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ORIGINAL RESEARCH

Functional and Mental Health Status of United Kingdom Military Amputees Postrehabilitation

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Abstract

Objectives: To evaluate the functional and mental health status of severely injured traumatic amputees from the United Kingdom military at the completion of their rehabilitation pathway and to compare these data with the published normative data.

Design: Retrospective independent group comparison of descriptive rehabilitation data recorded postrehabilitation.

Setting: A military complex trauma rehabilitation center.

Participants: Amputees (N=65; mean age, 29±6y) were evaluated at the completion of their rehabilitation pathway; of these, 54 were operationally (combat) injured (23 unilateral, 23 bilateral, 8 triple) and 11 nonoperationally injured (all unilateral).

Interventions: Continuous ~4-week inpatient, physician-led, interdisciplinary rehabilitation followed by ~4-weeks of patient-led, home-based rehabilitation.

Main Outcome Measures: The New Injury Severity Score at the point of injury was used as the baseline reference. The 6-minute walk test, Amputee Mobility Predictor with Prosthesis, Special Interest Group in Amputee Medicine, Defence Medical Rehabilitation Centre mobility and activity of daily living scores as well as depression (Patient Health Questionnaire-9), anxiety (General Anxiety Disorder Scale-7), mental health support, and pain scores were recorded at discharge and compared with the published normative data.

Results: The mean New Injury Severity Score was 40±15. After 34±14 months of rehabilitation, amputees achieved a mean 6-minute walk distance of 489±117m compared with age-matched normative distances of 459 to 738m. The 2 unilateral groups walked (544m) significantly further ($P>.05$) than did the bilateral amputee (445±104m) and triple amputee (387±99m) groups. All groups demonstrated mean functional mobility scores consistent with scores of either active adults or community ambulators with limb loss. In total, 85% could walk/run independently and 95% could walk and perform activities of daily living independently with an aid/adaptation. No significant difference in mental health outcome was reported between the groups ($P>.05$). At discharge, 98% of patients were able to control their pain.

Conclusions: Severely injured military amputees who completed intensive interdisciplinary rehabilitation achieved levels of physical function comparable with those in age-matched healthy adults. Mental health outcomes were indicative of preparedness for full integration back into society. Archives of Physical Medicine and Rehabilitation 2015;96:2048-54

Conflicts in Afghanistan and Iraq have led to advances in battle care emergency medicine, enabling military personnel to survive injuries that would have once proved fatal.[1] These improved outcomes are credited to the high-quality care from point of trauma on the battlefield to arrival back in the United Kingdom (UK) for continued medical and surgical care.[1] However, little empirical data exist on outcomes in traumatic amputees postrehabilitation. There is a medical and economic interest in ensuring that the trauma rehabilitation pathway is effective. Measuring physical function and mental health outcomes are essential to inform the development of evidence-based best practice.

There is no published data on the rehabilitation outcomes of UK military members with amputation from the recent conflicts. Therefore, the purpose of this study was to evaluate the

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functional and mental health status of severely injured UK military traumatic amputees upon completion of the rehabilitation pathway and comparing these data with the published normative data.

Methods

Overview and data sources

A retrospective analysis of injury severity scores and the postrehabilitation functional and mental health status of rehabilitation were undertaken in a cohort of military amputees. Patients discharged between January 2013 and March 2014 were included in the analysis. Amputees were classified as any patient with an amputation above the ankle or above the hand. Only patients with digital amputations were excluded. Permission to access anonymous data was granted by the local Caldicott Guardian (person responsible for protecting the confidentiality of a patient and service-user information and enabling appropriate information sharing). Ethical approval was granted by the Research Ethics Approval Committee for Health, University of Bath.

It is beyond the scope of this article to complete a detailed comparison of different North Atlantic Treaty Organization amputee care pathways. Combat casualty care for the United States (US), Canadian, and UK military has previously been described,[2] along with a detailed analysis of US combat amputee care.[3] The paradigm of UK military rehabilitation at the Defence Medical Rehabilitation Centre (DMRC) is given in figure 1.

Injury severity was calculated at the point of injury and recorded by the UK Joint Theatre Trauma Registry. Severity of injury is defined and measured using the New Injury Severity Score (NISS). "Major trauma" has been defined as an NISS of >15.[4] The NISS measures injury severity from 1 to 75, with a higher score signifying greater severity of injury. The distribution of body regions experiencing trauma were categorized as follows: head/face/neck, chest/upper back, upper limb, spine, abdomen, pelvis, genitals, and lower limb. This information was used to define the number of anatomical regions injured in addition to the amputation. Patient demographics, mechanism of injury, and length of rehabilitation were recorded. Predicted body mass and body mass index (BMI) were calculated according to the methods outlined by Osterkamp.[5]

Length of rehabilitation was defined as the number of 4-week inpatient admissions and the number of months from first to last admission. Functional and mental health outcome measures were recorded upon completion of the rehabilitation pathway. All data were extracted from the Defence Medical Information Compatibility Program or from medical notes.

List of abbreviations:

6MWD	**6-minute walk distance**
6MWT	**6-minute walk test**
ADL	**activities of daily living**
BMI	**body mass index**
DMRC	**Defence Medical Rehabilitation Centre**
NISS	**New Injury Severity Score**
SIGAM	**Special Interest Group in Amputee Medicine**
UK	**United Kingdom**
US	**United States**

Postrehabilitation functional measures

The 6-minute walk test (6MWT)[6] is an internationally recognized validated outcome measure that is used to assess function in a range of conditions. The test was performed indoors on a 20-m flat surface, with patients instructed to walk back and forth, turning around a cone, as many times as possible in 6 minutes. No assistive devices were used. The Amputee Mobility Predictor with Prosthesis[7] is a functional outcome measure administered by a physiotherapist who observes and records the amputees' ability to perform basic mobility activities. The Special Interest Group in Amputee Medicine (SIGAM) mobility assessment[8] is a self-reported outcome tool that measures the potential of lower limb amputees to walk with their prosthesis. In addition, 2 DMRC outcome tools were used by clinicians assessing the patient's ability to walk and perform activities of daily living (ADL). "Mobility" was recorded as the ability to "run," "walk independently," "walk independently with an aid/adaptation," or "requires wheelchair to walk." The ability to perform ADL was recorded as "independent," "independent with aid/adaptation," "assistance with some tasks," or "requires constant care." These measures are simple, quick to administer, and easy to understand and provide clinically useful information on functional status.

Postrehabilitation mental health measures

The Patient Health Questionnaire-9[9] and General Anxiety Disorder-7[10] are validated self-reported questionnaires used to define severity of depression and general anxiety disorder, respectively. Both report a simple diagnostic grading scale of none/minimal to severe. Major depressive and general anxiety disorder symptoms are graded with scores ≥ 10 (moderate symptoms) and ≥ 15 (moderate to severe symptoms).[9,10] In addition, 2 DMRC outcome tools were used by clinicians to assess the requirement for mental health support (yes/no) and the ongoing pain ("no," "controlled," or "uncontrolled" pain).

Data analysis

The amputees were grouped according to the number of amputations: unilateral, bilateral, and triple—and, in the unilateral amputee group, whether their injuries were sustained operationally (combat injured) or nonoperationally (noncombat injured). All multiple amputees (bilateral and triple) were injured during operations. Statistical analysis was performed using SPSS Statistics v.21.[a] All data were checked for normality using the Kolmogorov-Smirnov test and tests of skewness and kurtosis. One-way analysis of variance was used to determine whether there were significant main effects of the number of amputations (ie, group) on injury severity, length of rehabilitation, and the functional and mental health outcome measures. Post hoc analyses using least significant difference pairwise comparison tests were performed to determine differences between groups. For nonparametric data the Kruskal-Wallis test was used, with a post hoc analysis performed using a Mann-Whitney U test. The level of significance was set a priori at $P>.05$.

Results

Patient demographics

Sixty-five amputees were evaluated at the completion of their rehabilitation pathway (unilateral amputee, n = 23; nonoperationally