is independent of injury severity. As well as being a significant risk factor for traumatic injury [18], there is evidence that alcohol and drug misuse can impede the potential for fractures to heal (particularly open fractures with bone loss), resulting in poorer outcomes post-surgery [19].

Though effective treatments for mental disorders in medical populations exist [20], the rate of detection and intervention remains low. To determine the need for investment in mental health training and resources for limb reconstruction services, data are needed on the prevalence and impact of mental disorder in this population. We assessed levels of probable mental disorder in a large cross-sectional sample of limb reconstruction patients using standardised screening tools. The aims of the study were 1) to determine the prevalence of depression, anxiety, PTSD, and alcohol and drug dependence in a limb reconstruction population, 2) to assess the associations of mental disorders with demographic and functional variables, and 3) to test the hypothesis that mental disorders are associated with work disability, independent of the physical burden of injury.

## 2. Materials and methods

### 2.1. Setting

The sampling frame included all adults attending the Limb Reconstruction Service at King's College Hospital (KCH) in London, UK, between April 2012 and February 2016. This service is one of the busiest tertiary limb reconstruction units in the UK, receiving referrals from south-east England and the armed forces. The most common mechanism of injury is road traffic accidents, with motor car accidents being the largest subset. A typical patient seen in this unit is one with a long bone fracture that has failed to heal after multiple interventions. Referral to the KCH Limb Reconstruction Service is a critical juncture at which the patient must often decide whether to proceed with reconstruction or accept amputation.

### 2.2. Procedure

The data used in this study were collected as part of the *Integrating Mental & Physical healthcare: Research Training and Services (IMPARTS)* initiative [21], implemented by King's Health Partners, an academic health sciences centre, in 2011. IMPARTS is an integrated mental healthcare package designed to support physical healthcare teams in embedding mental health assessment and management into clinical care. The package consists of: 1) a web-based patient reported questionnaire enabling routine measurement of mental and physical health outcomes, with real-time feedback to clinicians; 2) development of mental health care pathways; 3) training in core mental health skills for physical healthcare teams; 4) a portfolio of self-help materials tailored to specific conditions. Since 2011 IMPARTS has been embedded in 25 clinical specialties across King's Health Partners.

IMPARTS was implemented in the KCH Limb Reconstruction Service in April 2012. Upon arriving at the clinic, patients were given an information sheet inviting them to complete a questionnaire on a touchscreen e-tablet. This explained that completing the questionnaire was voluntary and responses would be confidential. IMPARTS establishes routine outcome measurement as a service development rather than as a research project. Therefore formal consent was not required, but patients were informed that their anonymised data might be used for research or audit purposes. There were no exclusion criteria - all patients over the age of 18 were eligible for the routine outcome assessment. The questionnaire was administered in the clinic waiting room or an adjacent office prior to the patient's consultation, and took most patients 5–10 min to complete. Assistance was provided to patients unable to complete the questionnaire on their own. The questionnaire results populated the electronic patient record in real-time, enabling clinicians to review patients' responses, discuss results, and make appropriate referrals during the consultation. Patients who screened positive for probable mental disorder were automatically flagged and guidance on appropriate care pathways provided. A liaison psychiatrist and a cognitive behavioural therapist were recruited to confirm estimated diagnoses identified via screening and provide care to patients with mental health needs.

IMPARTS has generic research ethics approval from the National Research Ethics Service Research Database Committee (NRES Ref: 12/SC/0422), which permits the use of de-identified data collected via IMPARTS for research purposes, with the added safeguard that each project was approved by an oversight committee with two patient representatives, one of whom chaired the committee.

### 2.3. Measures

Critical to the ethos of IMPARTS is that the measures selected are salient to the patients' condition and capture relevant physical and functional patient-reported outcomes as well as mental disorders. Measures for the limb reconstruction questionnaire were selected by the IMPARTS team in collaboration with the limb reconstruction team, based on clinical experience and appraisal of the existing literature. Two measures were added to the questionnaire after the initial implementation of screening. Questions about smoking were added in response to Making Every Contact Count, an NHS mandate to improve support for health behaviour change. Questions on drug dependence were added at the request of the limb reconstruction team who felt that substance misuse was a prevalent problem in this patient group.

Pain and fatigue were assessed using visual analogue scales (VAS), which asked patients to select a number from 0 to 100 to depict the severity of their symptoms. Patients were asked “Overall, how would you rate your pain/fatigue today?”.

Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9), a self-report screening tool, which has been shown to have good validity and reliability in a variety of medical populations. A meta-analysis of 113 studies conducted in patients with chronic illness found that the PHQ-9 has high sensitivity (0.84; CI 0.69–0.91) and specificity (0.88; CI 0.83–0.91) compared to other commonly used depression screening tools [22]. Suicidal ideation was assessed by PHQ-9 item 9 and defined as having “thoughts that you would be better off dead or of hurting yourself in some way” more than half the days in the past two weeks. Criteria for probable Major Depressive Disorder (MDD) were met if the patient reported at least one of the two core items of the PHQ-9 (low mood or loss of interest) and at least five out of nine items in total, for more than half the days in the past two weeks. Item 9 (suicidal thoughts) counted towards the diagnosis of probable MDD if present at all.

Anxiety was assessed using the Generalised Anxiety Disorder Questionnaire-7 (GAD-7), with criteria for probable generalised anxiety