The impact of 10 years of war on combat casualty care research: A citation analysis

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October 7, 2011, marked the end of the 10th year of US combat operations in Iraq and Afghanistan. As in previous conflicts,[1] these wars have led to major advances in treating combat casualties,[2] and the advances are also being translated into injury management paradigms in civilian trauma centers.[3–5] Coincident with these advances was an increase in combat casualty research directed toward identifying new methods for saving lives and reducing the long-term disability resulting from battlefield injuries.

A review of the scientific literature published during this period can be used to evaluate the research on combat casualty care conducted during the recent conflicts. One approach for determining the influence of individual articles is to measure the number of citations or the acknowledgments that one article receives from another.[6] Previous citation studies have focused on trauma research in general[7] and on the vascular surgery literature,[8] but to our knowledge, no previous citation analyses have been reported for combat casualty care. The objective of this article was to identify and assess the relative impact of the top 50 most frequently cited articles on combat casualty care published during the first 10 years of war.

MATERIALS AND METHODS

The Thompson Reuters Web of Science was queried in October 2011 for articles published between 2001 and 2011, the first 10 years of the current conflicts in Iraq, Operation Iraqi Freedom (OIF) from March 19, 2003, to February 21, 2010, and Operation New Dawn from February 22, 2010, to the present and in Afghanistan, Operation Enduring Freedom (OEF) from October 7, 2001 to the present. The Web of Science, which is produced by the Institute for Scientific Information, provides Web access to the Science Citation Index, MEDLINE, and other citation indexes, which collectively index more than 12,000 journals worldwide, including open-access journals.[9]

We searched for articles indexed by one or more of the following terms: *combat*, *war*, *military*, *OEF*, *OIF*, *Operation Enduring Freedom*, *Operation Iraqi Freedom*, *Overseas Contingency Operations*, *Operation New Dawn*, and *Global War on Terrorism* in combination with any one or more terms related to trauma, specifically *wound*, *injury*, *trauma*, or *casualty.*

Using the search refinement capability within Web of Science, we limited the selected articles to those within the following subject areas of highest relevance to combat casualty care: surgery, orthopedics, critical care medicine, emergency medicine, infectious diseases, or hematology. We further limited the selected publications to those that were articles (reviews, abstracts, meeting announcements, etc. were omitted). Articles published in any journal between 2001 and 2011 were accessed using the Web of Science database to obtain information about the number of article citations. A final review of the top 50 most frequently cited articles resulted in exclusion of an additional 13 publications: 2 that were not focused on the relevant conflicts (OEF/OIF, Global War on Terrorism, Overseas Contingency Operations) and 11 that did not specifically address combat casualty care. Thus, the next most cited articles that met the inclusion criteria were elevated into the top 50.

The 50 most cited articles were then analyzed with regard to the topic, authors, institution(s), major category (preclinical vs. clinical/epidemiologic), and number of citations. The epidemiologic/clinical studies were further categorized with regard to the patient population, military versus civilian.

RESULTS

The 50 most frequently cited articles were cited from 40 to 264 times during the 10-year study period, with a median value of 152 citations. The earliest article from this list was cited in 2002 (#22, Holcomb et al.) and the latest in 2009 (#38, Cotton et al. and #44, Kragh et al.) (Table 1). The most frequent topics of the articles in our study were resuscitation, epidemiology, and hemostasis, respectively, which collectively accounted for most articles (39 of 50, 78%) (Table 2). Six of the studies were categorized as preclinical and 44 as clinical/epidemiologic. Of the clinical/epidemiologic studies, 37 were of military personnel, and 7 were civilian studies with implications for combat casualty care.

The most frequently cited military article was also the most cited overall, #1 by Borgman et al. (2007), "The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital." This study involved a retrospective chart review of 246 patients at a

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TABLE 1. The 50 Most Frequently Cited Articles on Combat Casualty Care During 10 Years of War (2001–2011)

Rank Order	Article Title	Year	Times Cited
1	Borgman MA, Spinella PC, Perkins JG, et al. The ratio of blood products transfused affects mortality in patients receiving massive transfusions at a combat support hospital. *J Trauma*. 2007;63:805–813.	2007	264
2	Owens BD, Kragh JF Jr., Wenke JC, Macaitis J, Wade CE, Holcomb JB. Combat wounds in Operation Iraqi Freedom and Operation Enduring Freedom. *J Trauma.* 2008;64:295–299.	2008	124
3	Wedmore I, McManus JG, Pusateri AE, Holcomb JB. A special report on the chitosan-based hemostatic dressing: experience in current combat operations. *J Trauma.* 2006;60:655–658.	2006	122
4	Davis KA, Moran KA, McAllister CK, Gray PJ. Multidrug-resistant *Acinetobacter* extremity infections in soldiers. *Emerg Infect Dis.* 2005;11:1218–1224.	2005	109
5	Holcomb JB, McMullin NR, Pearse L, et al. Causes of death in US Special Operations Forces in the global war on terrorism—2001–2004. *Ann Surg.* 2007;245:986–991.	2007	100
6	Scott P, Deye G, Srinivasan A, et al. An outbreak of multidrug-resistant *Acinetobacter baumannii*-calcoaceticus complex infection in the US military health care system associated with military operations in Iraq. *Clin Infect Dis.* 2007;44: 1577–1584.	2007	98
7	Owens BD, Kragh JF Jr., Macaitis J, Svoboda SJ, Wenke JC. Characterization of extremity wounds in Operation Iraqi Freedom and Operation Enduring freedom. *J Orthop Trauma.* 2007;21:254–257.	2007	96
8	Kashuk JL, Moore EE, Johnson JL, et al. Postinjury life threatening coagulopathy: is 1:1 fresh frozen plasma: packed red blood cells the answer? *J Trauma.* 2008;65:261–270.	2008	96
9	Kelly JF, Ritenour AE, McLaughlin DF, et al. Injury severity and causes of death from Operation Iraqi Freedom and Operation Enduring Freedom: 2003–2004 versus 2006. *J Trauma.* 2008;64:S21–S26.	2008	91
10	Sperry JL, Ochoa JB, Gunn SR, et al. An FFP:PRBC transfusion ratio >= 1:1.5 is associated with a lower risk of mortality after massive transfusion. *J Trauma.* 2008;65:986–993.	2008	89
11	Duchesne JC, Hunt JP, Wahl G, et al. Review of current blood transfusions strategies in a mature Level I trauma center: were we wrong for the last 60 years? *J Trauma.* 2008;65:272–276.	2008	85
12	Stinger HK, Spinella PC, Perkins JG, et al. The ratio of fibrinogen to red cells transfused affects survival in casualties receiving massive transfusions at an army combat support hospital. *J Trauma.* 2008;64:S79–S85.	2008	76
13	Patel TH, Wenner KA, Price SA, Weber MA, Leveridge A, McAtee SJ. A US Army forward surgical team's experience in Operation Iraqi Freedom. *J Trauma.* 2004;57:201–207.	2004	74
14	Alam HB, Chen Z, Jaskille A, et al. Application of a zeolite hemostatic agent achieves 100% survival in a lethal model of complex groin injury in swine. *J Trauma.* 2004;56:974–983.	2004	73
15	Alam HB, Uy GB, Miller D, et al. Comparative analysis of hemostatic agents in a swine model of lethal groin injury. *J Trauma.* 2003;54:1077–1082.	2003	72
16	Niles SE, McLaughlin DF, Perkins JG, et al. Increased mortality associated with the early coagulopathy of trauma in combat casualties. *J Trauma.* 2008;64:1459–1463.	2008	71
17	Repine TB, Perkins JG, Kauvar DS, Blackbourne L. The use of fresh whole blood in massive transfusion. *J Trauma.* 2006;60:S59–S66.	2006	69
18	Eastridge BJ, Jenkins D, Flaherty S, Schiller H, Holcomb JB. Trauma system development in a theater of war: experiences from Operation Iraqi Freedom and Operation Enduring Freedom. *J Trauma.* 2006;61:1366–1372.	2006	69
19	Scalea TM, Bochicchio KM, Lumpkins K, et al. Early aggressive use of fresh frozen plasma does not improve outcome in critically injured trauma patients. *Ann Surg.* 2008;248:578–583.	2008	69
20	Spinella PC, Perkins JG, Grathwohl KW, et al. Effect of plasma and red blood cell transfusions on survival in patients with combat related traumatic injuries. *J Trauma.* 2008;64:S69–S77.	2008	67
21	Chambers LW, Rhee P, Balzei NC, et al. Initial experience of US Marine Corps forward resuscitative surgical system during Operation Iraqi Freedom. *Arch Surg.* 2005;140:26–32.	2005	62
22	Holcomb JB, Dumire RD, Crommett JW, et al. Evaluation of trauma team performance using an advanced human patient simulator for resuscitation training. *J Trauma.* 2002;52:1078–1085.	2002	60
23	Leininger BE, Rasmussen TE, Smith DL, Jenkins DH, Coppola C. Experience with wound VAC and delayed primary closure of contaminated soft tissue injuries in Iraq. *J Trauma.* 2006;61:1207–1211.	2006	60
24	Schreiber MA, Perkins J, Kiraly L, Underwood S, Wade C, Holcomb JB. Early predictors of massive transfusion in combat casualties. *J Am Coll Surg.* 2007;205:541–545.	2007	60
25	Perkins JG, Schreiber MA, Wade CE, Holcomb JB. Early versus late recombinant factor VIIa in combat trauma patients requiring massive transfusion. *J Trauma.* 2007;62:1095–1099.	2007	59
26	Lakstein D, Blumenfeld A, Sokolov T, et al. Tourniquets for hemorrhage control on the battlefield: a 4-year accumulated experience. *J Trauma.* 2003;54:S221–S225.	2003	58
27	Acheson EM, Kheirabadi BS, Deguzman R, Dick EJ, Holcomb JB. Comparison of hemorrhage control agents applied to lethal extremity arterial hemorrhages in swine. *J Trauma.* 2005;59:865–874.	2005	58
28	Aronson NE, Sanders JW, Moran KA. In harm's way: infections in deployed American military forces. *Clin Infect Dis.* 2006;43:1045–1051.	2006	56
29	Sayer NA, Chiros CE, Sigford B, et al. Characteristics and rehabilitation outcomes among patients with blast and other injuries sustained during the global war on terror. *Arch Phys Med Rehabil.* 2008;89:163–170.	2008	56

TABLE 1. *(Continued)*

Rank Order	Article Title	Year	Times Cited
30	Spinella PC, Perkins JG, McLaughlin DF, et al. The effect of recombinant activated factor VII on mortality in combat-related casualties with severe trauma and massive transfusion. *J Trauma.* 2008;64:286–293.	2008	56
31	Armonda RA, Bell RS, Vo AH, et al. Wartime traumatic cerebral vasospasm: recent review of combat casualties. *Neurosurgery.* 2006;59:1215–1225.	2006	54
32	Bilski TR, Baker BC, Grove JR, et al. Battlefield casualties treated at Camp Rhino, Afghanistan: lessons learned. *J Trauma.* 2003;54:814–821.	2003	53
33	Plotkin AJ, Wade CE, Jenkins DH, et al. A reduction in clot formation rate and strength assessed by thrombelastography is indicative of transfusion requirements in patients with penetrating injuries. *J Trauma.* 2008;64:S64–S68.	2008	53
34	Beekley AC, Watts DM. Combat trauma experience with the United States Army 102nd Forward Surgical Team in Afghanistan. *Am J Surg.* 2004;187:652–654.	2004	52
35	Fox CJ, Gillespie DL, O'Donnell SD, et al. Contemporary management of wartime vascular trauma. *J Vasc Surg.* 2005; 41:638–643.	2005	52
36	Johnson EN, Burns TC, Hayda RA, Hospenthal DR, Murray CK. Infectious complications of open type III tibial fractures among combat casualties. *Clin Infect Dis.* 2007;45:409–415.	2007	52
37	McLaughlin DF, Niles SE, Salinas J, et al. A predictive model for massive transfusion in combat casualty patients. *J Trauma.* 2008;64:S57–S63.	2008	52
38	Cotton BA, Au BK, Nunez TC, Gunter OL, Robertson AM, Young PP. Predefined massive transfusion protocols are associated with a reduction in organ failure and postinjury complications. *J Trauma.* 2009;66:41–49.	2009	52
39	Rasmussen TE, Clouse WD, Jenkins DH, Peck MA, Eliason JL, Smith DL. The use of temporary vascular shunts as a damage control adjunct in the management of wartime vascular injury. *J Trauma.* 2006;61:8–12.	2006	50
40	Petersen K, Riddle MS, Danko JR, et al. Trauma-related infections in battlefield casualties from Iraq. *Ann Surg.* 2007; 245:803–811.	2007	49
41	Handrigan MT, Bentley TB, Oliver JD, Tabaku LS, Burge JR, Atkins JL. Choice of fluid influences outcome in prolonged hypotensive resuscitation after hemorrhage in awake rats. *Shock*. 2005;23:337–343.	2005	47
42	Montgomery SP, Swiecki CW, Shriver CD. The evaluation of casualties from Operation Iraqi Freedom on return to the continental United States from March to June 2003. *J Am Coll Surg.* 2005;201:7–12.	2005	47
43	Potter BK, Burns TC, Lacap AP, Granville RR, Gajewski DA. Heterotopic ossification following traumatic and combat-related amputations—prevalence, risk factors, and preliminary results of excision. *J Bone Joint Surg Am.* 2007;89:476–486.	2007	47
44	Kragh JF Jr., Walters TJ, Baer DG, et al. Survival with emergency tourniquet use to stop bleeding in major limb trauma. *Ann Surg.* 2009;249:1–7.	2009	45
45	Kheirabadi BS, Acheson EM, Deguzman R, et al. Hemostatic efficacy of two advanced dressings in an aortic hemorrhage model in swine. *J Trauma.* 2005;59:25–34.	2005	44
46	Cooke WH, Salinas J, Convertino VA, et al. Heart rate variability and its association with mortality in prehospital trauma patients. *J Trauma.* 2006;60:363–370.	2006	44
47	Wright JK, Kalns J, Wolf EA, et al. Thermal injury resulting from application of a granular mineral hemostatic agent. *J Trauma.* 2004;57:224–230.	2004	43
48	Kozen BG, Kircher SJ, Henao J, Godinez FS, Johnson AS. An alternative hemostatic dressing: comparison of CELOX, HemCon, and QuikClot. *Acad Emerg Med.* 2008;15:74–81.	2008	42
49	Beekley AC, Sebesta JA, Blackbourne LH, et al. Prehospital tourniquet use in Operation Iraqi Freedom: effect on hemorrhage control and outcomes. *J Trauma.* 2008;64:S28–S36.	2008	42
50	Clouse WD, Rasmussen TE, Peck MA, et al. In-theater management of vascular injury: 2 years of the Balad Vascular Registry. *J Am Coll Surg.* 2007;204:625–632.	2007	40

US combat support hospital (NATO Role III health service support[10]), each of whom received a massive transfusion (≥10 U of red blood cells [RBCs] in 24 hours). In this analysis, the authors demonstrated that for patients with combat-related trauma requiring massive transfusion, a high plasma-to-RBC ratio approaching 1:1.4 was associated with improved survival to hospital discharge, secondary to decreasing death from hemorrhage. They concluded that a 1:1 ratio of plasma to RBCs should be used in massive transfusion protocols for all hypocoagulable patients with traumatic injuries. With 264 citations, this article had more than twice the number of citations as the second most cited article by Owens et al. (2008), "Combat wounds in Operation Iraqi Freedom and Operation Enduring Freedom," which had 124 citations.

The most cited study of a civilian population was article #8 by Kashuk et al. (2008), "Postinjury life threatening coagulopathy: Is 1:1 fresh frozen plasma: packed red blood cells the answer?" The aim of this study was to further evaluate the results of the Borgman et al. study using civilian trauma data to investigate the independent effect of the fresh frozen plasma (FFP)–to–RBC ratio in 133 patients who received >10 U of RBC. The investigators found that although the data suggested that a 1:1 FFP/RBC ratio reduced coagulopathy, it did not translate into a survival benefit, indicating that further clinical investigation was necessary.

Among the preclinical studies, the most cited was #14 by Alam et al. (2004), "Application of a zeolite hemostatic agent achieves 100% survival in a lethal model of complex

TABLE 2. Topics of the 50 Most Frequently Cited Articles

Topic	Number of Articles (n = 50)
Resuscitation	14
Epidemiology (total)	13
Combat casualties	9
Orthopedics	1
Vascular	1
Infection	1
Rehabilitation	1
Hemostasis	12
Agents/dressings	7
Tourniquets	3
Clotting factors	2
Infection	4
Vascular trauma	2
Neurotrauma	1
Orthopedic trauma	1
Prehospital	1
Trauma system	1
Wound management	1

groin injury in swine," in which they used a combined femoral artery and vein transection model to compare nine hemostatic dressings. They concluded that the use of a zeolite hemostatic agent controlled hemorrhage and significantly reduced mortality compared with untreated controls.

Of the 13 epidemiologic studies, 9 were focused on combat casualties in general and the remainder on more specific topics, with 1 article addressing each of the following: orthopedics, infection, vascular trauma, and rehabilitation.

Many authors had more than one top cited article identified in our study. Dr. John B. Holcomb had both the highest number of articles and the highest number of citations, followed by Dr. Charles E. Wade and Dr. Jeremy G. Perkins (Table 3).

By institution, 20 of the 50 most cited articles had involvement of investigator(s) from the US Army Institute of Surgical Research, and 10 of the 50 used data from the Joint Theater Trauma Registry, the comprehensive combat casualty care registry similar to the civilian National Trauma Data Bank.[11]

DISCUSSION

This study identified the most frequently cited research in combat casualty care during the first 10 years of the current conflicts. Our results suggest that the greatest impact on both the military and civilian trauma care communities has been in the resuscitation of massively bleeding casualties, known as damage-control resuscitation (DCR). The DCR concept developed from a series of technical and organizational advances in combat casualty care[12] and was based on efforts to replace natural components of whole blood and reverse physiologic decompensation. Hallmarks of the DCR process include the identification of key resuscitation end points, the use of physiologically comparable blood products and agents that support coagulation, and an effective multidisciplinary approach to trauma care.[13] The topics of the combat casualty care articles cited in our study contrast with those reported in "Citation classics in trauma," an article by Ollerton and Sugrue[7] (2005) in the *Journal of Trauma,* in which few of the highly cited articles reported data on blood transfusions or hemostasis. This difference can be explained by the fact that combat casualty research during our study period was focused on the resuscitation of severely bleeding patients because hemorrhage is the most common cause of death on the

TABLE 3. Authors With More Than One Top Cited Article

Author	No. Publications	No. Publications as First Author	No. Citations
Holcomb, John B.	20	2	1,511
Wade, Charles E.	12	0	997
Perkins, Jeremy G.	10	1	799
Beekley, Alec C.	6	2	543
Jenkins, Donald H.	6	0	518
McLaughlin, Daniel F.	5	1	325
Salinas, Jose	5	0	266
Spinella, Philip C.	5	2	516
Grathwohl, Kurt W.	4	0	451
Niles, Sarah E.	4	1	236
Rasmussen, Todd E.	4	1	193
Rhee, P.	4	1	254
Kragh, John F., Jr.	3	1	263
Smith, David L.	3	0	143
Acheson, E.M.	2	1	100
Alam, H.B.	2	2	143
Baer, David G.	2	0	87
Blackbourne, Lorne H.	2	0	109
Bochicchio, Kelly M.	2	0	138
Burns, Travis C.	2	0	99
Champion, Howard R.	2	0	187
Clouse, W. Darren	2	1	86
Deguzman, R.	2	0	100
Dick, E.J.	2	0	100
Eliason, Jonathan L.	2	0	86
Hess, John R.	2	0	142
Inocencio, R.	2	0	143
Kauvar, David S.	2	0	109
Kheirabadi, B.S.	2	1	100
Koustova, E.	2	0	143
Lawnick, Mary M.	2	0	187
Macaitis, Joseph	2	0	218
Moore, Ernest E.	2	0	185
Moran, Kimberly A.	2	0	148
Murray, Clinton K.	2	0	147
Owens, Brett D.	2	2	218
Pearse, Lisa	2	0	187
Peck, Michael A.	2	0	86
Petersen, Kyle	2	1	144
Repine, Thomas	2	1	324
Rich, Norman M.	2	0	89
Schreiber, Martin A.	2	1	113
Sebesta, James A.	2	0	299
Walters, Thomas J.	2	0	87
Wenke, Joseph C.	2	0	218

battlefield from a potentially survivable injury.[14–16] The most cited military and civilian articles (#1, Borgman et al. [2007] and #8, Kashuk et al. [2008], respectively) were among these studies and addressed the combat casualty care topic that could arguably be considered to have had the greatest impact during the past 10 years, the potential for increasing survival by administering a high ratio of plasma to RBCs in exsanguinating patients. Since their publication, these articles that were included in the category "resuscitation" have stimulated a wide range of additional studies on both the 1:1 ratio[17] and related strategies, including a high platelet-to-RBC ratio,[18] in both combat and civilian trauma patients. These studies have also led to widespread changes in the treatment guidelines for managing patients with hemorrhage.[19,20]

The high interest in research on the treatment of hemorrhage was also evidenced by the large number of top cited articles focused on vascular injury and the use of hemostatic methods and devices (i.e., hemostatic agents/dressings and tourniquets). The topics of "hemostasis" and "vascular trauma" combined comprised 14 articles, which is equal to the number of articles in the category "resuscitation." The observation of an equal number of articles in these two topic areas is notable and reflects an appropriate balance of interest in research into identifying and controlling hemorrhage as well as restoring circulatory volume. The article by Kragh et al. (2009), "Survival with emergency tourniquet use to stop bleeding in major limb trauma," although #44 among the most cited articles, was nevertheless important for having an influence on increased use of tourniquets and for spurring interest in related research on devices to decrease junctional bleeding.[21] The most cited preclinical article (# 14, Alam et al., 2004), which investigated a hemostatic dressing, provides further evidence of the high interest and impact of research on hemorrhage using animal models.

Combat casualty epidemiology, the topic with the second highest number of articles among the 50 most cited, included articles describing the characteristics of combat casualties (e.g., #2, Owens et al., 2008) and efforts to develop the Joint Trauma System to respond to these injuries (e.g., #18, Eastridge et al., 2006). The Joint Theater Trauma Registry, the data repository collecting and hosting US Department of Defense trauma-related data for casualties admitted to a NATO Role III facility, was the data source for 3 of the 13 top-cited epidemiology articles. The relatively large number of epidemiologic studies, many of which focus on NATO Role III, may in part reflect the logistical and regulatory obstacles to conducting prospective clinical trials in the combat setting and the challenges in collecting out-of-hospital data from NATO Role I and II facilities.[22] However, these studies identify potential gaps in capability and performance and provide direction for the development of evidence-based research and process improvement efforts. The findings are also informing the development of new technologies and innovations and are serving as the basis for conducting long-term outcome studies.

Some topics representing a high injury burden in combat were not well represented among the top-cited articles. Orthopedic injuries comprise the highest percentage of anatomic injuries on the battlefield[23] and a high burden of long-term disability,[24] but only two articles focused on this topic (#7, Owens et al., 2007; and #43, Potter et al., 2007). The Joint Trauma System, a systematic and integrated approach that has revolutionized battlefield trauma care,[25] and traumatic brain injury, which can have serious long-term consequences,[26] were each represented by only one article in the ranking (#18, Eastridge et al., 2006, and #31, Armonda et al., 2006). Apart from the relevant articles in the hemostasis category, prehospital combat casualty care/epidemiology was represented by only one article (#46, Cooke et al., 2006), although it has been identified as a critical area for improving casualty survival in future conflicts.[27–29] Despite their low representation among the top cited articles, heightened interest and additional research on these topics within the combat casualty care community remain critically important.

Our study has several limitations. Articles of high interest that were published very recently have not had sufficient time to be as widely cited as those presented here. Future analyses will be needed to understand the true impact of research published during the period of the current conflicts. In addition, because the focus of our study was very broad (i.e., on combat casualty care in general), some topics such as prehospital care may not have been adequately represented. Given its importance, a separate analysis of the research on this topic is warranted. Finally, we did not evaluate the quality of the studies or attempt to assess their impact on clinical practice.

Despite these limitations, our study provides an informative analysis of combat casualty care citations and identifies the trauma management topics and individual articles of greatest interest and potential impact resulting from the first decade of sustained combat operations. The most cited articles published during the first 10 years of war reflect the most important cause of battlefield death, massive bleeding. Some important topics such as orthopedic injuries and prehospital care were not well represented among the top cited articles. These results demonstrate the importance of combat casualty research during this period not only for advancing military medicine but also for translating these lessons learned into civilian injury management paradigms. Future analysis of combat casualty care research will be useful in developing an injury care research agenda for both the military and civilian trauma care communities.

AUTHORSHIP

J.A.O. conducted the literature search and analyzed the data. J.A.O., B.J.E., D.G.B., T.E.R., and L.H.B. designed the study. All authors interpreted the data. J.A.O., B.J.E., and L.H.B. wrote the manuscript, which D.G.B., R.T.G., and T.E.R. critically revised.

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DISCLOSURE

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