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Initial injury severity and social factors determine ability to deploy after combat-related amputation☆,☆☆

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ABSTRACT

Objective: While many recent publications have examined the ability of amputees to return to active duty, it remains largely unknown why few amputees deploy after amputation and many amputees do not. The purpose of this study is to examine what predictor(s) exist for whether or not an amputee will deploy after sustaining a combat-related amputation.
Methods: All U.S. Service members who sustained major extremity amputations from September 2001 through July 2011 were analysed. Amputation level(s), mechanism of injury, time interval to amputation, age, rank, Physical Evaluation Board (PEB) disposition and ability to deploy after amputation were determined.
Results: Deployment information after amputation was obtained for 953 amputees. There were 47 (5%) amputees who deployed. There were no significant differences amongst service branches for the deployment of amputees ($p > 0.2$). Amputees who underwent their amputation on the same day of their injury were significantly less likely to deploy after amputation than those who had their amputation on the day of injury ($p = .01$). Deployed amputees had significantly lower Injury Severity Scores than amputees who did not deploy (15.98 vs 20.87, $p < 0.01$) and officers were significantly ($p < .01$) more likely to deploy and the average age of amputees who deployed was significantly higher than those who did not (27.5 vs 25.1, $p < .01$). Lastly, those amputees who sustained a transtibial amputation were significantly more likely to deploy than all other amputation levels ($p < .01$). Nine out of 19 (47%) Special Forces amputees were able to deploy.
Discussion: The vast majority of amputees do not able to deploy after undergoing amputation. The main predictors of deploying after sustaining a combat-related amputation appear to be: sustaining a transtibial amputation, being of senior rank or age and being a member of the Special Forces. Many of these factors appear to be non-treatment related and highlight the importance that individual and social factors play in the recovery of severe injuries.

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Introduction

The main goal in the treatment of any injured person is to allow them to become independent and productive members of society. As such, the ability of an injured person to return to work is often used as a surrogate measure of functional outcome after injury as [1–3]. The ability to return to active duty is an especially useful measure of recovery for combat-related amputees. This distinction not only signifies that an amputee has regained substantial function from a physical standpoint but also demonstrates an important recovery emotionally, too [4,5].

Recent studies have examined the ability of combat-related amputees to return to duty and physical activity after sustaining severe lower extremity trauma [6–8], seeming to answer the question of how often members of this population are able to

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return to work. However, returning to duty and returning to a physically demanding role within the military are not synonymous [9]. Some service members who return to duty after injury have very low demanding jobs that require little physical or emotional demand, whereas others go on to complete subsequent combat-related deployments with physically and emotionally gruelling roles [6,8,10]. These duties represent far different ends of the 'functionality spectrum.' However, there has been only one study that touched upon how many amputees complete subsequent deployments after injury, as opposed to simply returning to duty, and that study contained a very small cohort of amputees [11]. The purpose of this study is to examine what predictor(s) or injury characteristics make it likely that an amputee will after sustaining a combat-related amputation.

Methods

All U.S. service members who sustained at least one major extremity amputation between the time periods of September 2001 and July 2011 were included. This cohort of amputees has been previously examined for general, amputee characteristics [12]. A major extremity amputation was defined as any amputation at or proximal to the carpal or tarsal joints [13]. No revision amputations were evaluated in this cohort. Demographic, injury and treatment data, including age and rank at time of injury, mechanism of injury, level of amputation, Injury Severity Score (ISS) from multiple electronic medical record systems and data repositories. Amputations were described as occurring on either the day of injury (Day 0), days 1–89 after injury and 90 days or later after injury.

Subjects were queried in their respective Physical Evaluation Board Liaison Office (PEB) database for service branch. The PEB, comprised of military officers and medical personnel, is responsible for determining an ill or injured service member's capacity to continue service on active duty. Each injured service member can be permanently retired, separated with severance pay, placed on the temporary disability retirement list (TDRL), or fit for duty (fit). A Service Member may also return to active duty with a disposition of continuation on active duty (COAD), which allows an individual to return to active duty after a PEB appeal process and a change in job status. If the service member's illness or injury causes a disability that is incompatible with military duties, the PEB determines if the individual should be medically discharged. For individuals medically discharged, the medical conditions which preclude service are enumerated and a rating expressed as a percentage is assigned as a measure of the degree which the service member's disability conditions prohibit military service [14]. These disability ratings also correspond to disability payments to which a medically discharged service member is entitled.

The ability of a service member to deploy after undergoing an amputation was determined by examining data kept by the Traumatic Extremity Injuries and Amputation Center of Excellence (EACE). This organization is designed to facilitate the care and research of service members who have sustained traumatic extremity injuries and amputations across the Department of Defense and Veteran's Affairs systems. The ability of injured service members to deploy to a combat zone after sustaining a severe extremity injury or amputation is one of the data points recorded by this organization.

Differences in service branch, demographics, PEB disability ratings and dispositions, early and late amputations, Injury Severity Scores, Military Occupation Specialty (MOS) and amputation level were then compared between those who deployed after amputation and those who did not deploy after amputation. Continuous data were compared using Student's t test and categorical data were compared using chi-square analysis or Fischer's exact test.

Table 1
The number of combat-related amputees at each amputation level who were deployed after their injury. %: The percentage of all amputees at this level who deployed after amputation.

Amputation location	Deployed	%	P-value
Transhumeral	1	2	0.72
Transfemoral	9	5	0.85
Transfemoral, transtibial	1	3	1
Transradial	3	5	1
Transtibial, transtibial	2	4	1
Transtibial	27	8	<0.01
Transtibial, knee disarticulation	1	7	0.51
Ankle disarticulation	1	5	1
Wrist disarticulation	2	8	0.33

Results

There were 1316 total amputees identified between September 2001 and July 2011. Of those, 1221 amputees sustained primary, major extremity amputations. Deployment information was available for 953 (78%) of the 1221 amputees. Forty-seven (5%) amputees were deployed to a combat zone after their amputation(s). Transtibial amputees were significantly more likely to be deployed after amputation ($p < .01$). Only six of the 47 (13%) amputees who deployed after their amputation sustained an upper extremity amputation. Table 1 contains all of the different amputation levels for those amputees who deployed after amputation.

No significant differences were found between branches of service in regards to service members deploying after amputation (Table 2). Both rank and age at the time of amputation were found to be significant predictors of deploying after amputation. Officers were significantly ($p < .01$) more likely to deploy after amputation while junior enlisted amputees were significantly less likely to deploy ($p < .01$). Additionally, amputees that deployed had a mean age that was significantly higher ($p < 0.01$) than those who did not deploy (27.52 vs 25.11, respectively) (Table 3).

Service members who deployed after amputation had significantly lower ISS (15.98 vs 20.87, $p < 0.01$) and significantly lower PEB combined disability ratings (66.29 vs 75.54, $p < .01$) than those who did not deploy. Similarly, those amputees who deployed were significantly more likely to have a final PEB disposition of either 'fit for duty' or 'continuation on active duty' (COAD) than those amputees who did not deploy ($p < .01$)(Table 4). Of the 19 known Special Forces operatives within the cohort, 9 (47%) went

Table 2
Table showing the number of combat-related amputees in each service branch who were able to deploy after their injury.

Branch of service	Deployed	%	Not deployed	%	P-value
Air force	2	12	15	88	0.20
Army	37	5	680	95	0.78
Marine	8	4	196	96	0.58
Navy	0	0	15	100	NA
Total	47	5	906	95	<.01

Table 3
Table showing those combat-related amputees who were able to deploy after injury separated by rank. E1–E4: junior enlisted personnel. E5–E9: senior enlisted personnel. Officer: officers of any rank. SEM: standard error of the mean.

Rank	Deployed	%	Not deployed	%	P-value
E1–E4	13	2%	512	98%	<0.01
E5–E9	22	6%	332	94%	0.17
Officer	12	16%	62	84%	<0.01
Mean age	27.52	SEM 0.78	25.11	SEM 0.17	<0.01