

An Inventory of the Combat Medics' Aid Bag

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ABSTRACT

Introduction: Tactical Combat Casualty Care (TCCC) recommends life-saving interventions; however, these interventions can only be implemented if military prehospital providers carry the necessary equipment to the injured casualty. Combat medics primarily use aid bags to transport medical materials forward on the battlefield. We seek to assess combat medic materiel preparedness to employ TCCC-recommended interventions by inventorying active duty, combat medic aid bags. **Methods:** We sought combat medics organic to combat arms units stationed at Joint Base Lewis McChord. Medics volunteered to complete a demographic worksheet and have the contents of their aid bag photographed and inventoried. We spoke with medic unit leadership prior to their participation and asked that the medics bring their aid bags in the way they would pack for a combat mission. We categorized medic aid bag contents in the following manner: (1) hemorrhage control; (2) airway management; (3) pneumothorax treatment, or (4) volume resuscitation. We compared the items found in the aid bags against the contemporary TCCC guidelines. **Results:** In January 2019, we prospectively inventoried 44 combat medic aid bags. Most of the medics were male (86%), in the grade of E4 (64%), and had no deployment experience (64%). More medics carried a commercial aid bag (55%) than used the standard issue M9 medical bag (45%). Overall, the most frequently carried medical device was an NPA (93%). Overall, 91% of medics carried at least one limb tourniquet, 2% carried a junctional tourniquet, 31% carried a supraglottic airway (SGA), 64% carried a cricothyrotomy setup/kit, 75% carried a chest seal, and 75% carried intravenous (IV) fluid. The most commonly stocked limb tourniquet was the C-A-T (88%), the airway kit was the H&H cricothyrotomy kit (38%), the chest injury set were prepackaged needle decompression kits (81%), and normal saline was the most frequently carried fluid (47%). Most medics carried a heating blanket (54%). **Conclusions:** Most medics carried materials that address the common causes of preventable death on the battlefield. However, most materials stowed in aid bags were not TCCC-preferred items. Moreover, there was a small subset of medics who were not prepared to handle the major causes of death on the battlefield based on the current state of their aid bag.

KEYWORDS: combat; medic; aid bag; military

Introduction

Background

The TCCC guidelines are a set of evidence-based, prehospital trauma management recommendations specifically designed for the austere, combat setting.^{1,2} Military armed conflict introduces numerous factors not encountered in civilian trauma medicine that must inform and influence medical management expectations placed on military prehospital providers, namely combat medics. In particular, "equipment must be simple, light, and rugged."³ A life-saving intervention may be rendered useless if it cannot be carried to battlefield casualties and effectively administered by combat medics, potentially under hostile fire.

Front-line, combat medics have few options to transport medical materiel to the point of injury. The primary method utilized by combat medics are aid bags, or backpacks worn over the uniform and body armor where size and weight are of the utmost importance.⁴ Excessive size and weight increase physical exertion and limits mobility, especially in hostile situations where rapid mobility is of the highest importance. The US Army currently fields the M9 medical bag and several commercial vendors offer variations of aid bags and self-contained litter kits—in addition to smaller pouches that are worn on the thigh or attached to body armor—that combat medics may use.⁵ In addition to the size and weight limitations, medics can carry only what is logistically available. Multiple, previously published military studies attribute medical materiel shortfalls to the deployed, medical logistical system.^{6–11}

Despite more than two decades of TCCC and numerous published studies related to TCCC, there are no published data that describe and evaluate the combat medic aid bag and its capacity to facilitate TCCC-recommended, life-saving interventions.

Goal of This Investigation

We seek to assess combat medic materiel preparedness to use TCCC-recommended interventions by inventorying active duty combat medic aid bags.

Methods

We sought soldiers with the military occupational specialty (MOS) 68W, with or without special skills identifiers, assigned to a brigade combat team. We asked medics with personal aid bags (i.e., not unit issued) to bring their aid bags for

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equipment inventorying. Before participating, we contacted relevant unit leadership and asked that the medics bring their aid bags in the way they would pack for a combat mission (without medications).

Ethics

We submitted project proposal H-18-035 to the US Army Institute of Surgical Research (USAISR) regulatory support division. Our project met all USAISR regulatory requirements for performance improvement not requiring institutional review board oversight. Participants volunteered to complete the aid bag inventory and associated survey. Additionally, we obtained approval to inventory and photograph aid bags from the relevant chain of command.

Surveys

We prospectively administered surveys to combat medics. Surveys solicited data on each subject's demographics and prior operational experience. The surveys also solicited data regarding the contents of each subjects' aid bag (see the Survey online at <https://jsom.us/SchauerSurvey>).

TCCC Guidelines and Lifesaving Interventions

We categorized medic aid bag contents according to the category of life-saving intervention facilitated by each piece of equipment: (1) hemorrhage control; (2) airway management; (3) pneumothorax treatment, or (4) volume resuscitation. We used TCCC Guidelines for Medical Personnel (version 31 January 2017) to define the equipment that medics should carry in their aid bags and compared carried equipment against that stipulated in the guidelines. Depending on the item and its intended use, we also captured subcategories (generally by manufacturer or brand). We consolidated commodity items (e.g., interchangeable and not requiring any training to use a different make or brand) under a single category.

Data Analysis

We performed all statistical analysis using Microsoft Excel (version 10, Redmond, WA) and JMP Statistical Discovery from SAS (version 13, Cary, NC). We used descriptive statistics.

Results

In January 2019, we prospectively inventoried 44 combat medic aid bags from units assigned to the 7th Infantry Division. A majority of the medics were male (86%), in the military grade of E4 (64%), and had no deployment experience (64%). Slightly more medics carried a commercial aid bag (55%) than used the standard issue M9 medical bag (45%). The most prevalent medical device was a nasopharyngeal airway (93%). For massive hemorrhage control, the most commonly found item was the C-A-T tourniquet (88%). The H&H cricothyrotomy kit (38%) was the most frequently packed advanced airway device. In the pneumothorax treatment category, the most prevalent item was a prepackaged needle decompression kit (81%). In the circulation category, normal saline was the most frequently carried fluid (47%). In addition, 75% carried a SAM splint and a heating blanket (54%) (Table 1).

Discussion

We inventoried active duty combat medic aid bags to evaluate materiel preparedness to deliver TCCC-recommended, life-saving interventions. Overall, we found most medics carried

TABLE 1 Demographics of Medics With Aid Bags Inventoried*

		% (n) or Median (IQR)
Demographics	Age, y	23 (31–29)
	Sex, male	86% (32)
	E2	5% (2)
	E3	5% (2)
	E4	64% (24)
	E5	21% (8)
Rank	E6	3% (1)
	Deployment experience	None
	1	18% (7)
	2	5% (2)

*We were unable to link seven aid bags to surveys for demographic information.

materiel to address the most common preventable causes of death on the battlefield (Table 2). However, few of the specific devices carried were preferred by TCCC. More medics used a commercial, nonstandard aid bag than used the unit-issued M9 medical bag. More concerning is that 9% of medics did not have any limb tourniquets, 98% did not have a junctional tourniquet, 69% did not have an SGA, 36% did not have a cricothyrotomy setup, 25% did not have a chest seal, and 25% did not have any IV fluids. Ostensibly, these medics are not prepared to handle potentially preventable causes of battlefield deaths. Of note, the majority of the medics reported no deployment experience, suggesting that most lacked much, if any, real-world experience.

Hemorrhage is the most common cause of preventable death on the battlefield.^{12,13} TCCC recommends the following items for hemorrhage control: limb tourniquet, junctional tourniquet (JTQ), and hemostatic dressings (Combat Gauze preferred; Celox Gauze, ChitoGauze, or XStat acceptable).² Almost all medics (94%) carried a CoTCCC-approved limb tourniquet. However, only one medic (2%) possessed a JTQ and no medics packed hemostatic dressings. During the recent conflicts in Afghanistan and Iraq, it was standard unit practice for all service members to carry C-A-T tourniquets in the pockets of their uniforms.⁵ US Army standard issue now also includes the improved first aid kit (IFAK) that contains C-A-T tourniquets and a hemostatic dressing. US Army combat lifesavers (CLS) receive CLS bags that also contain C-A-T tourniquets and hemostatic dressings.¹⁴ However, none of these medical kits contain a JTQ. Junctional hemorrhage surpassed extremity hemorrhage as the most common cause of preventable death on the battlefield after widespread distribution of limb tourniquets. Given multiple, readily available alternative sources for limb tourniquets, we recommend unit medical leadership consider having medics pack JTQ, not limb tourniquets, in their aid bags to maximize hemorrhage control measures in the forward battlespace.

Airway compromise was the second most common cause of preventable death on the battlefield.^{12,13} TCCC recommends the following items for airway management: NPA, supraglottic airway (SGA; i-Gel preferred), and cricothyroidotomy kit (Cric-Key preferred). Of all items, NPA was the most commonly stowed medical materiel (93%). Curiously, published data on military prehospital airway management during the recent conflicts in Afghanistan and Iraq demonstrate rare utilization of the NPA.^{6,15} Most medics (65%) possessed a cricothyroidotomy kit in their aid bag; however, only 1 (3.4%) was the TCCC-preferred Cric-Key. Only 31% of medics carried an

TABLE 2 Itemized Aid Bag Inventory

Category	Item	% (n)
Aid bag	Standard issue M9	45% (20)
	Nonissue bag	55% (24)
Hemorrhage	Any tourniquet	91% (40)
	SOFTW	6% (3)
	C-A-T	88% (39)
	Other	0% (0)
	Any junctional tourniquet	2% (1)
	JETT	0% (0)
	SAM	2% (1)
	Other	0% (0)
	XSTAT	0% (0)
Airway	NPA	93% (41)
	OPA	29% (13)
	BVM	31% (14)
	Suction device	15% (7)
	Any SGA device	31% (14)
	KingLT (any size)	31% (14)
	Combitube	0% (0)
	LMA	0% (0)
	Any cricothyrotomy equipment	64% (28)
	Control-Cric	2% (1)
	H&H cricothyrotomy kit	38% (17)
	NAR cricothyrotomy kit	25% (11)
	Other cricothyrotomy kit	0% (0)
	Endotracheal tube	2% (1)
	Macintosh blade	2% (1)
	Miller blade	2% (1)
	ETT holder	0% (0)
Pneumothorax	Stethoscope	47% (21)
	Any chest seal	75% (33)
	Chest seal – H&H	41% (18)
	Chest seal – NAR	27% (12)
	Chest seal – other	27% (12)
	Chest tube	2% (1)
	Chest tube kit (prepackaged)	2% (1)
	Prepackaged needle decompression kit	81% (36)
Circulation	Any IV fluid	75% (33)
	Hextend	2% (1)
	Lactated Ringers	36% (16)
	Saline	47% (21)
	Other	2% (1)
	Pressure bag	0% (0)
	Warmer – EnFlow	0% (0)
	Warmer – Thermal Angel	0% (0)
	Warmer – other	0% (0)
Monitoring	Pulse oximetry	47% (21)
	Colorimetric end-tidal CO ₂	2% (1)
	Blood pressure cuff	0% (0)
Miscellaneous	SAM splint	75% (33)
	Pelvic binder	2% (1)
	Cervical collar	9% (4)
	Heating blanket	54% (23)
	Atomizer	0% (0)
	Eye shield	57% (25)

SGA and none were the TCCC-preferred i-Gel SGA. Only 15% of medics carried any suction device, and all were manually operated disposable units. Our findings demonstrate medics rarely carried TCCC-preferred airway management devices. This finding may be due to a mismatch in TCCC recommendations and the US Army medical logistics system. We recommend the CoTCCC incorporate US Army Medical Materiel Agency representatives in its periodic guideline review and updates to synchronize the medical and logistical communities.

TCCC guidelines recommend blood products for resuscitation of hypotensive combat casualties.² In the absence of blood products, TCCC recommends the following intravenous fluids by precedence: Hextend then LR/Plasma-Lyte A. TCCC recommends against NS. Most of the medics carried NS (47%), while less stowed TCCC-recommended fluids: 2% Hextend and 36% LR. While logistical constraints may explain fewer medics carrying TCCC-recommended fluids, it does not account for medics packing a product (NS) that TCCC recommends against. This finding suggests medics and unit medical leadership may not be well versed in TCCC guidelines as the cost differences are not substantial enough to limit use of LR. We recommend periodic TCCC training for medics and medical unit leadership to improve TCCC guideline adherence.

Study Limitations

Our study has several important limitations. First, we specifically instructed medics and unit leadership to pack aid bags as they would for combat operations. Despite this request, it is possible that some participants did not adhere and this may account for some of our findings. Second, medics pack only the medical materiel available in the logistics system. Consequently, deficiencies in unit medical stores may account for some of our findings. Correspondingly, unit medical leaders may be accountable for non-perishable medical equipment (e.g., pulse oximeters) and, as a result, may not issue those items to medics for stowage in individual aid bags. Conversely, some medical materiel may be expendable and in ample supply and thus be carried by more medics in our study. Third, medical units are centrally issued medical materiel as part of sets, kits, and outfits. Although units may order medical supplies, they can only order what is available in the system. Newer items that are commercially available (e.g., i-Gel SGA, Cric-Key cricothyroidotomy kit, etc.) may not be part of issued equipment and/or available via logistical resupply. Consequently, some of our findings may reflect a logistical supply system still updating its inventory. A consideration for a future study would be assessing for equipment requested that was not received as that may better highlight shortages related to logistical challenges. Last, while the Army frequently employs a “train as you fight” mantra, the logistical supply chain and unit budgets are vastly different in the garrison setting compared to the predeployment/deployment phases and thus this may influence materiel product availability and oversight.

Conclusions

Most medics carried materiel that address the common causes of preventable death on the battlefield. However, most materiel stowed in aid bags were not TCCC-preferred items. Moreover, there was a small subset of medics that were not prepared to handle the major causes of death on the battlefield with the current state of their aid bag.

Disclaimer

Opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Air Force, the Department of the Army, or the Department of Defense.

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Disclosure

The authors have none to report.

Author Contributions

SGS is the principal investigator and was involved in all aspects of the study. JFN was involved in protocol development, data collection, data interpretation and manuscript development. NU was involved in data collection and manuscript development. MDA and RAD were involved in grant submission, protocol development, data interpretation and manuscript development. All authors contributed significantly to this project.

References

1. Butler FK Jr, Hagmann J, Butler EG. Tactical Combat Casualty Care in Special Operations. *Mil Med*. 1996;161(suppl 1):3–16.
2. Butler F. TCCC Updates: Two Decades of Saving Lives on the Battlefield: Tactical Combat Casualty Care Turns 20. *J Spec Oper Med*. 2017;17(2):166–172.
3. Butler FK Jr, et al. Tactical combat casualty care 2007: evolving concepts and battlefield experience. *Mil Med*. 2007;172(suppl 1):1–19.
4. The Soldier's Heavy Load. <https://www.cnas.org/publications/reports/the-soldiers-heavy-load-1>, Accessed: 06 October 2019.
5. Kotwal RS, et al. Saving lives on the battlefield: a joint trauma system review of pre-hospital trauma care in combined joint operating area-Afghanistan (CJOA-A). 2013, Central Command MacDill AFB FL.
6. Schauer SG, et al. Prehospital airway management in Iraq and Afghanistan: a descriptive analysis. *South Med J*. 2018;111(12):707–713.
7. Schauer SG, et al. Trends in prehospital analgesia administration by us forces from 2007 through 2016. *Prehosp Emerg Care*. 2019;23(2):271–276.
8. Schauer S, et al. Chest Seal Placement for Penetrating Chest Wounds by Prehospital Ground Forces in Afghanistan. *J Spec Oper Med*. 2017;17(3):85–89.
9. Schauer SG, et al. An analysis of casualties presenting to military emergency departments in Iraq and Afghanistan. *Am J Emerg Med*. 2019;37(1):94–99.
10. Naylor JF, et al. Non-battle emergency department utilization of the first modular army field hospital prototype in support of Operation Inherent Resolve. *Mil Med*. 2018;184(5–6):e168–e171.
11. Schauer SG, et al. A descriptive analysis of casualties evacuated from the Africa area of operations. *Afr J Emerg Med*. 2019;9: S43–S46.
12. Eastridge BJ, et al. Died of wounds on the battlefield: causation and implications for improving combat casualty care. *J Trauma Acute Care Surg*. 2011;71(1):S4–S8.
13. Kelly JF, et al. Injury severity and causes of death from Operation Iraqi Freedom and Operation Enduring Freedom: 2003–2004 versus 2006. *J Trauma Acute Care Surg*. 2008;64(2):S21–S27.
14. Flecha I, et al. Combat lifesaver-trained, first-responder application of junctional tourniquets: a prospective, randomized, cross-over trial. *Mil Med Res*. 2018;5(1):31.
15. Laike JR, et al. Prehospital interventions performed in a combat zone: a prospective multicenter study of 1,003 combat wounded. *J Trauma Acute Care Surg*. 2012;73(2):S38–S42.



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