International Journal of Surgery 48 (2017) 286–290

Contents lists available at ScienceDirect

International Journal of Surgery

journal homepage: www.elsevier.com/locate/ijsu

Original Research

Occupational outcomes following combat-related gunshot injury: Cohort study

Matthew D. Laughlin[a], Philip J. Belmont Jr.[b], Paul J. Lanier[a], Julia O. Bader[c], Brian R. Waterman[d], Andrew J. Schoenfeld[e,*]

[a] Department of Orthopaedic Surgery and Rehabilitation, William Beaumont Army Medical Center, Texas Tech University Health Sciences Center, El Paso, TX, United States
[b] Department of Surgery, Uniformed Services University of the Health Sciences, Bethesda, MD, United States
[c] Department of Clinical Investigation, William Beaumont Army Medical Center, El Paso, TX, United States
[d] Department of Orthopaedic Surgery, Wake Forest University, Winston-Salem, NC, United States
[e] Department of Orthopaedic Surgery, Brigham and Women's Hospital, Harvard Medical School, 75 Francis Street, Boston, MA 02115, United States

ARTICLE INFO

Keywords:
Gunshot injury
Outcomes
Sociodemographic factors
Military*Level of evidence:*
III
Prognostic

ABSTRACT

Background: The long-term impact of gun violence on physical function and occupational disability remains poorly explored. We sought to examine the effect of combat-related gunshot injury on work capacity within a cohort of military servicemembers and identify clinical characteristics that influence the capacity to return to work.

Methods: A query was performed to identify all servicemembers injured by gunshot in the years 2005–2009. These soldiers were then followed for a period up to the end of 2014 in order to identify those separated from service due to an inability to perform military duties as a result of their injury. Socio-demographic and clinical characteristics were considered co-variates. The dependent variable in this study was inability to effectively return to work, as delineated by the proxy of medical separation from military service. A multivariable logistic regression model was used to evaluate factors associated with an increased likelihood of medical separation following gunshot injury.

Results: Of the 1417 individuals meeting inclusion criteria, 40% (n = 572) of the cohort were medically separated in the time-period under study. Significant predictors of separation included non-thoracic injuries, increased injury severity score (ISS; OR 1.05; 95% CI 1.04, 1.06), Senior Enlisted (OR 3.90; 95% CI 2.16, 7.01), and Junior Enlisted military rank (OR 6.99; 95% CI 3.93, 12.44).

Conclusions: This is the largest study in the literature to assess the long-term capacity to return to work following gunshot injury in any population. Individuals in high-demand occupations and those with non-thoracic wounds, or elevated ISS, should be counseled in the post-gunshot injury period regarding the negative associations of these characteristics with the capacity to return to work. Enhanced access to social services in the period following injury could similarly benefit individuals of low socioeconomic background.

1. Introduction

Over the course of 20th century military conflicts, a continuous rise in the incidence of blast-related injuries was noted as compared to wounds caused by gunshot [1–4]. This disparity in injury mechanism reached its apex in the latter half of the most recent Iraq conflict (2003–2010), where close to 80% of all American casualties resulted from explosive blasts [2–4]. However, since that time, an increase in the number of combat injuries precipitated by gunshot has been noted, particularly in Afghanistan and among combat-specific military personnel [4]. Over the same time-period, there has been a concomitant resurgence of gun-violence in the civilian sector within the United States [5–8].

Due to advances in emergency response times and surgical care, individuals who sustain gunshot related injuries in military conflicts and the civilian sector are surviving at unprecedented rates [1–10]. However, the long-term impact of gun violence, particularly in terms of physical function and occupational disability, remains poorly explored in both civilian and military populations, although enduring ramifications can be anticipated [1,7,11]. For example, among a small series of

* Corresponding author.
E-mail addresses: mdlaughlin@gmail.com (M.D. Laughlin), Philip.james.belmont@gmail.com (P.J. Belmont), pjlanier@gmail.com (P.J. Lanier), Julia.m.bader.civ@mail.mil (J.O. Bader), Brian.r.waterman@gmail.com (B.R. Waterman), ajschoen@neomed.edu (A.J. Schoenfeld).

https://doi.org/10.1016/j.ijsu.2017.11.037
Received 21 August 2017; Received in revised form 10 October 2017; Accepted 24 November 2017
Available online 27 November 2017
1743-9191/ © 2017 IJS Publishing Group Ltd. Published by Elsevier Ltd. All rights reserved.

civilians treated for gunshot in a recent study, persistent pain and difficulties with normal daily activities persisted for up to two years following injury [7]. At the same time, as far as we are aware, there are no investigations that report the long-term functional or occupational sequelae of gunshot injuries for military personnel.

In this context, we sought to examine the effect of combat-related gunshot injury on work capacity within a cohort of military servicemembers. We also intended to examine factors, including sociodemographic, clinical and occupational characteristics that may influence the capacity to effectively return to work following these injuries. The military is an ideal setting in which to study this issue based on a number of factors including the following: a large sample of individuals exposed to occupational hazards in the combat zone, the capacity for longer-term follow-up without attrition due to the military's electronic health records system and the broad demographic, socio-economic, vocational, educational and professional strata encompassed by the modern American armed forces [11,12]. Several prior medical studies have maintained that the American military is broadly representative of the United States demographic aged 18–55 years [11–14]. We hypothesized that sociodemographic factors and occupational demands would strongly influence the capacity to effectively return to work following gunshot injuries.

2. Methods

This study relied on data obtained from the Department of Defense Trauma Registry and the military's Physical Evaluation Board proceedings obtained through the Defense Manpower Data Center. Both registers have been utilized in prior work and the means through which their data is collected has also been extensively described [2–4,11,15,16]. In brief, the Department of Defense Trauma Registry collects detailed information on all servicemembers in the Department of Defense (Army, Navy, Air Force, Marine Corps) evacuated from a combat zone following injury [1–4]. The Physical Evaluation Board maintains records on all personnel referred for medical or psychiatric conditions that prevent the satisfactory performance of duty, regardless of etiology [1,11,16].

The Department of Defense Trauma Registry was queried by Internal Classification of Disease-9th revision (ICD-9) code to identify all military personnel who sustained a gunshot injury between January 1, 2005 and December 31, 2009 while deployed to Iraq or Afghanistan. Individuals who died as a result of their wounds within 30-days of injury were excluded from further review as were those who did not sustain combat-related gunshot injuries. All included patients had their records in the Department of Defense Trauma Registry abstracted and age at the time of injury, biologic sex, military rank (Junior Enlisted [lowest four ranks in any branch], Senior Enlisted [Non-commissioned officers], Officers), military occupational specialty (combat or non-combat personnel) and branch of service were recorded. Injury characteristics were also abstracted, specifically the anatomic location of injury as defined by Churchill region (abdomen, head/neck, extremity, thorax) and Injury Severity Score (ISS).2,3 Physical Evaluation Board proceedings through December 31, 2014 (minimum 5-years of post-injury surveillance) were surveyed for all included individuals and the determinations of the board were recorded where applicable.

In line with prior research [11,16], the dependent variable in this study was inability to effectively return to work, which was defined as completion of a Physical Evaluation Board-directed separation from military service by proxy. Gunshot injury was viewed as the precipitating factor, with age, biologic sex, military occupational specialty, theater of injury, military rank, year injured, ISS and anatomic location of injury considered co-variates. For the purposes of this analysis and guided by prior investigations, military rank and occupational specialty/branch of service were considered proxies of socio-economic status and occupational demands, respectively [11,13,14,17]. In this paradigm, Junior Enlisted individuals were considered representative of low-socio-economic status [11,13,14,17] and servicemembers with combat-specific occupational designations, Junior or Senior Enlisted rank and/or Army or Marine service, were considered representative of high-demand physical occupations [17].

Initial analysis consisted of Kaplan-Meier testing with a start date of January 1 of the year of gunshot injury. The end date consisted of the date of Physical Evaluation Board separation. Individuals separated from military service for reasons other than medical were censored. A model was then developed with initial bivariate comparisons made within the individual co-variate categories using logistic regression testing. Categories that maintained p-values < 0.2 in bivariate tests were subsequently analyzed in a multivariable regression model that controlled for confounders. Variables that maintained odds ratios (OR) and 95% confidence intervals (CI) exclusive of 1.0 with p-values < 0.05 following adjusted regression testing were considered statistically significant predictors of inability to effectively return to work following gunshot injury. All statistical testing was conducted to SAS v9.3 (SAS, Cary, NC). This study received institutional IRB approval prior to commencement.

3. Results

In the time period under study, 1497 individuals sustained a combat related gunshot injury. Of these, 80 (5%) died within 30 days of their injury, leaving 1417 cases for inclusion in this analysis.

There were 1410 men (99%), and 7 women, with an average age of 25.8 (SD 6.1) at time of injury (Table 1). The majority of injured personnel served in the Army (n = 1086, 77%) and 79% (n = 1123) had a combat-specific military occupation. Fifty-five percent (n = 778) were Junior Enlisted individuals, while Officers accounted for only 9% (n = 123) of the cohort. The most common anatomic region of injury was the extremity, accounting for 73% (n = 1028) of all casualties. The average ISS was 11.3 (SD 10.7).

Table 1
Demographic factors and injury characteristics of servicemembers sustaining gunshot injuries.

Age, mean (SD)	25.8 (SD 6.1)
Age Categories, n (%)	
< 20	69 (5)
20–29	1034 (73)
30–39	270 (19)
40–49	35 (2)
≥50	9 (1)
Male, n (%)	1410 (99)
Military Occupation, n (%)	
Combat-Specific	1118 (79)
Non-combat	299 (21)
Military Rank, n (%)	
Officer	123 (9)
Enlisted Junior	774 (55)
Enlisted Senior	520 (37)
Branch of Service, n (%)	
Army	1086 (77)
Navy	37 (3)
Air Force	14 (1)
Marine Corps	280 (20)
Year of Injury, n (%)	
2005	273 (19)
2006	384 (27)
2007	440 (31)
2008	182 (13)
2009	138 (10)
Churchill Anatomic Region of Injury, n (%)	
Abdomen	125 (9)
Extremity	1028 (73)
Head/Neck	174 (12)
Thoracic	89 (6)
Iraq Theater, n (%)	1111 (78)
Injury Severity Score, mean (SD)	11.3 (SD 10.7)

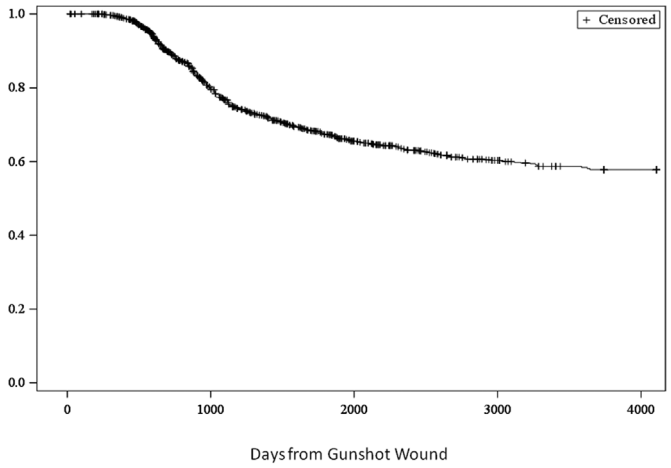

Fig. 1. Kaplan-Meier survival curve depicting the time from gunshot injury to medical separation from military service. X-axis = time in days from gunshot injury to medical separation from military service. Y-axis = probability of medical separation from military service.

Table 2
Results of the bivariate logistic regression analysis regarding factors that were predictive of Physical Evaluation Board (PEB) separation following gunshot injury. Ref – referent; MOS – military occupational specialty.

Variable	OR	95% CI	P-value
Male Sex	1.70	0.33, 8.77	0.53
Female Sex	Ref	Ref	Ref
Combat-Specific MOS	1.43	1.09, 1.87	0.009
Non-Combat MOS	Ref	Ref	Ref
Churchill Anatomic Region	–	–	–
Thoracic	Ref	Ref	Ref
Abdomen	2.14	1.21, 3.79	0.009
Extremity	1.42	0.89, 2.25	0.14
Head/Neck	1.73	1.01, 2.96	0.05
Iraq Theater	1.16	0.90, 1.51	0.26
Afghanistan Theater	Ref	Ref	Ref
Military Rank	–	–	–
Officers	Ref	Ref	Ref
Junior Enlisted	6.87	3.93, 12.01	< 0.001
Senior Enlisted	3.78	2.14, 6.68	< 0.001
Year of Injury	–	–	–
2005	1.25	0.81, 1.94	0.31
2006	1.61	1.07, 2.43	0.02
2007	1.59	1.06, 2.39	0.02
2008	1.46	0.92, 2.33	0.11
2009	Ref	Ref	Ref
Age Group	–	–	–
< 20	6.15	0.73, 51.92	0.09
20–29	6.51	0.81, 52.26	0.08
30–39	3.02	0.37, 24.57	0.30
40–49	0.75	0.07, 8.20	0.81
≥50	Ref	Ref	Ref
Branch of Service	–	–	–
Army/Marine Corps	2.02	1.07, 3.83	0.03
Navy/Air Force	Ref	Ref	Ref
Injury Severity Score	1.05	1.03, 1.06	< 0.001

Ultimately, 40% (n = 572) of the cohort were medically separated through the proceedings of a Physical Evaluation Board (Fig. 1). Five hundred fifteen (36%) servicemembers were able to complete another combat deployment following their gunshot injury. In unadjusted analysis age, military occupational specialty, rank, year of injury, anatomic region of injury and branch of service all met criteria for inclusion in the multivariable regression analysis (Table 2). Following multivariable testing, significant predictors of Physical Evaluation Board separation included ISS (OR 1.05; 95% CI 1.04, 1.06) and abdominal injuries (OR 1.87; 95% CI 1.01, 3.47), among others (Table 3). Junior Enlisted (OR 6.99; 95% CI 3.93, 12.44) and Senior Enlisted (OR 3.90; 95% CI 2.16, 7.01) personnel were also at significantly greater odds of Physical Evaluation Board separation as compared to Officers.

Table 3
Results of the multivariable logistic regression analysis regarding factors that were predictive of Physical Evaluation Board (PEB) separation following gunshot injury. Ref – referent; MOS – military occupational specialty.

Variable	OR	95% CI	P-value
Combat-Specific MOS	1.26	0.94, 1.69	0.12
Non-Combat MOS	Ref	Ref	Ref
Churchill Anatomic Region	–	–	–
Thoracic	Ref	Ref	Ref
Abdomen	1.87	1.01, 3.47	0.048
Extremity	2.13	1.27, 3.58	0.004
Head/Neck	1.87	1.04, 3.35	0.037
Military Rank	–	–	–
Officers	Ref	Ref	Ref
Junior Enlisted	6.99	3.93, 12.44	< 0.001
Senior Enlisted	3.90	2.16, 7.01	< 0.001
Branch of Service	–	–	–
Army/Marine Corps	1.79	0.89, 3.60	0.10
Navy/Air Force	Ref	Ref	Ref
Year of Injury	–	–	–
2005	1.12	0.70, 1.78	0.63
2006	1.48	0.95, 2.30	0.08
2007	1.54	0.99, 2.38	0.051
2008	1.48	0.90, 2.43	0.12
2009	Ref	Ref	Ref
Injury Severity Score	1.05	1.04, 1.06	< 0.001

4. Discussion

Over the course of the first decade of the 21st century, the frequency and severity of gunshot injuries has increased among civilian populations in the United States [5–10]. Interestingly, at the same time but under different circumstances, the incidence of wounds caused by gunshot has also risen, in some respects approaching percent-rates not encountered since the Vietnam era [1–4]. While gunshot injured individuals continue to survive their wounds at the highest rates in military history, the long-term effects of these traumatic events particularly with respect to functional disability remain underevaluated. Most prior works within civilian and military contexts have primarily focused on survival and complications rates within the short term [2–10]. There are relatively few studies that can address functional capacity and the ability to return to work at time-periods beyond six to twelve months following injury [7], let alone describe risk factors that may impair the capacity for successful functional and/or occupational restoration. In order to address this issue, we sought to use ten-years' of military data gathered from the Department of Defense Trauma Registry and Defense Manpower Data Center to evaluate the rate of medical separation following gunshot injuries and describe clinical and sociodemographic factors associated with this adverse outcome. This investigation is in line with the recent call from the American College of Surgeons Committee on Trauma to improve the quality of research around gunshot injuries [18].

This investigation features several advantages over prior cross-sectional evaluations. Foremost, as far as we are aware, this is the largest study in the literature to assess the long-term capacity to return to work following gunshot injury in any population. Unique features of the military's electronic medical records system [1–4,11,15,16] allowed us to survey individuals for medical separation irrespective of their location, unit affiliation, or status at the time of the Physical Evaluation Board proceedings [11,16]. The demographic diversity encountered within today's armed forces may also enable translation of these findings to civilian populations [11–14,17], particularly since the age of our cohort is strikingly similar to that of American civilians most likely to be exposed to gun violence [5–7,10].

Our results indicate that 4 in 10 individuals who sustained a

gunshot injury were unable to successfully return to their pre-injury occupational duties. Furthermore, in adjusted analysis, non-thoracic injuries, Enlisted rank and ISS were found to be significant predictors of inability to return to duty (Table 3). The significance of Enlisted military rank as a whole may be indicative of the rigors associated with these high-intensity, physically demanding occupations [11,17], which may preclude an individual's ability to effectively perform at the required level following gunshot injury. Return to work rates have been reported to be higher following trauma in civilian patients with low physical demand jobs [19]. Abdominal gunshot wounds carry with them the propensity for damage to multiple visceral organs, particularly with hollow viscus injuries [8–10]. More than one study has reported an average of at least two organs damaged per gunshot injury [9,10] and as many as 75% of patients with an abdominal gunshot wound are anticipated to require some type of surgery [8]. In light of these realities, it may be more difficult to recover and rehabilitate from abdominal gunshot injuries as compared to wounds to the chest. At the same time, wee are cautious in the interpretation of the outcome related to wounds to the extremities as well as the head and neck (Table 3). While it is conceivable that injuries to these locations may result in more dramatic disability than survivable gunshot wounds to the chest, it should be recognized that protective body armor worn by military personnel provides most coverage to the chest and thorax. This may represent a confounder that cannot be controlled for given the design of this study.

The adverse influence of socioeconomic status on outcomes following traumatic injury have previously been described in the literature [11] and are also encountered here in light of the significant increase in medical separation for Junior Enlisted personnel as compared to officers. Prior studies performed within military populations have maintained that Junior Enlisted individuals disproportionately derive from disadvantaged socioeconomic strata and are representative of civilian patients from similar socioeconomic background [11–14]. In civilian studies, adverse outcomes following injury for individuals from low socioeconomic background have been attributed to healthcare segregation and access to care, although these issues are known to be muted within the military healthcare system [11,14]. As postulated in prior works, adverse outcomes for individuals from low socioeconomic background in the military are thought to be reflective of limitations in social support, as well as educational level [11]. This is important, as given the universal healthcare access provided by the military, outcomes may be anticipated to be even worse among civilians from low socioeconomic environments who sustain similar injuries.

We acknowledge several limitations associated with this study. Foremost, as this effort relied on data imparted to the Department of Defense Trauma Registry and Defense Manpower Data Center registries, we are limited to consider the variables captured in these datasets. As a result, we are unable to describe the severity of particular injuries in most respects, nor can we quantify clinical decision making as pertains to the need for surgery, transfusion or intensive care requirements, or the types of procedures performed. These factors may have influence over the outcomes considered here and, thus, we acknowledge the potential for residual confounding in our statistical models. Similarly, our reliance on register data means that we do not have access to clinical outcome measures or functional scores to objectively determine disability. Instead, we must rely on determinations of the Physical Evaluation Board proceedings as a proxy. We also have to use military rank and occupational specialty as proxies for socioeconomic status and occupational requirements. Enlisted personnel are exposed to combat-related injuries, including gunshot wounds, at a higher rate than officers and there are also more enlisted individuals in combat theaters [1–4], which may also confound results to some extent. However, we wish to emphasize that these approaches have been used as established metrics for functional requirements and socioeconomic status and Physical Evaluation Board proceedings are accepted as a valid measure of an individual's capacity to perform military occupational requirements [11,16]. Lastly, we also acknowledge the potential for selection bias in this work, as individuals who were separated for disciplinary reasons or decided to leave the military without reporting a disability would not be designated as having an adverse outcome in this study, even if they were impaired by sequelae of their gunshot injury.

In conclusion, the results of this analysis—the largest of its kind to be conducted among a population of patients with gunshot injuries—hold important meaning for both the military and civilian sectors. At a minimum, among military personnel, we have identified specific factors associated with adverse occupational outcomes following gunshot injury. We see no reason why many of these factors, including the proxies of high demand physical labor and socioeconomic status, cannot be applied to civilian patients with similar injuries. Individuals in high-demand occupations prior to gunshot injury and those with non-thoracic wounds should be counseled in the post-injury period regarding the negative associations of these characteristics with the capacity to effectively return to work. Similarly, more aggressive outreach in the period following injury, including enhanced access to social services, could be afforded to individuals of low socioeconomic background in order to maximize the potential for successful rehabilitation and recovery. These could include work hardening programs as well as alternative vocational training. We believe that the application of these recommendations have substantial potential to improve clinical care and enhance recovery for both military and civilian patients who sustain gunshot wounds.

Conflicts of interest

No conflicts of Interest.

Sources of funding

No funding was received.

Ethical approval

Approved by the William Beaumont Army Medical Center IRB.

Research registration unique identifying number (UIN)

None.

Author contribution

Laughlin - study design, data collections, data analysis, writing.
Belmont - study design, data analysis, writing.
Lanier - data collections, data analysis, writing.
Bader - data collections, data analysis, writing.
Waterman - study design, data collections, writing.
Schoenfeld - study design, data analysis, writing.

Guarantor

Matthew D. Laughlin, DO.

References

[1] P.J. Belmont, B.D. Owens, A.J. Schoenfeld, Musculoskeletal injuries in Iraq and Afghanistan: epidemiology and outcomes following a decade of war, J. Am. Acad. Orthop. Surg. 24 (2016) 341–348.
[2] P.J. Belmont Jr., G.P. Goodman, M. Zacchilli, M. Posner, C. Evans, B.D. Owens, Incidence and epidemiology of combat injuries sustained during “the surge” portion of operation iraqi freedom by a U.S. Army brigade combat team, J. Trauma 68 (2010) 204–210.
[3] P.J. Belmont Jr., B.J. McCriskin, R.N. Sieg, R. Burks, A.J. Schoenfeld, Combat wounds in Iraq and Afghanistan from 2005 to 2009, J. Trauma Acute Care Surg. 73 (2012) 3–12.
[4] A.J. Schoenfeld, J.C. Dunn, J.O. Bader, P.J. Belmont Jr., The nature and extent of war injuries sustained by combat specialty personnel killed and wounded in

Afghanistan and Iraq, 2003-2011, J. Trauma Acute Care Surg. 75 (2013) 287–291.
[5] B. Kalesan, M.E. Mobily, O. Keiser, J.A. Fagan, S. Galea, Firearm legislation and firearm mortality in the USA: a cross-sectional, state-level study, Lancet 387 (2016) 1847–1855.
[6] A. Sauaia, E. Gonzalez, H.B. Moore, K. Bol, E.E. Moore, Fatality and severity of firearm injuries in a denver trauma center, 2000-2013, JAMA 315 (2016) 2465–2467.
[7] M. Abghari, A. Monroy, S. Schubl, R. Davidovitch, K. Egol, Outcomes following low-energy civilian gunshot wound trauma to the lower extremities: results of a standard protocol at an urban trauma center, Iowa Orthop. J. 35 (2015) 65–69.
[8] K. Fikry, G.C. Velmahos, A. Bramos, S. Janjua, M. de Moya, D.R. King, et al., Successful selective nonoperative management of abdominal gunshot wounds despite low penetrating trauma volumes, Arch. Surg. 146 (2011) 528–532.
[9] D.V. Feliciano, J.M. Burch, V. Spjut-Patrinely, K.L. Mattox, G.L. Jordan Jr., Abdominal gunshot wounds. An urban trauma Center's experience with 300 consecutive patients, Ann. Surg. 208 (1988) 362–370.
[10] J.M. Nicholas, E.P. Rix, K.A. Easley, D.V. Feliciano, R.A. Cava, W.L. Ingram, et al., Changing patterns in the management of penetrating abdominal trauma: the more things change, the more they stay the same, J. Trauma 55 (2003) 1095–1110.
[11] A.J. Schoenfeld, G.P. Goodman, R. Burks, M.A. Black, J.H. Nelson, P.J. Belmont Jr., The influence of musculoskeletal conditions, behavioral health diagnoses, and demographic factors on injury-related outcome in a high-demand population, J. Bone Joint Surg. Am. 96 (2014) e106.
[12] R.W. Gimbel, L. Pangaro, G. Barbour, America's “undiscovered” laboratory for health services research, Med. Care 48 (8) (2010) 751–756.
[13] A.D. Bagchi, K. Stewart, C. McLaughlin, P. Higgins, T. Croghan, Treatment and outcomes for congestive heart failure by race/ethnicity in TRICARE, Med. Care 49 (2011) 489–495.
[14] A.J. Schoenfeld, W. Jiang, M.B. Harris, Z. Cooper, T. Koehlmoos, P. Learn, et al., Association between race and post-operative outcomes in a universally insured population versus patients in the State of California, Ann. Surg. 266 (2017) 267–273.
[15] D.J. Stinner, T.C. Burns, K.L. Kirk, J.R. Ficke, Return to duty rate of amputee soldiers in the current conflicts in Afghanistan and Iraq, 2010, J. Trauma 68 (6) (2010) 1476–1479 68.
[16] J.D. Cross, D.J. Stinner, T.C. Burns, J.C. Wenke, J.R. Hsu, Return to duty after type III open tibia fracture, J. Orthop. Trauma 26 (2012) 43–47.
[17] A.J. Schoenfeld, A.A. George, J.O. Bader, P.M. Caram Jr., Incidence and epidemiology of cervical radiculopathy in the United States military: 2000 to 2009, J. Spinal Disord. Tech. 25 (2012) 17–22.
[18] D.A. Kuhls, B.T. Campbell, P.A. Burke, L. Allee, A. Hink, R.W. Letton, et al., Survey of american College of Surgeons committee on trauma members on firearm injury: consensus and opportunities, J. Trauma Acute Care Surg. 82 (2017) 877–886.
[19] E.J. MacKenzie, J.A. Morris Jr., G.J. Jurkovich, Y. Yasui, B.M. Cushing, A.R. Burgess, et al., Return to work following injury: the role of economic, social, and job-related factors, Am. J. Public Health 88 (1998) 1630–1637.