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Journal of Special Operations Medicine

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MSG Michael Brochu, USA	Jul 01 - May 04
HMCM Gary E. Welt, USN	May 04 - Jun 06
HMCM Glenn Mercer, USN	Jul 06 - Present

HMCM Gary Welt
10 May 04 - 30 Jun 06

SOCM Glenn Mercer
18 Jul 06 - Present

This Edition's Feature Articles:

Dedicated to the Indomitable Spirit & Sacrifices of the SOF Medic

Journal of Special Operations Medicine

Contents

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COVER

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Past and present Senior Enlisted Medical Advisors

From the Editor

The Journal of Special Operations Medicine (JSOM) is an authorized official military quarterly publication of the United States Special Operations Command (USSOCOM), MacDill Air Force Base, Florida. The JSOM is not a publication of the Special Operations Medical Association (SOMA). Our mission is to promote the professional development of Special Operations medical personnel by providing a forum for the examination of the latest advancements in medicine and the history of unconventional warfare medicine.

 Articles, photos, artwork, and letters are invited, as are comments and criticism, and should be addressed to Editor, JSOM, USSOCOM, SOC-SG, 7701 Tampa Point Blvd, MacDill AFB, FL 33621-5323. Telephone: DSN 299-5442, commercial: (813) 826-5442, fax: -2568; e-mail JSOM@socom.mil. The JSOM is serial indexed (ISSN) with the Library of Congress and all scientific articles are peer-reviewed prior to publication. The Journal of Special Operations Medicine reserves the right to edit all material. No payments can be made for manuscripts submitted for publication.

Distribution: This publication is targeted to SOF medical personnel. There are several ways for you to obtain the Journal of Special Operations Medicine (JSOM). 1) USSOCOM-SG distributes the JSOM to all our SOF units and our active editorial consultants. 2) SOMA members receive the JSOM as part of membership. Please note, if you are a SOMA member and are not receiving the subscription, you can contact SOMA through http://www.trueresearch.org/soma/ or contact MSG Russell Justice at justicer@earthlink.net. SOMA provides a very valuable means of obtaining SOF related CME, as well as an annual gathering of SOF medical folks to share current issues. 3) For JSOM readers who do not fall into either of the above mentioned categories, the JSOM is available through paid subscription from the Superintendent of Documents, U.S. Government Printing Office (GPO), for only $30 a year. Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954. GPO order desk -- telephone (202) 512-1800; fax (202) 512-2250; or visit http://bookstore.gpo.gov/subscriptions/alphabet.html. You may also use this link to send a email message to the GPO Order Desk—orders@gpo.gov. 4) The JSOM is online through the Joint Special Operations University's new SOF Medical Gateway; it is available to all DoD employees at https://jsoupublic.socom.mil/publications/index.php. On the left you will have several tabs; you must first "log-in" using your SS#, DOB, and name; then go to "publications." Scroll down until you get to the JSOM and click on the picture. From this site, you can link straight to the Government Printing Office to subscribe to the JSOM. We are working with the JSOU to have a SOCOM-SG medical site; we will keep you posted as that progresses. 5) The JSOM can also be emailed in PDF format; if you would like to be added to the PDF list please send your request to JSOM@socom.mil.

We need Continuing Medical Education (CME) articles!!!! Remember, our continuing education is for all SF medics, PJs, and SEAL corpsmen. In coordination with the Uniformed Services University of Health Sciences (USUHS), we also offer CME/CNE to physicians, PAs, and nurses.

JSOM CME consists of an educational article which serves to maintain, develop, or increase the knowledge, skills, and professional performance and relationships that a physician uses to provide services for patients, the public, or the profession. The content of CME is that body of knowledge and skills generally recognized and accepted by the profession as within the basic medical sciences, the discipline of clinical medicine, and the provision of healthcare to the public. A formally planned Category 1 educational activity is one that meets all accreditation standards, covers a specific subject area that is scientifically valid, and is appropriate in depth and scope for the intended physician audience. More specifically, the activity must:

- Be based on a perceived or demonstrated educational need which is documented
- Be intended to meet the continuing education needs of an individual physician or specific group of physicians
- Have stated educational objectives for the activity
- Have content which is appropriate for the specified objectives
- Use teaching/learning methodologies and techniques which are suitable for the objectives and format of the activity
- Use evaluation mechanisms defined to assess the quality of the activity and its relevance to the stated needs and objectives

To qualify for 1 CME, it must take 60 min to both read the article and take the accompanying test. To accomplish this, your articles need to be approximately 12 - 15 pages long with a 10 - 15 question test. The JSOM continues to survive because of the generous and time-consuming contributions sent in by physicians and SOF medics, both current and retired, as well as researchers. We need your help! Get published in a peer-review journal NOW! See General Rules of Submission in the back of this journal. We are always looking for SOF-related articles from current and/or former SOF medical veterans. We need you to submit articles that deal with trauma, orthopedic injuries, infectious disease processes, and/or environment and wilderness medicine. More than anything, we need you to write CME articles. Help keep each other current in your re-licensure requirements. Don't forget to send photos to accompany the articles or alone to be included in the photo gallery associated with medical guys and/or training. If you have contributions great or small… send them our way. Our e-mail is: JSOM@socom.mil.

Lt Col Michelle DuGuay Landers

Dedication

SFC Nathan L. Winder

SFC Nathan Winder died from a GSW to the neck June 26, 2007 while assisting the 984th MP north of Diwaniyah, Iraq.

Born in Seoul, South Korea, Winder, 32, was raised in Utah. He was assigned to 2nd Battalion, 1st Special Forces Group (Airborne) at Fort Lewis, WA and deployed to Iraq in support of Operation Iraqi Freedom as a member of the Combined Joint Special Operations Task Force – Arabian Peninsula.

Winder enlisted in the Army August 31, 1993, as a mechanized infantryman. After completing basic and advanced individual training at Fort Benning, GA, he was assigned to Company B, 1st Battalion, 41st Infantry Regiment at Fort Riley, KS. He later served as a Bradley Fighting vehicle section leader with 1st Bn, 9th Infantry Regiment at Camp Hovey, Korea and as a dismounted squad leader with 1st Bn, 5th Cavalry Regiment at Fort Hood, TX.

In 2003, he was selected to attend the Special Forces Qualification Course at Fort Bragg, to become a Special Forces Medic. He earned the coveted Green Beret in 2006 and was assigned to the 1st Special Forces Group (Airborne) at Fort Lewis, WA.

Winder's military education also includes the Warrior Leaders Course, Basic Noncommissioned Officer Course, and Basic Airborne Course.

His awards and decorations include: Army Commendation Medal, Army Achievement, Good Conduct Medal, National Defense Service Medal, Global War on Terrorism Service Medal, Korean Service Medal, Noncommissioned Officer Professional Development Ribbon, Army Service Ribbon, Overseas Service Ribbon, Expert Infantryman Badge, Parachutist Badge, Driver/Mechanics Badge, Special Forces Tab, Bronze Star Medal, Purple Heart, Meritorious Service Medal, Iraqi Campaign Medal, and the Combat Infantryman Badge.

Nathan is survived by his wife, son, and parents.

From the Command Surgeon

WARNER D. "Rocky" FARR
COLONEL, U.S. ARMY
Command Surgeon
HQ USSOCOM

Several issues ago we published a cover with some of the former USSOCOM Command Surgeons on it who had contributed to making the *Journal of Special Operations Medicine* (JSOM) the quality medical publication that it is today. However, all the changes, mostly for the good I hope, that have come out of the Command Surgeon's office would not have been possible without the quality senior enlisted medical advisors working as partners with the surgeons, so this JSOM cover is for them. We included a chart with the names of ones we could not find pictures of. These predecessors of ours have left a proud legacy. Two of them still work here on post and I am privileged to see them on a recurring basis. We owe all of them a great deal of thanks.

This issue of the JSOM follows the December 2007 Special Operations Medical Association (SOMA) meeting here in Tampa. SOMA continues to grow; we expected 1000 attendees perhaps, up from 800 last year, and ended up getting more like 1200. I attached some of the slides that I presented at SOMA at the end of this column. We plan to publish another JSOM Lesson Learned Supplement, which will include more from the SOMA conference. For preparing such an outstanding conference I heartily congratulate the SOMA leadership: Bob Saum, Bob Harrington, Russ Justice, Sammy Rodriguez, and Dave Davis! Dr. Harrington continues to grow a more robust program each meeting and the attendees overwhelmingly liked the small group sessions. Particularly noteworthy were the number of foreign SOF medical soldiers in attendance. With the growth of Theater Special Operations Command Surgeons I hope even more allies will participate and give presentations. Bob Harrington continues to search for enlisted Medics to speak so step up to the plate. SFC Miguel Davila from USASOC gave an excellent talk entitled "Strategic Lessons from a UW Clinic."

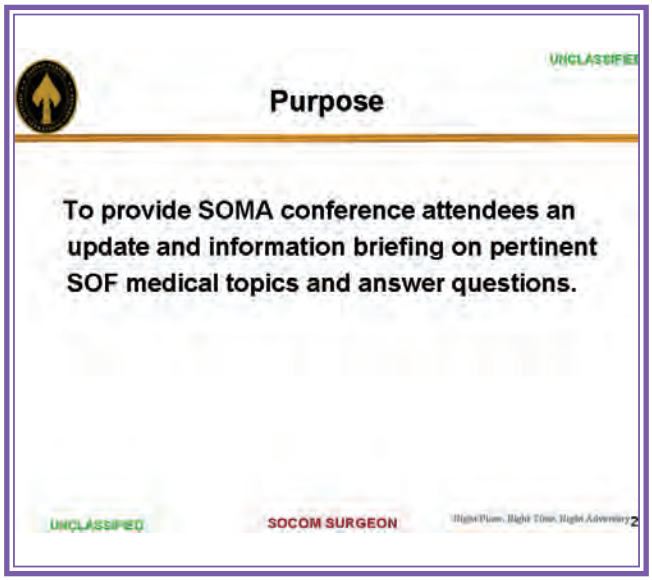
The conference arrangements were, for the first time, run by a professional corporation and it showed. The SOMA website is now run by them at: http://www.trueresearch.org/soma/. There were some bobbles as SOMA transitions from a small, personal organization to a professional enterprise but all in all I though it a great improvement. We should be able to accommodate even more vendors with this change. The vendors are like family, I say, since they are with us every year and very supportive. We owe them a vote of thanks. It was also nice to see the "gray beards," the former SOMA presidents, there: Allen Moloff, Craig Llewellyn, and Jimmy Coy. This was the twentieth anniversary, depending on how you are counting; it is truly breathtaking to see the change and growth.

I tried to attend all of the component conferences the weekend before SOMA. The Army conference seemed the biggest, but the Navy was a very close second. It was also nice to see the Marines in full participation. All seemed very useful to getting component business done. One thought to consider is how SOMA can do things, most probably through the small group sessions, that will count toward component medic certification training? An example would be if SOMA can be a portion of Special Forces' requirement on its Medics for non-trauma module training. This might not only be good for our Medics but would be a way to ensure attendance if it checked off some commander's box. Pass any comments on this to my Chief of Training, Lieutenant Commander Patterson, at joe.patterson@socom.mil.

Captain Scotty Gilpatrick from my training section, presented data on the Advanced Tactical Practitioner (ATP) test and card at several of the component sessions. Send any card or certification issues concerning the SOF interoperable medic standard and its sustainment to him at: scott.gilpatrick@socom.mil.

In addition, a first at the SOMA conference was a meeting of all of the Theater Special Operations Command (TSOC) Surgeons! We had LTC Rusty Rowe from SOCEUR; LTC John Gill from SOCSOUTH; COL Bob Noback from SOCCENT; his incoming replacement, LTC Ric Ong; and LTC(P) Frank Newton on his way from 1st SFG(A) to SOCPAC. These TSOC Surgeons are your key contact for theater evacuation issues and forward SOF surgical support issues. For too long we have accepted high-risk plans (that is a nice way to say, *"We have no plan and are sticking to it")* on SOF surgical care and evacuation in the immature theaters that we usually work in. These surgeons can advocate with their commanding generals on the need for better plans and can write better war plans and medical annexes. They can also require the geographic combatant commands to support you. I consider them so important that I have asked them to each provide a column in each issue of the JSOM. The last issue started with SOCCENT's first column and this issue starts SOCSOUTH's first.

We also had a Biomedical Initiatives Steering Committee meeting crammed into SOMA week, along with our Curriculum Evaluation Board, or Requirements Board, our Medical Acquisitions and Logistics board. Good thing the holidays were there to recuperate!



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Tactical Combat Casualty Care Training

- To ensure a basic level of training and standardization of medical equipment to all combatants in order to reduce the mortality of injuries sustained on the battlefield.
  - Who- Both medics and non-medics
  - What- Training and equipment
  - Where- At their home station
  - When- Prior to deploying to a combat zone
  - Why-
    - "Humans are more important than hardware"
    - Potential for medics to become a casualty
    - Potentially Preventable Battlefield Deaths by non-medical personnel intervention

Bottom Line Up Front : TC3 concepts and equipment are saving lives on the battlefield & are endorsed by ACS COT and PHTLS

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TCCC Feedback

- 1st 82 SOF Deaths-Potentially Survivable Wounds in the GWOT(12)
- Factors That *Might* Have Changed Outcomes
- Surgical airway vs. intubation(1)
- Hemostatic dressings/direct pressure(2)
- Tourniquets (3)
- Needle thoracostomy
- PRBCs on helos (2)
- Battlefield antibiotics
- Faster CASEVAC time

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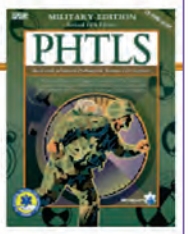

"For this reason, the appropriate care while under fire that achieves both the best long-term result for those already wounded as well as preventing further injury to other team members is often stated as "accurate return fire."

UNCLASSIFIED SOCOM SURGEON Right Place, Right Time, Right Adversary 7

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Command Medic Certification Program

Our Medics Are Different

"Special care should be taken in selecting the hospital corpsmen to accompany the force. In many cases, an enlisted corpsman will be required to make the diagnosis & administer the medication normally prescribed by a medical officer."

NAVMC 2890—*SMALL WARS MANUAL, U.S. MARINE CORPS* (1940)

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CMCP Advanced Tactical Practitioner (ATP) Update

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USSOCOM Surgeons Office Command Medic Certification Program

- ATP Mission: Certify SOF Level I Ground Combat Medics within USSOCOM to perform command developed critical tasks to the interoperable SOF Medic standard
- We test all SOCM Classes and all PJ courses
- Must have an ATP card to deploy with a USSOCOM unit as a medic and to attend SOCMSSC (USSOCOM 350-29)

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USSOCOM Surgeons Office Command Medic Certification Program

- USSOCOM Surgeons Office maintains a database of all who have tested the ATP from the first SOCM class of 2006 and PJ Course of 2007 as well as all of the previously maintained SOF Paramedic applications
- Database
  - Army
  - Navy
  - Air Force
  - Marine
  - Civilian and International

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USSOCOM Surgeons Office Command Medic Certification Program

- How many have taken the ATP:
  - JSOMTC:
  - Kirtland AFB / PJ School:
- ATP Future:
  - Web based or Online ATP exams
  - Video ATP questions
  - Larger bank of questions
  - Eligibility for NREMT-P

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CONTACT US !!!!!!

- Please call or email us with any questions
  - Deputy Surgeon for Clinical Operations- COL Bob Vogelsang
  - Chief USSOCOM Education and Training- LCDR Joe Patterson
  - Command PA and ATP Coordinator- CPT Scott Gilpatrick
  - Medical Training NCO- MSGT Diane Hinck
  - (813) 826-5065, 5043, 2948
  - stp@socom.mil
  - stp@hqsocom.socom.smil.mil

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Journal of Special Operations Medicine

- Lt Col Michelle DuGuay Landers (813-826-7544)
- Updates from Component, TSOC, and USASFC Surgeons
- CME for physicians, PAs, nurses and medics
- Available Online @ JSOU and SOMA
- Examples…
  - Case reports from SOF first responders
  - Scientific articles
  - Medical Quiz
  - Human Performance Forum
- NOBODY else does this!

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Journal of Special Operations Medicine "Supplements"

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Antivenin

- In all AORs we are subject to envenomation by animals for which there is no FDA-approved antivenin
- Host nations may have antivenins for particular animals, but cannot be used by DOD without IND policy
- USSOCOM working to create and have approved a policy allowing SOF to use local, non-FDA approved antivenins in all AORs
  - To achieve this, we need to provide OSD(HA)/FDA with information on the local antivenins to be used
  - To comply with OSD(HA)/FDA, we will be asking COCOMs for this information
- Due to nature and locations SOF operate, USSOCOM will also ask for exception to policy to allow use of IND antivenins below Level III medical facilities

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ACQUISITION AUTHORITY

- COMMANDER USSOCOM's Authority (10 USC Section 167)
- Develop and Acquire Special Operations-Peculiar Equipment
- Acquire Special Operations-Peculiar Material, Supplies, and Services
- Head of Agency for Acquisition Authority
- Head of Contracting Activity

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SOF Tactical Combat Casualty Care (TCCC) Acquisition Program

- Unit Level TCCC Kits (Increment I)
  - Individual Operator Kit
  - SOF Medic/Corpsman TCCC Protocol Kit
- Group Level TCCC Kits (Increment II)
  - CASEVAC Kits
  - Medical Officer Kits

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AT&L Initiatives

- Medical Acquisition Production & Deployment
  - SOF Variant RG-33 MRAP
    - Program Manager PEO-SOF Warrior
    - Partners SOCOM SG, SOAL-SW, USAMMA, SOFSA, USASOC-SG
    - Phase: Fielding of SOF RG-33 CASEVAC capability.
    - MFP 11 Procurement $1.1M
    - Supports 255 USSOCOM RG-33 Vehicles

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USSOCOM RG-33

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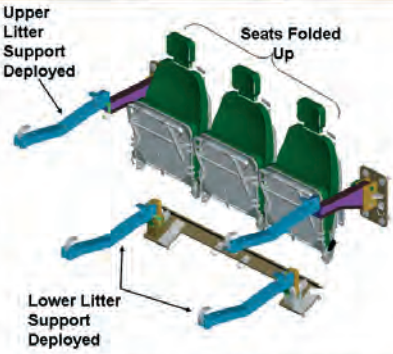
USSOCOM RG-33

- To deploy litter supports, first fold up seats out of the way
- Fold the upper and lower litter support arms our from the stowed position
- Insert locking pins to secure the arms in deployed position



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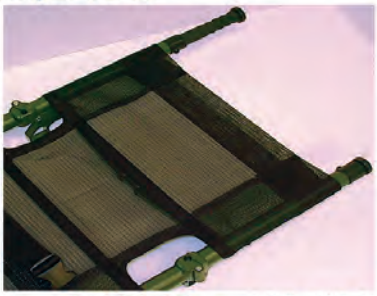
USSOCOM RG-33

2007 Collapsible End Litter
2 ea. Litters per RG-33



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USSOCOM RG-33 CASEVAC Kit

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Theater Special Operations Commands

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Level II Bottom Line

- MFP-11 bought SOF Level I manpower and SOF-unique training
- MFP-11 bought some SOF Level II manpower and SOF-unique training
- Level III and above is an EA responsibility
- To save lives, SOF must have level II capability to bridge the gap between medics and conventional medical force

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How do we grow SOF Level II ?

- USSOCOM Chief of Staff directed all components to ID level II requirements.
- Requirements for level II must be worked concurrently with USSOCOM, GCCs and Services with POM 10-15 milestones.
  - Components, with TSOC inputs, provide requirements.
  - SOCOM validates the requirements and works joint solutions where required.
  - Components take to their services validated requirements and work through their requirements and resourcing processes.
- Resourcing could be MFP-2, 8 or 11, depending on the POM decisions.

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ENLISTED CORNER

SENIOR ENLISTED MEDICAL ADVISOR (SEMA)
SOCM GLENN MERCER

My staff section was recently tasked with redrafting the Commander's Policy on Performance Enhancing Substances. In late 2003, a policy of total prohibition was issued to the Force that progressively became an impediment to emerging exercise and metabolic science. While the initial decision to use prohibition as a solution to the risk of rampant poly-pharmacy in the qualification courses, it also made the reasonable and rational use of performance enhancing substances a violation, even when most were acquiring these as commercial off-the-shelf (COTS) products through the Exchange Services. The 2003 policy in its strictest interpretation prohibited the use of even multi-vitamin supplements or coffee if used deliberately for the purpose of improving your performance.

Ultimately, the use of absolute prohibition to mitigate behavior was no longer supportable. It was evident through service level literature, SOF-specific investigations, and leaders' observations, that a significant percentage of the force was not only using some form of supplementation, but in many cases, the sole source of education regarding purpose and efficacy of them was vendors literature. The conflict of interest is obvious.

During the development of the new policy there was great debate about whether it was even possible to establish a new hierarchy of thought when it comes to having a policy about performance enhancers. When you consider every possible substance that can be purchased or acquired and subsequently ingested, this topic grows exponentially – to a massive level. One of the critical changes was establishing the correct basic vocabulary that captured the topic at both the *macro* and *micro* levels.

The 2008 policy can essentially be distilled down to a few simple statements. You may use and patronize what is legal. Class I, IB, and VIII materials are not part of this policy. USSOCOM has shifted from prohibition to aggressive education as to the policy regarding performance enhancers. USSOCOM neither condones nor endorses the use of performance enhancers. If prohibited or illicit items are found in your system, you will be subjected to disciplinary action. Commanders and officers-in-charge may have a more stringent local policy.

To support this new policy, a website has been established on the SOFNet that will act as the clearinghouse for all queries. Personnel that submit a request for information (RFI) into that system will receive a response that has a policy stamp attached to it. While the core model is intended to be simple I/O for information, we realize in advance that a host of consulting agents will be necessary to answer some questions. It is anticipated that this Secret Internet Protocol Router Network (SIPR) backbone will parlay into the future that humans are more important than hardware (HMITH) information solutions and act as our model for IT upgrades when the larger concepts associated with human performance and professional sports models are under the surgeons' auspices.

The SOCOM Biomedical Initiatives Steering Committee (BISC) provided additional support with the completion of the SOF Nutrition Manual, which had not been updated for over 10 years. With some 15 chapters written by industry experts, it is a timely and comprehensive reference that will be placed at the front of the response chain for performance enhancement. As these chapters are drafted some two months before they are assembled and sent to the clemency, it is my desire that by the time you read this you will be able to concurrently test drive the new website and the pages on "Human Performance."

USASOC

Dalton Diamond, MD
COL, USA
Command Surgeon

I am writing this column over the Christmas holidays so we just have time to take one more look at the body and then close the coffin lid on 2007. It has been a year filled with some memorable individual events as well as the continued steady grind of the Global War on Terror.

In the former category are the preparations for the stand-up of the initial 4th battalion in each Special Forces Group and the next battalion in the 95th Civil Affairs Brigade; expansion of the Special Operations Combat Medic (SOCM) course to accommodate MARSOC; inauguration of a Surgeon's Cell for Special Forces Command; and an increase in SOMA participation from 800 + to over 1200. SFC Nicholas Wursterbarth, 1/7th SFG, and SSG Christopher McNamara, 1/75th Rangers, were named SF Medic and SOCM Medic of the year, respectively, and were awarded Meritorious Service Medals. Congratulations and well done to both of these fine ARSOF Warriors!

The USASOC Surgeon's Conference preceding the SOMA Conference was well attended, for which I am grateful. My sincere thanks to COL Deal, MSG Rodrigues, MSG Blazer, and others who put the program together, made sure all the speakers showed up, and generally made things work. A special thank you goes to LTC Daria Smith who served ably as CCH (Chief Cat Herder) in Tampa and to Mr. Terry Phelps and LTC Buck Benson who held down the fort in Fayetteville.

The grind of the GWOT is represented by repeated cycles of train up and deployment which extracts a toll from our Warriors — wounded and whole — and from our equipment. Based on surveys and reports from official monitoring agencies ARSOF forces are holding up much better than conventional forces with much lower rates of PTSD and other markers of what LTG Wagner, the USASOC Commanding General, refers to as "stress on the force." None the less, we will search diligently for recommendations on ways to reduce the stress further.

In 2008 we will continue to work with the USSOCOM Care Coalition, the Army Wounded Warrior Program, and the care providers and case managers at the various MTFs to maximize the healing and rehabilitation of our wounded Soldiers. The Care Coalition is a great initiative and I am constantly astounded by the thoroughness of Mr. Jim Lorraine and his team, including CPT Dawn Paul, Maj Julie Scott, MAJ Sharon Henderson, Dan Thompson and SFC Marty Thompson (a.k.a. the Thompson Twins), SFC Dan McKinney, SFC Fidencio Medina, SFC Michael Mayden, and all the other fine folks. There are some real challenges, particularly for those with the most serious injuries and for those with traumatic brain injury/mental health issues. LTC Bob Forsten will remain the USASOC Surgeon's spearhead on behavioral health as we explore adding uniformed behavioral health professionals to our CSS force structure and creating some level of assessment/selection for ALL personnel being assigned to USASOC.

I looked at LTC (P) Pete Benson's column as USASFC Surgeon from the Fall 2007 issue of JSOM and noted his comments about medical careerism in SOF. On the one hand, why wouldn't we want to keep a physician who is doing a good job in ARSOF and wants to stay?

Why not relieve ourselves of yet another empty position to interview for and fill? On the other hand, there is the argument Pete makes about inbreeding, loss of situational awareness inside the AMEDD, possible degradation of clinical skills, and, most important of all, loss of credibility outside of our own command. Yes, we need experienced SOF Medical Warriors on higher level staffs but LTC (P) Benson is likely spot on in his assessment.

So, that's it for 2007, my 39th year in the Army (COL Farr has me beat by one year). My personal resolution for 2008 is to figure out what I want to be when I grow up.

I offer my personal thanks to all of you and your families for the sacrifices you make in the defense of the United States and our way of life.

Sine Pari!

COL Dalton Diamond (L) with SSG Christopher McNamara. SSG McNamara was named SOCM Medic of the year, being awarded the Meritorious Service Medal.

COMPONENT SURGEON

AFSOC

Timothy Jex, MD
Col, USAF
Command Surgeon

It was great to see everyone at SOMA this year. Along with some excellent presentations, there were important issues discussed, both in the formal sessions and in the hallways and peripheral meetings. One of the key topics addressed by the component surgeons was the design and employment of Level II surgical support for SOF. AFSOC first developed our own Level II surgical teams and critical care transport teams about five years ago. Once these teams were fielded, they immediately earned high praise from the line, and the demand for them has consistently exceeded their availability. AFSOC is doubling our number of teams this year, but this handful of teams will still not meet even the current requirements, much less the forecasted increase. So as the other components are looking to develop a similar capability, I thought this would be a good time to share some of the insights we've gained during that time.

Our Special Operations Surgical Teams (SOST) and Special Operations Critical Care Evacuation Teams (SOCCET) are identical to the conventional Air Force's MFST and CCATT teams in terms of manpower, but hardened through SOF unique training and experience in order to provide self-contained, self-sustained, highly mobile surgical support and evacuation for far forward SOF missions. Most of us have been trained to design combat surgical support capable of handling bad, if not worst-case, scenarios, i.e. large mass casualties and a sustained high volume of patients. However, that is virtually never the real requirement in SOF operations. 99% of the time, the requirement is for life-saving field surgery for very small numbers, very far forward. Although the somewhat limited capability of our 5-man SOST initially met with widespread skepticism, experience has shown that both the size and skill mix (emergency med doc, general surgeon, ortho surgeon, CRNA, and surgical tech) is spot on. With only man-portable equipment and supplies, they are able to manage three critical casualties for 48 hours. The 5-man SOCCET adds the ability to maintain ICU-level care while transporting patients on tactical airlift.

Because their case volume will normally be very low, it is critical that SOF surgical teams are limited to 90-day deployments with at least 1:1 dwell time and optimally 180 days between deployments in order to maintain their currency and long-term sustainability. In our experience, this requirement has not been intuitive for many line commanders. It has been up to us to educate them. Likewise, it's important to task these scarce resources intelligently. These teams will continue to be high-demand, low-density for the foreseeable future, so deploying them to theater hospitals or utilizing them as a long-term, just-in-case, on-call capability supporting large operations, for example, is totally inappropriate. Not only are other resources available to fill those requirements, but chronic inappropriate use of these specialized teams has resulted in a mass exodus of our surgeons. They are trained and anxious to do *their* mission, not someone else's, nor can they maintain their professional qualifications sitting idle for extended periods.

We also believe it's important to have all of our surgical teams collocated and home-based within the SOF community. This is crucial for effective SOF-unique training and integration into the SOF culture and com-

munity. In the past, we have found it very difficult to effectively use on-call teams from geographically separated medical facilities.

Obviously there will be component-unique issues and constraints, but I felt it was important to provide a very quick summary of AFSOCs lessons learned.

The early successes of our SOF surgical teams have been phenomenal, and now it seems that every JTF commander wants one, regardless of the real requirement. I believe that as all the components come online with additional teams, we, the joint SOF medical community, need to develop clear doctrine governing optimal mission allocation and utilization of these limited number of teams to help deter misuse and to ensure their maximum effectiveness and long-term viability.

COMPONENT SURGEON

NAVSPECWARCOM

Jay Sourbeer, MD
CAPT, USN
Command Surgeon

As impressive as the achievements of NSW in 2007 are, the high pace of events set against many rapidly evolving changes today promise even more outstanding achievements in 2008. Key to adjusting our course as we move at high speed is improving communications, especially feedback such as lessons learned. New acronyms, new commands, increases in billets, and an increasing need for improved SOF downrange make it difficult to pin people down for good information on how things are going. The SOMA Conference was a good venue to put out the information we need to share, the need for lessons learned, and the need for after action information to reach the higher command levels.

The performances of all the Special Operations personnel is stunning, and sharing those successes helps build the requirement for greater medical training, more medical support, and increase funding.

We have conducted command assessments over the past year and are duly impressed with the medical departments' performances. The groups are outfitting our operators and support personnel to fulfill their mission requirements; with their support we have continued success on the battlefield. We need to recognize the outstanding job our personnel are doing as we have done with the selection of the Special Operations Medical Association Medic of the Year.

This year's SOMA Medic of the Year is Petty Officer Chris. His citation read; "Special Operations Operator (SO) Chris distinguished himself by his actions on the battlefield as the primary Medic for a Special Operations Task Force supporting Operation IRAQI FREEDOM.

"After sustaining severe casualties resulting in the injury and return of one Medic, SO Chris was hand selected to fill a vital role and shift immediately to a new Task Unit. His professionalism, maturity, and ability to adapt enabled a smooth transition and prevented an operational pause in combat operations.

"In March 2007, SO Chris was working as lead Medic and senior combat advisor; he led a force of SEALs and Iraqi Army personnel on a presence patrol. Word was relayed back to his unit that a team was under heavy enemy fire and needed assistance, so a CASEVAC was requested. Upon arrival they came under enemy fire. SO Chris' leadership was called upon as they removed critically wounded personnel from the line of fire. Triage was the first step, performed flawlessly and with esteemed precision. Tourniquets were applied and dressings stabilized, preventing further blood loss. The CASEVAC platform was too distant to assist in immediate evacuation, so SO Chris managed the CASEVAC with organic vehicles, directing immediate changes on the vehicles to accommodate these casualties and conduct the evacuation. His leadership, tactical acumen, and medical expertise directly resulted in saving the lives of wounded men.

"SO Chris continued to manage his team and to work with the Iraqi Army personnel instructing them in methods of caring for their wounded, and helped develop procedures to continue their success in the field of opera-

tions. Teaching the Iraqi personnel how to utilize the equipment they have prevented the need for them relying solely on U.S. forces. His superb medical training was proven nearly immediately on the battlefield by the Iraqi forces on three separate occasions prior to SO Chris' redeployment.

"SO Chris' exceptional medical, tactical, and leadership expertise during combat operations made him and his Task Unit successful. His heroism, courage under fire, and outstanding medical skills were instrumental in saving the lives of his wounded teammates and Iraqi soldiers. He will continue his career in a platoon leadership role training and preparing his operational personnel with the tools they will need to be successful on the battlefield."

These dedicated and selfless Operators exist throughout the force, and deciding on one Medic for his performance over that of others during the past year was difficult. We want to thank the leadership for taking the time to nominate their Sailors for their outstanding battlefield and non-battlefield successes over this past year. The Medic of the Year for 2008 will have similar heroic experiences and successes and we will again have difficulty selecting just one.

Thank you to all the Special Operations Medics across the services; you should be proud of your dedication, training, medical experiences, and accomplishments on and off the battlefield.

COMPONENT SURGEON

MARSOC

Stephen F. McCartney, MD
CAPT, USN
Command Surgeon

It is 2008 and U.S. Marine Corps Forces Special Operations Command (MARSOC) will celebrate its second anniversary on 24 February. As I reviewed JSOM 2007 Volume 7, Edition 1, I read over what I said in my column a year ago. I hope I have remained loyal in my promise at the outset of MARSOC that I would chronicle the birth and development of MARSOC Medical. While the birth seemed "breech" at times, looking back gives me a sense of pride for what we have accomplished thus far. The MARSOC challenges in the past year were legion, crossed over many lanes, but we met them head on. We accomplished much of this with the help of Colonel Farr's team in Tampa, as well as my respected fellow Component Surgeons. MARSOC thanks you all.

MARSOC Medical currently has 88% of its medical service and clinical specialty officers on station with over-all medical enlisted strength at 75%. Our personnel continue to deploy into theatre as the shipboard "SOC" component of the Marine Expeditionary Units, or MEU (SOC). The Marine Special Operations Advisory Group (MSOAG) continues with foreign internal defense (FID) missions on its 2008 slate and this October 08 our Marine Special Operations School will begin its first Individual Training Course. It is our number one priority to access and train the right Marines to serve with MARSOC.

It was great to be at the SOMA 2007 Conference and be given the forum to brief the large number of attendees on MARSOC organization, mission, and medical lay-down, as well as the way ahead. The MSOAG Surgeon, LCDR Mike Shusko, USN, also had a chance to show the great work in FID he and his command perform from 2006 to 2007. The "Controversies in Special Operations Medicine" panel was, as always, enlightening, interactive, and offered a chance to launch flaming arrows at topics for which no official policy or answers exist. I always enjoy the invitation to take part since SOMA shows the experience and ethos of SOF medical personnel. I thank the SOMA Conference staff for the gracious time allotted us so MARSOC could "get on the map." I give a special thanks also for providing Mess Night so we could show respects and heartfelt gratitude to the parents and memory of MARSOCs own, HM2 "Luke" Milam USN, who was killed in action in September 2007.

I was fortunate to recently deploy to Afghanistan for the express purpose to observe, evaluate, and surgically partake in what I feel is the most critical capability gap currently in SOF medicine: Level II surgical support available to SOF forces.

The potentially preventable SOF deaths from hemorrhage in the pelvis, abdomen, and thoracic cavity, which are not amenable to tourniquet, remains far too high. Lessons learned in OIF and OEF teach us that the ability to source an agile small foot print, "damage control" surgical support for SOF missions is not always there. This makes the commander incur a risk he should not have to with regard to providing his SOF warriors with the best chance to survive lethal and limb threaten-

ing wounds. With new geographical commands, increased OP TEMPO, and future mission profiles, the requirement for small, well-trained, scalable SOF Level II surgical platforms has never been more apparent to me.

Questions about size, need for holding capacity, training, sourcing, and oversight remain to be discussed. Each Component has different needs due to missions. The time to lean forward on SOF Level II surgical support was yesterday. If the SOF community embraces this reality today and steps off smartly, we will hopefully see peer publications articulating data showing surviving SOF warriors from near fatal truncal hemorrhage, and fewer papers profiling "potentially preventable" SOF deaths. I look forward to working with our SOF community to wrestle this one to the ground and get the right surgical capabilities, to the right place, on the right mission, to handle complicated, potentially fatal combat wounds the right way.

May 2008 prove to be a good year for all of us. God Bless America!

SOCCENT

Robert Noback, MD
COL USA
Command Surgeon

This may only be the second SOCCENT column, but, as usual, it is time for a change. By the time this edition comes out, I will have moved on, and LTC Ric Ong will have taken over as the SOCCENT Command Surgeon. Though we get to be the frontmen, nothing happens without a whole pile of people behind the curtains, and too often they get overlooked. This is a small effort to fix that.

First among these folks is Maj Keith Wilson, SOCCENT Medical Planner, AKA, the brains of the outfit. Aside from imparting his experience at SOCCENT and his intricate wealth of knowledge about medical issues facing SOF in the AOR, Keith had the invidious task of keeping me on my choke chain. This was, as he found, no easy task, as he had to perform various Augean tasks such as explain to me in one-syllable terms why we had to go through a metal detector at the 379th Air Expeditionary Wing. I'm still not sure whether it was to see if we had weapons, or to confirm that we did; and we'll skip the details of the unnamed PAX terminal attendants who told us we had to show up at 0600 for a 0900 flight, but couldn't help us when we showed up at 0600 because they were the night shift and not responsible for any flights after 0800. "That's some catch, that Catch-22." To completely list all the contributions Keith has made in his nearly four years at SOCCENT would be nigh impossible.

Another group that deserves special recognition is our series of exceptional forward Med Log officers, Majors Freddie Jenkins, Mike Cupito, Rich Elmore, and Lt Col Mark Tesmer. As has been mentioned in other articles and columns, because of the lack of JTD personnel in the TSOC medical sections, the SOCCENT medical section comes from all over. These Med Log officers, all Air Force AEF rotators, dove in and mastered the often arcane mysteries of the Army log system, and did all the heavy lifting. I had the easy part of telling them to find stuff; they had the hard part of actually making it appear. They did, 100% of the time, even for items not normally used, or new to the theatre. In addition to our Air Force MSCs we were fortunate to grab Lt Lakesha Chieves who also was multi-functional for the J4 and was key to making sure people appeared in the right country at the right time.

A point that frequently gets missed is that a Surgeon, at any level from battalion to COCOM, or anywhere in between, cannot be a Surgeon, if that person is spending most or all of his or her time being a clinician. Four of the most amazing PAs I have ever worked with, CPTs Colin Frament, Tim Flaugher, George "GW" Horsley, and John Paul, let me be the Surgeon by being the clinical guys themselves. Between them and our AEF forward IDMTs, MSgts Fink, Foster, and Deguzman, the fact is that care for

SOCCENT folks, either at MacDill or forward, was never less than the best. Supporting everyone and without whom the clinical care and internal logistics wouldn't happen are the more than marginally magnificent crew of CMSgt Thomas, and SSgts Dones, Azera, Georges, Estrada, and Airman Blake.

There are plenty of other people who could be thanked, but this isn't an Academy Awards speech, just a chance to recognize the SOCCENT medical folks who really make things happen – thanks guys, if I got anything right, it sure as hell wasn't anything I did without you.

Μολον Λαβε

TSOC SURGEON

SOCSOUTH

Wm. John Gill, PA-C MPAS
LTC USA
Command Surgeon

Greetings; we at SOCSOUTH hope you all enjoyed a peaceful and healthy holiday season. Like most of us in the SOF medical community, I am a product of COLs Farr and Diamond. As the designated Theater Special Operations Command (TSOC) Command Surgeon for BG Cleveland, it is my task to provide you with a situation report (SITREP) on the medical issues facing the command.

The TSOC surgeons would not exist if not for the foresight and persistence of COL Farr. Without his guidance and skill at making the case for the need, this position would only exist in the world of good intention. After being here six months I wonder how we ever got the job done in the past. It just proves that the Farr hypothesis works, "cobbling together what ever it takes to succeed."

The institution of the medical section and Command Surgeon manning in the TSOCs have given increased medical visibility throughout our AOR. We have a seat at the table on operations and planning. BG Cleveland not only encourages our input but expects it. No longer are we chasing the plan, but now have direct input at the beginning of the process. This is a conceptual break from the way it was prior to the increased medical staffing. The medical component is now an established part of this SOC system.

The SOCSOUTH AOR is going through transition as we begin implementing Operation Enduring Freedom — Caribbean and Central America. There are limited medical resources within this AOR. Unconventional Warfare is the order of the day for SOF medicine in this AOR, and with it comes the requirement and development of increased medical Levels I and II care, casualty evacuation (CASEVAC) and medical intelligence. We have a complex AOR with virtually every terrain, climate, and socioeconomic type. The medical issues are so complex that the sub-specialty of tropical medicine was developed to address the uniqueness of this area. This theater is evolving in every aspect and presents challenges to the medical support on virtually every level of care. The process will take considerable time before it matures into a more medically sophisticated SOF environment.

The dilemma of getting the assets required for support continues to be a challenge for everyone and being in a theater perceived as of limited threat leaves us near the end of the needs line. However, we are so far ahead of where we were a year ago that our complaining has decreased to simple whining. I am sure that the SOCOM folks are happy that the noise has settled down.

On a side note, the SOMA Conference was excellent this year. Kudos to all who presented and organized the event. The TSOC surgeons were all present and for the first time, we were able to meet and share thoughts. Some of those thoughts were better addressed and clarified at the hotel watering hole. Most of the issues discussed were generic throughout the TSOC medical arena. I personally look forward to benefiting from this experienced brain trust.

I am available for questions or comments pertaining to my AOR and always happy to put my two cents into the conversation.

Until next issue…

Special Forces Surgeon

USASFC

Peter J. Benson, MD
LTC, USA
Command Surgeon

Thus far, the U.S. Army Special Forces Command (Airborne) Surgeon's Office has successfully survived the past first quarter of FY08. MSG Ware and I are continuing to define the function of the Command Surgeon's Office at this echelon and promote its' advocacy for medical issues, both internal and external, to the Special Forces Groups. We will soon be adding additional personnel to permit better Special Forces-specific medical staff representation within USASOC and USSOCOM. Our intent is to be the conduit for medical issues to the USASFC staff and an advocacy for coordination of Command medical policy, and guidance. Operational issues, matters of policy, or questions should be addressed first to this office within the appropriate Command before being transmitted directly to a higher echelon.

MSG Ware and I were glad to have met many of the Special Forces Groups' professional providers, operations officers, and Medical Sergeants at the Special Operations Medical Association Conference in December. SOMA gave us a great opportunity to introduce ourselves in person and to give the audience an idea of our backgrounds and the Office's future goals. Many important topics were addressed at the conference among which were: changes to the Tactical Combat Casualty Care (TCCC) guidelines, Special Operations Combat Medic Skills Sustainment Course (SOCMSSC) changes, TAC set updates, the status of Level II surgical support to Special Forces, the role of medicine in Unconventional Warfare, the role of female treatment teams, deployed care of multi-purpose canines (MPCs), and personnel/career issues. We will do our best to address these issues and represent the requirements of the Special Forces Groups.

One of the key components for the Command Surgeon's Office to be successful is communication and integration with the Groups. To this end it is vitally important that issues regarding operation, staffing, training, equipment, and force modification/modernization be addressed to us. Allied with this is the critical nature of inputting lessons learned into the JLLIS, the SOCOM lessons learned database. When it comes to capturing evidence to support emerging requirements for equipment, training, personnel, or changes in doctrine – the Special Forces medical community often has scant tangible evidence to support our drive for change. I encourage providers at all levels of the Command to ensure that lessons learned from operations and training are captured in the appropriate data bases at all levels of the Command.

MSG Ware and I will hopefully be able to visit throughout the Special Forces Groups this year to improve our awareness on the issues and trends that you face "out there." We have a very supportive Command with regard to making change. Let us be your advocates for your issues and we will do our best to work toward common solutions.

USSOCOM Education and Training Update

COL Robert Vogelsang
Deputy Surgeon for Clinical Operations

Joe, Scotty, and Diane in the training section of the SOSOM-SG office are pretty much running full speed and have their rhythm down, tightening up processes and making them more efficient and responsive. Having three people in there makes it a lot better than when Steve Briggs had to do everything by himself. We have caught up on a lot of the Advanced Tactical Practitioner (ATP) cards and certificates that were not provided to some previous JSOMTC/Kirtland grads and the ATP database is being thoroughly scrubbed and reconciled with units to insure that those in the database should actually be there and to also discover those not in the database who should be. The Rangers have been completed and we are working with other units to do the same with them.

LTC Rob Lutz and SOCM Glenn Mercer have the Requirements Board (RB) working better now than at any time in the past and luckily, the Curriculum and Examination Board (CEB) continues to function well. Both groups held productive meetings during the last SOMA Conference. The RB updated the ATP Critical Task List (CTL) which COL Farr approved. It is now at the USSOCOM Directorate for Knowledge and Futures (SOKF) for final approval. MG Hashem, SOKF Director, is in charge of all SOCOM training, and we expect his approval of the CTL soon. This is important since the CTL has not been updated since September 2004. Although the new proposed CTL has few changes, the review process by the Operators is now working much better than before and we expect it to continue that way.

The CEB reviewed and revised Tactical Medical Emergency Protocols (TMEP) and the TMEP Drug List. The Spring JSOM supplement will include full-page updates to last year's TMEPs (revised individual protocols only) and the Drug List as well as reprints of the entire pocket-sized version of both the TMEPs and the Drug List. The CEB also created many more new ATP exam questions with a lot more gory images.

After one year of conducting the ATP, it appears that most exam takers do well and pass the first time. Though we have not crunched all the numbers for every test, it seems that the pass rate for first time ATP exam takers is in the 85% range. Very few people get very high scores (above 90%); but very few fail miserably. Most scores of those who fail tend to be within five percentage points of passing (70%). For people who do not pass initially, the vast majority pass on their second try. There have been a very small number of three-timers and I think there was one instance where the fifth time's a charm.

Scotty has looked at a Navy training tracking system that has the potential to be able to be utilized by all components to track ATP currency. At present, it appears to be difficult for even the components to track their own Medics' currency, and the ability to have all SOF ATPs in one web-based system would allow input at the lowest level to be rolled up through units, components, and all the way to USSOCOM. Components and even subordinates could add their own additional training requirements that need tracking, if so desired. This is nothing anyone has committed to and if it does happen, it will be quite a way off. It is something we are looking at as a way to standardize and simplify everyone's ability to track medical training requirements.

The new USSOCOM Directive 350-29 (which will replace much of the current 40-2) should at least be at the components for review by the time this issue of JSOM hits the streets. Yes, a new version of the old 40-2 is long overdue, but since getting it into the USSOCOM training office for proponency, I think there has been better scrutiny (though it took longer) and what finally comes out at the end will be a better directive than would have been produced otherwise. Nothing is ever static and there will always be updates needed as missions change, technology progresses, and methods evolve; however, we are trying to anticipate some of those so the new directive won't be outdated a month after it is a done deal.

I know you don't believe it, but the intent here really is to make things better for the Medic on the ground, furthest from the USSOCOM flagpole. Like many things

we have experienced in our military careers, improvements, many times, are made in degrees over periods of time, instead of by leaps and bounds in an instant. I'm not always sure we can greatly influence the slowly grinding cogs of the great machine, but we all do everything we can to make the processes work. Yes, I can hear the groans and profanity you just uttered all the way here in Tampa; however, it all starts with you. We see very few lessons learned and we don't get many article submissions from the Medics there at the end of the chain. No one here can attempt to make it better or easier to do your job unless someone above hears about it. We are always willing to entertain comments from the individual servicemember, units, and component headquarters. As said before, nothing happens instantly, but it has to start somewhere.

From the Advanced Tactical Practitioner (ATP) Test Guy: ATP Preventive Medicine for 2008

CPT Scott Gilpatrick
USSOCOM Physician Assistant and ATP Coordinator

As advanced tactical practitioners (ATPs) we spend a lot of time rehearsing to be able to manage trauma, and yet rarely do it for real. When we do engage in the management of some gruesome injury on a human, it usually only takes a short time, and then your patient is off to a Level II or III facility. It's an emotional experience if you do it at Level I, and it gets even more emotional if you do it on one of your own friends/teammates. What makes this emotional for both parties involved (Operator and operated on) is the sheer significance of the moment shared between the Medic and his patient. When someone's life depends on someone else's and a Medic gets to look at his buddy's guts or whatever structure lies beneath broken and open skin — that's closeness. You are getting to do what you love and want to do, what you have practiced since you started the SOCM course or PJ Course, and your friend's life depends on it. With this emotional discussion comes the point or issue at hand. We are way more likely to spend the non-traumatic injury times with our teammates during the times we damage our livers, linings of our blood vessels, and insides of the lower lip.

This year, spend some time doing maintenance on the equipment you are in charge of. Not only are you responsible for the medical equipment you signed for, you've got the human part of your tactical element. Educating your guys on how to live healthy and long lives is your mission as much as crisis-action trauma medical treatment. HUMAN PERFORMANCE is the cool buzzword within SOF and everyone wants their Operators to perform at the professional athlete level. We no longer do just PT in the morning after a hard night of celebration, then go to the chow hall to cram eggs, bacon, SOS, doughnuts, etc… into our dip-stained gullets. We now run functional fitness-based programs and eat meals balanced by a sports nutritionist. And supplements! What elixir will make us perform better — give us more!!!! (as long as it doesn't violate policies)….

As a platoon or team Medic, you are the maintenance guy for the humans you work with. Preventive maintenance is just as important as sick call and trauma management. Be the smart guy in your platoon or on your team on diet and exercise. EDUCATION… Read it all, and tailor fitness and diet to your element. Look at upcoming missions or operations and see if you can figure out what diet plan or activity plan will best prepare your element to do better than last time. If you can't figure it out, ask someone. You are going to do preventive maintenance on your vehicles and weapons prior to deployment aren't you? Well, preventive maintenance checks and services (PMCS) of weapons, vehicles, and equipment are individual tasks. The same thing applies with the most important piece of equipment — your body. Why treat it like crap? Would you go outside with your weapon and drag it in the dirt on purpose? How about getting your vehicle out of the motor-pool and filling the gas-tank with water and urine? Not much different than taking your body out for a cholesterol laden lunch at the all-you-can-eat Chinese buffet and then add a night of binge drinking and social smoking.

Educate your teammates. Diet and exercise are keys to enhanced performance and mission success. Strive to learn and then pass on the information on healthy living to all you work with.

How convenient that this rant comes at the start of the New Year. It also precedes the soon to be released Special Operations Forces Nutrition Guide. The early copy I got is a one-stop book on what you need to know about diet, supplements, and the SOF operator. You can get most of the answers you need from this book on living healthy and performing better with a good diet. Better yet, it's geared toward the SOF operator. Big brained nutritionists and dieticians with lots of input from SOF Docs and Operators put this thing together. There is a section on eating on the road. We know that TDY trips, especially long ones, always generate high LDL levels. No more! Now there are healthy choices out there and the SOF nutrition guide tells you how to find them. Even more appropriate, it contains information on mission nutrition and calorie requirements for better performance. This great document will come soon, so look for it and read it as soon as it arrives!

A man too busy to take care of his health is like a mechanic to busy to take care of his tools.
-Spanish Proverb-

This year, become smarter on health, fitness, nutrition, exercise, and diet. Take this new-found knowledge and dump it on all the guys you take care of. Make it your mission to be healthier and make your patients healthier. Operators see **their Medics** before they see the PA or the Doc. Take that opportunity, at that level, to educate and influence diet and exercise. Key to this mis-

sion is educating you first. And of course, if you can't find the answer, call us at USSOCOM Surgeons office and we will help you find it.

And remember – lead by example!

Attendance at the Joint Special Operations Warfighter Certificate (JSOWC) program is highly recommended by the USSOCOM SG for all personnel being assigned to TSOC staffs. The JSOWC appears tailor made to prepare medical professionals (MC, MSC, NC, & senior enlisted) for assignment to TSOC staff billets. This SOF focused program spans the gap between what a conventional military medical professional has been exposed to and what is required to effectively function within the SOF operational planning environment.

Joint Special Operations Warfighter Certificate

By JOHN S. PRAIRIE *and* FRANK X. REIDY

The Joint Special Operations University (JSOU), located at Hurlburt Field, Florida, is the designated agency within U.S. Special Operations Command (USSOCOM) to conduct joint special operations education. It is responsible for courses that cover necessary material that is either not provided elsewhere or not provided when required by the special operations forces (SOF) community. As of February 2007, JSOU began offering a Joint Special Operations Warfighter Certificate (JSOWC).

The JSOWC program is an intensive, SOF-focused educational curriculum that prepares special operations warriors and enablers for assignment to joint special operations duty positions. This program is designed to provide the individual with the principles of joint operations while focusing on the key concepts of joint special operations. Within this program, three specific courses will concentrate on formulating and integrating U.S. national strategy, resources, and planning at the strategic level; conducting joint special operations collaborative planning at the operational level; and providing a thorough understanding of the current irregular warfare environment.

Supporting the USSOCOM Capstone Concept for Special Operations, JSOWC is designed to meet joint special operations education requirements that have not been traditionally provided at Service schools, career advancement schools, or military occupational specialty training. The curriculum is subdivided into three distinct course modules:

- Module 1: Strategic Thinking for Special Operations Forces Planners Course
- Module 2: Irregular Warfare Course

Joint Special Operations University at Hurlbert Field


Joint Special Operations Warfighter Certificate students

- Module 3: Joint Special Operations Collaborative Planning Course.

While the modules are mutually supporting, each is independent and may be taken in any sequence based on the individual's availability. Completing all three modules qualifies the student for the certificate.

The courses in the certificate program build on the lessons learned from recent operations, emphasize operational art, and include rigorous academic materials. Module 1 will be offered October 15–26, 2007, and again April 7–18, 2008. This module will concentrate on national policy, strategy, and strategic-level planning. Module 2 will be offered January 7–18, 2008, and again June 9–20, 2008. This module will focus on terrorism, theory of insurgencies, counterinsurgency practices, and historical case studies. Module 3 will be offered October 29–November 9, 2007; March 10–21, 2008; and August 11–22, 2008. This module will feature planning and tools essential for joint SOF staff planning and will conclude with a comprehensive exercise.

The certificate is for SOF personnel at midcareer. It is designed for those personnel preparing for, en route to, or assigned to their first joint SOF headquarters at a theater special operations command, the USSOCOM Center for Special Operations, or joint force headquarters. The intended students are special operations senior noncommissioned officers (E–6 through E–9), warrant officers (W–1 through W–4), and commissioned officers (O–2 through O–4).

The idea for the certificate program has been 2 years in development. During fiscal year 2005, JSOU completed an educational requirements analysis. A key finding in that study noted that neither USSOCOM, nor Service, nor joint professional military education institutions are sufficiently preparing midlevel SOF leaders at the appropriate times in an individual's career for the operational or strategic challenges of the war on terror. The JSOWC program is just the first initiative intended to elevate the JSOU curriculum and to make progress toward USSOCOM's educational goals while remaining aligned with joint and component training institutions. Through this program, JSOU will deliver personnel who will be better positioned to contribute to the war on terror mission to the USSOCOM Center for Special Operations, theater special operations command staffs, and other joint force headquarters.

Seats are limited to 20 students per course, so register now via the JSOU Web site at <https://www.hurlburt.af.mil/jsou/>, and monitor the JSOU page for updates. Please direct questions to Lieutenant Colonel John Prairie at DSN 579–4328 or commercial 850–884–4328. JFQ

Lieutenant Colonel John S. Prairie, USA, is Deputy of the Operational Department at the Joint Special Operations University and Program Manager for the Joint Special Operations Warfighter Certificate (JSOWC). Frank X. Reidy is Director of the JSOWC Strategic Thinking for Special Operations Forces Planners Course.

- Course tuition is provided by JSOU, all other costs are borne by nominating command.
- LTC Prairie's (JSOWC POC) correct number is DSN 579-1842, Comm 850-884-1842. The hyperlink for JSOU in the attachment doesn't work, but all the info you need is on the regular JSOU site.
- The prerequisite is the basic SOF online course offered through JSOU. There are several SOF related Joint Pubs they recommend you be familiar with (available on the JSOU webpage) before taking the course.
- The course is not eligible for JPME Level II credit but, is being looked at for the future.

Better Living Through Lessons Learned

Casualty Treatment and Evacuation Vignettes From Operation Iraqi Freedom (OIF) And Operation Enduring Freedom (OEF)

CPT Scott M. Gilpatrick, APA-C, DMO; LTC Shawn Kane, MD, SFS, DMO

Lessons learned: Evidence behind evidenced-based. That is how we practice medicine most of the time — that is how standards are set in medicine. We back up all of the pills and interventions we use up with solid evidence. In a clinical setting, we use the best practice guidelines to provide timely and safe care to our patients. As SOF Medics, the clinic is your time to practice and learn the art of patient care and sick call medicine. This is probably 70% of your patient care.

Then there is the other 30% of your time doing patient care that is trauma related. It is the stuff we spend most of our medical training time preparing for. Most of us do not get to spend our normal workdays in a level one trauma center or riding around with a large metropolitan EMS service. We must make the most of our trauma training time as well as the evidence and lessons learned of those who experienced these situations before us.

The Joint Lessons Learned Information System – Special Operations Forces (JLLIS-SOF) is an excellent place to find lessons learned, after action reviews (AARs), and other publications to learn from. Register at the SIPR site (http://www.jllis.smil.mil/ussocom/) and then you can do your own Google-type search for whatever interests you. Take what you find and craft scenarios to train on or discuss among your teammates. There are AARs from geographical areas and tactical scenarios that you might find yourself in the near future. Learn from the people who already made the mistakes. Learn what worked well, learn what did not work well, and maximize training time to prepare yourself as much as possible. The JLLIS-SOF gives every SOF medical provider the opportunity to share knowledge and experiences in order to better prepare your colleagues for what they will face in a hostile or non-hostile deployed environment. Please submit AARs, lessons learned, and vignettes to the JLLIS-SOF or to the authors and allow everyone to benefit from your experiences. This is the authors' initial attempt to gather medical lessons learned and pass them onto the SOF medical community. With luck, as well as continued input from the field, we will be able to make this a regular feature in the Journal of Special Operations Medicine.

After an exhaustive five-minute search with the keyword "casualty" these three SOF mission AARs with medical value were found. Highlighted within each AAR are some lessons learned and then our comment and opinions on how they make a difference to the Advanced Tactical Practitioner (ATP). Names, locations, units, dates, and specific tactics/techniques/and procedures (TTPs) were removed to make the AARs publishable. The original submitter's important thoughts and lessons learned are *italicized*.

AAR 1

A Special Operations Task Force conducts a combined air and ground assault on a known enemy objective in order to disrupt and gain actionable intelligence on the enemies' network. The assault force consisted of multiple medium and heavy armored vehicles as well as light and medium helicopter assault assets.

Actions on the Objective

At onset of the actions on the objective, one of the vehicles hit an improvised explosive device (IED) during movement into a security position. A radio call soon followed stating that a vehicle had struck an IED at an intersection and they had *"one unconscious casualty."* Upon receiving that information the assault force advanced tactical practitioner (ATP) and the element SGM loaded into their vehicle and drove to the site.

Assessment and Treatment

Upon reaching the scene, I observed that the vehicle, a Stryker, was missing the third wheel on both sides, and the tailgate was still closed. Several Soldiers were providing care to the casualty, who was lying on top of the Stryker. The Stryker — Medical Evacuation Vehicle (MEV) arrived and while climbing up to assess the casualty I asked for a litter to be opened and litter bearers be identified. **I advised the SGM that the air evacuation option would be the fastest way to evacuate the casualty to the level of care required and the SGM began to coordinate assets.** Fellow Soldiers had extricated the casualty to the top of the vehicle and five people were crowded around working on him. At this time it appeared that he had the following wounds: multiple (approximately five) penetrating wounds to the right flank/lower back and a badly broken right arm which was actively bleeding from a large soft tissue avulsion just under the deltoid. The patient was complaining of not being able to breathe and when asked he stated that he "just had some busted ribs." A pulse oximeter was placed on his finger, and his initial oxygen saturations were 98%, with a heart rate of 90. The initial on-scene assault force ATP **controlled the brachial artery bleeding with Chitosan due to the wound being too high for a tourniquet.** Another ATP was putting small pieces of Chitosan onto the *"shark bite"* portion of the arm injury. Since that wound was not actively bleeding, *I intervened and directed him to just wrap it to save time*. I then gave two packages of the **Hy-Fin dressings** (four dressing's total) to another Soldier who was assisting, and instructed him to place them onto the flank wounds. **The Hy-Fins seemed to work a little better than regular Hydrogel dressings, which were more difficult to pry apart**. We secured the casualty to the litter, lowered him over the side of the damaged Stryker and then loaded him into the MEV for the short drive to the pre-planned helicopter landing zone (HLZ). Ground elements and our combat control team (CCT) had already secured the HLZ and were standing by to receive us. Upon reaching the HLZ we were told that the bird was one minute out. Upon landing, we loaded the casualty onto the aircraft. **The first responding ATP accompanied the wounded Soldier on the two-minute flight to the Combat Support Hospital (CSH).** *Reviewing the JOC log after the mission revealed that it had taken 18 minutes from report of the IED blast to the patient arriving at the emergency room*.

Outcome

The patient sustained the following wounds:

- Open, comminuted humerus fracture, treated with external fixation.
- Partial transection of the brachial artery. This injury was effectively controlled with the Chitosan dressing applied by the assault force ATP. Multiple surgeons at the combat support hospital (CSH) stated that the patient would have lost his arm had it not been for the excellent treatment in the field and the rapid evacuation to surgical care.
- Three fractured ribs, one of which had punctured the right lung, creating a minor pneumothorax
- Penetrating abdominal injuries to include a liver laceration that was treated in the operating room.

It was surmised that the Stryker had hit a pressure sensitive device that detonated underneath the vehicle, breaching the hull. The explosive was hidden underneath a manhole cover and the driver stated that he did not notice anything in the road. The casualty was sitting inside the vehicle during the detonation.

Lessons Learned

Discussion 1

Choose the best CASEVAC platform.

Recommendation

Always plan for the worst-case scenario. If HLZs are available, and the conditions permit, air is usually the fastest way to evacuate a casualty. Usually, it takes about 10-15 minutes to treat and package a casualty. During that time, the Tactical Operations Center (TOC) can notify prepositioned aircraft and the wounded and the aircraft can arrive at the HLZ almost simultaneously. In this particular instance, it was a two-minute flight to the CSH. The driving route was briefed as "less than 10 minutes." In reality, *due to roadblocks and checkpoints, it took us 37 minutes to drive from the target to the FOB gate*.

Discussion 2

SOF Flight ATPs are hired and further trained to plan for and conduct CASEVAC for the SOF forces and their attachments.

RECOMMENDATION

If there is a SOF Flight ATP on the CASEVAC aircraft and he is not overwhelmed with a large number of casualties there is no need for the ground assault force ATP to accompany the patient. The assault force still had to prosecute the target or conduct a ground movement back to the base, in either case the ATP who left with the casualty may have been needed later.

Discussion 3

Incorporation of CASEVAC scenarios in training. *I think the speed at which this CASEVAC was conducted reflected a great deal about the level of our training*. Upon hearing the radio call of a critically wounded Soldier, *the Medic responded, the commander notified higher, the aircraft was alerted the CCT and a security team moved to the HLZ, and the SGM directed and coordinated movements. All of this was done simultaneously and seamlessly.*

RECOMMENDATION

Always have casualty play in training. **Always!**

Discussion 4

This is something that needs to be as familiar as shooting to TF members. Nobody wants to train on this, but it is up to you as the Medic to ensure that it is done. The ATP on the scene did an awesome job of treating his casualty. He seemed to develop tunnel vision on treating the casualty as did everyone else. Initially, no one was working on the next step(s) in the evacuation chain. Train your team Medics and be able to provide them guidance as you work. *Better yet, have them know what needs to be done and what you are going to need prior to you asking that way you can focus on the medicine.* Talk to your chain of command about accompanying or not accompanying the casualty during evacuation. If appropriate medical assets are available during evacuation, stay where the majority of your Soldiers are. During a casualty situation you can find yourself completely in charge. Be ready for that responsibility and "war game" the endless possibilities with yourself and your peers.

ATP Comments: *There are quite a few common sense issues as well as valuable anecdotes highlighted throughout this scenario. As far as how many critical task list items were encountered, they were too numerous to count. Many medical tasks — with a bunch of critical decision making required. Casualty evacuation (CASEVAC) — one of the phases of Tactical Combat Casualty Care, sometimes ends up as a contingency plan. It needs to be a deliberate plan that has its own contingencies. War game and work those contingencies till you are blue in the face! It will pay off as muscle memory when you are task saturated with medical tasks, and someone wants to know how to get your casualties out.*

AAR 2

We received notification of troops in contact (TIC) with multiple serious friendly wounded in action (WIAs) and were on stand-by for a possible CASEVAC mission. The medical planner informed us that a mass casualty (MASCAL) situation had been declared at the medical facility treating the TIC casualties. An urgent fixed wing (FW) CASEVAC mission was being planned and initiated. The plan called for the casualties to be transported via rotary wing aircraft to a flight landing strip (FLS) where our fixed wing aircraft would be waiting. We would be receiving four postoperative casualties, three of which were being mechanically ventilated. The base medical team on the FW CASEVAC aircraft was a Special Operations Forces Medical Element (SOFME), which consists of xyz. *In light of the criticality and number of casualties, the SOFME was augmented with an additional two physician assistants from the Joint Special Operations Task Force.*

Equipment Used

The full complement of SOFME equipment was loaded onto the aircraft. Two additional ventilators, an additional surgical anesthesia package, an additional Propaq, and supplemental oxygen and assorted delivery devices were added to the base equipment based on the number and severity of the casualties. In addition, 20 units of packed red blood cells (PRBCs) were loaded to resupply the forward surgical team (FST) who had initially treated the casualties.

In-flight Narrative

Flight time was approximately 35 minutes. In-flight, we assembled three low-flow oxygen lines and adjusted our gear for easy access. *Upon landing, there was some confusion as to whether we were going to be trans-loading casualties from a helicopter or accepting them from the FST.* After a few minutes on the ground, an Army Medic ran onto the plane and informed us that we needed to go to the FST to transport the patients and bring all the equipment to exchange. The SOFME/Surgical team moved by frontline ambulance (FLA) to the FST. Upon arrival, we discovered there were five patients needing transport: four postoperative, three of which were vented, and two stable causalities. The FST had the causalities well packaged for transport with running IVs, suction and vents in place, additional medications, hypothermia blankets, and paperwork. *Casualties were transported to our awaiting aircraft by FLA, accompanied by providers, in order of increasing criticality; the least critical were forward loaded*. Casualties were floor loaded and strapped in a 2+2+1 (fore to aft) fashion and vents were attached to the previously assembled low flow O_2. Cabin pressure was maintained at 5,000 ft and temperature was controlled to prevent hypothermia. Flight time from FLS to the CSH was 22 minutes and all casualties remained stable en route. Details of each casualty follow in order of severity, highest to lowest:

Casualty #1

Approx 25y/o male with a gunshot wound (GSW) to the abdomen. The patient had undergone an exploratory laparotomy which revealed the following injuries: 1) multiple right colon lacerations with gross contamination requiring a right hemicolectomy, 2) grade II liver laceration that was treated with packing, 3) a retroperitoneal hematoma (the inferior vena cava, ureter, and kidneys were intact) and minor oral/facial trauma. Postoperative chest x-ray revealed no hemo or pnuemothorax (HTX/PTX). The patient received two units PRBCs, two liters intravenous fluids (IVF), and Unasyn 3g IV. The patient remained intubated and on mechanical ventilation for transport. He had a temporary vacuum abdominal dressing to suction, orogastric (OG) tube, Foley catheter, and bilateral peripheral anticubital (AC) IVs. The patient was sedated, pain managed, all bleeding was controlled, and vital signs were stable prior to transport. The patients IVs had clotted off during ground transport to the aircraft and a new peripheral IV was established in-flight. He was dosed with Fentanyl for sedation. Vital signs remained stable and within normal limits throughout the flight.

Casualty #2

23y/o male active duty (AD) U.S. Soldier with GSW to his left thigh and buttock and left inferior pelvic acetabular and rami fractures with communication into the pelvic cavity, with a serosal contusion to the descending colon without stool spillage. The patient had undergone a laparotomy with packing of posterior/left lateral pelvic hematoma and wound irrigation. The patient received three liters of LR and Zosyn 3.375g IV. The patient remained intubated and on mechanical ventilation for transport. He had a Foley catheter, OG tube, and bilateral peripheral AC IVs. The patient was sedated and all bleeding was controlled prior to transport. This patient was tachycardic (HR 120 to 130s), but all other vital signs were stable and within normal limits; his H/H was 39/13.6 and no gross bleeding was documented prior to or during surgery. The patient remained stable throughout the flight.

Casualty #3

AD U.S. male Soldier, unknown age, with GSWs to his left leg with an open supracondylar femur fracture and traumatic knee arthrotomy and to the right shoulder with an open fracture of clavicle and a severely comminuted proximal humerus fracture. His fractures were treated operatively with washouts and fixation. Patient was given two units of PRBCs, two liters LR, Ancef 1g and Levoquin 500mg IV. He had a foley catheter, OG tube, and bilateral peripheral AC IVs. The patient was sedated, all bleeding was controlled, and all vital signs were stable prior to transport. The patient remained stable throughout the flight.

CASUALTY #4

22y/o male AD U.S. Soldier with bilateral thigh shrapnel wounds s/p debridement and irrigation, right arm shrapnel wound s/p debridement and irrigation, right canthal fold laceration s/p repair, an open right patella fracture and open right medial condyle fracture with stellate skin wound s/p debridement and irrigation. IVFs and ABx were not documented. The patient's pain was well managed and all bleeding was controlled. His SaO_2 was low normal on room air (RA) at 93 to 95% and other vital signs were stable and within normal limits. Supplemental O_2 by non-rebreather (NRB) mask was placed and SaO_2 improved to 100% throughout the duration of the flight.

CASUALTY #5

Approx 26y/o male AD U.S. Soldier with GSW to bilateral thighs and left wrist s/p bedside wound irrigation and dressing. No fractures were noted on flouroscope. All extremities were neurovascularly intact. Due to the MASCAL situation, formal debridement and irrigation were deferred until patient reached the CSH. The patient's pain was well managed and all bleeding was controlled. His SaO_2 was low normal at 92 to 94% on RA and other vital signs were stable and within normal limits. Supplemental O_2 by NRB mask was placed and SaO_2 improved to 98 to 100% throughout the duration of the flight.

Ground transport at CSH location was coordinated in-flight and four ambulances were waiting on the flight line. Casualties were transloaded to the ambulances in order of decreasing criticality. A provider accompanied each the casualties to the CSH emergency department for handoff.

POST-FLIGHT

Aircraft configuration worked well and facilitated patient load and transport to CSH. All necessary equipment was available and within easy reach for casualty care. Transport to the Craig Joint Theater Hospital (CJTH) was prompt due to pre-planned ground transport. Overall, this mass casualty mission was a highly successful collaboration of Air Force Special Operations Forces Medical Element (SOFME) and SOF surgical assets. The casualties were expeditiously and safely evacuated to a higher echelon of care.

ATP Comments: *The FIRST report is never true! It often happens that the number and severity of patients you receive is different from what the initial report called for; be FLEXIBLE. Flexibility is one of the things that makes Special Operations Forces and Special Operations medicine different from our conventional colleagues. From this we can see the ATP is not always on the ground. CASEVAC and AIREVAC are a MAJOR part of the continuum of care we must maintain. Continuity of SOF providers and ATP level personnel from point of injury to the surgeon definitely saves lives. Monitoring severely injured post-operative patients in an extreme environment can be difficult, especially when it involves platforms not normally used for CASEVAC or AEROEVAC. We also take from this the need to know all the antibiotics and pain medications a severely injured operator might need or be placed on by different physicians.*

AAR 3

Situation: Special Operations Task Force (TF) conducts an assault to kill or capture a high value target (HVT). The objective (OBJ) was a small single story house located within a forested area with single road access. TF elements inserted via Special Operations aviation (SOA) aircraft. The casualty evacuation (CASEVAC) plan was a single MH-60 that would be located in a field approximately 500 meters south of the OBJ. Due to the increased risk and concerns with landing zone (LZ) and fast rope points, an additional TF Medic accompanied the assault.

ACTION ON THE OBJ

Immediately upon commencement, two previously unidentified fences surrounding the OBJ delayed the assault. A driveway channelized the ground element on approach and a parked vehicle further channelized the troop into what became the primary cone of fire. Upon entry the TF was engaged with AK fire and immediately sustained 4 x friendly wounded in action (FWIAs). Two of the three enemies were killed immediately, while a short fifteen-second firefight killed the remaining shooter.

ASSESSMENT & TREATMENT (FIRST MEDIC'S PERSPECTIVE):

On the call of wounded, the other Medic and I moved to the target building.

FWIA #1

Sustained a GSW that entered under the left armpit in the mid-axillary line that appeared to have severed some axillary vasculature. The entrance wound was approx 1 to 2cm wide with a large racquetball-size cavity behind it. I managed to clamp one of the bleeding vessels by palpation with a set of large hemostats. I continued to work on obtaining control of the axillary wound while the second Medic started exposing the chest. A third Soldier exposed the arm and found a GSW to the left bicep. There was significant bleeding from the wound and I told another Soldier to put a combat application tourniquet (CAT) on that arm, and *he did an excellent job of getting the CAT in proper position and stopping the bleeding. I was wounded while entering the building and at this point was unable to continue helping due to blood loss and some shock-like symptoms and told my fellow Medic that he had to manage the bleeder.*

ASSESSMENT & TREATMENT (SECOND MEDIC'S PERSPECTIVE)

On the call of wounded, Medic One and I moved to the target building. Medic One was the first to arrive and began treatment. He had removed the body armor and was trying to gain hemostasis on the left axillary wound with a pair of hemostats. The injuries and treatments were as follows:

FWIA #1 (everything is the same up to the point when the first Medic could not continue)

Just prior to taking over for Medic One I performed a cricothyroidotomy to gain control of the airway. *I used a 6.0 cut down endotracheal tube and secured it with 550 cord. Medic 1 told me to take over the bleeder because he had been shot.* I moved over to FWIA #1's right side and started trying to palpate the bleeder to get a clamp on anything pulsing. After finding a large area that I could palpate a flow of blood, *I decided I needed to open up the wound to the cavity and try to get eyes on the bleeders. I did a three-pointed star pattern from the initial bullet hole. After this, a large cavity opened up and I visualized no independent bleeders; however, what was exposed was a large area of severely devitalized tissue along the chest wall and upper axillary area that was bleeding severely*. With the help of another Soldier, I wiped away as much blood as possible and applied **two Hemcon dressings** that we tore in half and started to line the chest wall and axillary area. *We then started to pack the hole cavity with Kerlix trying to build a "ball" putting pressure on the chest wall and upper axillary area, and rotated the arm down using the shoulder to put pressure on the "ball" of Kerlix. We secured the arm with a cravat looped around FWIA #1's wrist and then tied around his thigh trying to keep the shoulder over the ball and maintaining traction.* I was able to visualize some of the white Kerlix and this seemed to tamponade the bleeding. I then rolled FWIA #1 to check the down side and found an exit wound 1 to 2cm in diameter in the mid-thoracic area of the left chest just lateral of the spine. I applied an **Asherman chest seal to the exit wound and it was effective**. Another Soldier opened the litter and we then placed FWIA #1 on to the litter and strapped him in. We moved to the LZ where Medic One, FWIA #1, and I were loaded onto a MH-60 and took off for the CSH. Immediately on loading we began to bag FWIA #1 with a bag valve mask (BVM) and O_2. The flight ATP tried several times to get his **oxylator** working properly; however, it was not functioning. I continued to bag FWIA #1 and the flight ATP conducted a therapeutic decompression to the left chest. The packing in the axillary was holding and there was no hemorrhaging. When reassessing the pulse in the aircraft it seemed to fade in and out; at one point chest compressions were started and when reassessed the pulse was back and we continued to monitor FWIA #1 for the flight.

FWIA #2 received a non-debilitating ricochet to the left forearm. The intact bullet was buried within the dermis and later removed with secondary closure upon return to base. Post wound prophylaxis included Gatiflaxacin 400mg qd x 7d.

FWIA #3 received minor shrapnel to the face when his weapon was hit while returning fire. The shrapnel was removed, and the area irrigated and debrided accordingly, and followed up daily for s/s of infection.

Medic One was hit in the medial aspect of the right forearm by an AK round which tracked up the length of the arm and left only ulnar innervations to the right hand. He had an estimated 500cc estimated blood loss before requiring treatment. **Another Soldier placed an effective tourniquet** that held until arrival at the CSH.

PROGNOSIS

Upon arrival at the CSH, the ER team immediately obtained hemostasis surgically on FWIA #1. Six units of PRBCs where used in regaining what the doctors considered a stable enough condition to move to surgery. While in surgery FWIA #1 went through another seven units of PRBCs, but the wounds were so catastrophic that he died while on the operating room table.

Medic One underwent surgical debridement of his wound and was able to return to duty after a period of convalescence and rehabilitation.

LESSONS LEARNED (MEDIC ONE'S PERSPECTIVE)

1. You MUST treat yourself first! My wound and my blood loss severely affected my abilities on target to the point where I had lost and regained consciousness twice. You are no good to anyone and you are not losing any time or showing any weakness to ensure you are treated first so that you are ABLE to be an asset to your casualties and your unit.

2. When we needed to pack this wound there was no question as to the speed and large amount of Kerlix we would need, and the crinkle Kerlix did not provide either. Crinkle Kerlix is great for nice compact bleeder kits but it did not provide the same volume and speed as a noncompressed Kerlix would have. It is also very difficult to unroll in a single handed scenario.

3. Don't attempt to clamp a bleeder you can't clearly identify. I initially located the primary axillary bleeder on FWIA #1 and attempted to clamp it with minimal success; we then decided to pack that area for more effective hemostasis. It was a bowl-like wound and that should have been the initial treatment in the first place; blind clamping in a field environment does not work.

4. Don't be proud; consider the two Medic option. Initial planning called for all personnel to be fast roped into separate and very undesirable landing points and I knew that if anything happened it would probably be significant. But as target analysis progressed we realized that we would not have the speed and surprise normally enjoyed, thereby increasing the threat level. Additionally, this was an upper level terrorist leader, which we have found not only to be more prone to a fight, but a likely body bomb wearer – which he was.

5. Brevity codes: We use CPR (critical, priority, and routine) for our evacuation calls. They worked! After infiltration, the air package was moving to a lager site but before arriving they heard over the radio that a critical casualty had been sustained. The CASEVAC pilots immediately returned to the CASEVAC LZ, saving everyone time and coordination. Upon review of the Tactical Operations Center (TOC) log it was 26 minutes from the report of the injury to touchdown at the CSH, a very respectable achievement considering the distance and situation.

6. The present chest plates work. Counting the fatality, four friendlies sustained hits to the chest or side plates, with all rounds being effectively stopped and no detriment to shooter effectiveness in the fight.

7. The absolute minimum size of a cricothyroidotomy should be a 7.0. In this instance, a 6.0 was not sufficient. The oxillator is set to stop respirations when a tidal resistance pressure is met; in this case it was the diameter of the tube that prevented the oxillator from working.

ATP Comments: *Medics do get wounded! You must be ready for every contingency. Knowing what assets for evacuation you have and where they are is key. Rehearsing and everyone knowing the plan was instrumental in the success of this mission. If you find something works like the medics did here with the critical/priority/routine (CPR) designation of casualties, and everyone is onboard with it, go for it. MAKE SURE EVERYONE IS ON THE SAME SHEET OF MUSIC before undertaking a change in well known military designation. This is relatively easy with a small task force and people who are trained to think outside of the box. Look at some of the medical procedure and equipment lessons learned. Armed with these types of lessons learned you should be able to develop great and meaningful training. Lessons like this can also help you pack your aid bag.*

Correction in the Fall 07 edition. Philippines was misspelled in the feature article title JOINT SPECIAL OPERATIONS TASK FORCE - PHILLIPINES (JSOTF-P) JOINT MECAP PLANNING.

To the JSOM Staff,

17 Dec, 2007

Thank you for helping provide the JSOM. I look forward to it each quarter and read it from cover to cover before sharing it with fellow healthcare providers. Although I registered and paid for the SOMA conference this year, the G3 at USAREUR and the G3 at ERMC did not see any value in allowing any of us to attend. This is the first year of many that I haven't been able to attend - - even when deployed. There seems to be a lack of understanding of SOF medicine by many leaders out here today. I will continue to use the JSOM to try and help educate those who don't understand and shed some light on the issues we face on a daily basis to help change these folks and their way of thinking. The hard copy of "The Journal" is an invaluable tool. Thank you again for your help.

Respectfully,
LTC Ben Chlapek
Executive Officer
KFOR 9, TF MED

Current Events

Published in **The Fayetteville Observer** Thursday, October 18, 2007

Special Operations Medics Training Center Opens

By Henry Cuningham
Military editor

U.S. Army photo - A Special Forces Medic helps create goodwill in foreign countries by helping treat local residents. A Medic is part of a 12-man A-team that operates in remote locations without access to hospitals and transportation. In 1962, Dr. Richard L. Coppedge helped design the program at Fort Bragg to give extra training to Special Forces Medics.

He was the Command Surgeon for the John F. Kennedy Special Warfare Center and School when Brig. Gen. William P. Yarborough identified the need.

Forty-five years later, Coppedge, now 85 and a retired colonel, was present at the Oct. 1 ceremony to mark the activation at Fort Bragg of the Special Warfare Medical Group to train Special Operations Medics of all Services.

"It's flabbergasting," said Coppedge, who now lives in Arizona. "It's almost too incredible to realize there is a separate command and the number trained — 1,500 a year — the degree of training, the excellence of the training ... I know that this is the best-trained Medic in the world.

The center's primary mission is to run the 46-week course for Special Forces Medics. Each 12-man A-team has a Medic.

"The training for our Medics is so unique that it demanded a special organization," said MG James W. Parker, commander of the John F. Kennedy Special Warfare Center and School.

The group trains Soldiers, Sailors, Airmen, and Marines at the Joint Special Operations Medical Training Center on Kedenburg Street.

At the same ceremony, COL Kevin M. Keenan turned over command to COL Jeffrey L. Kingsbury.

"After all, what could be more important than training combat Medics when our nation is at war?" Parker asked.

Keenan took over as as dean of Joint Special Operations Medical Training Center in 2000.

"Kevin has been a witness to and an active participant in all the changes and the growth since the war on terror," Parker said. "The warrior Medics that he has trained have taken part in operations from Afghanistan to Iraq to the Philippines and the Horn of Africa and countless other locations around the globe."

Dr. Richard L. Coppedge

In 2001, the Special Forces community only had 77 percent of the Medics it needed, Parker said. That meant 57 A-teams did not have the Medics they required, Parker said.

Today, the force has 103 percent of the Medics it needs, Parker said.

The school reduced the instructor-to-student ratio, increased the number of classes started each year and developed a program to give Soldiers another chance, he said.

Eight years ago, about 43 percent of the students graduated from Special Forces medic training, considered the most difficult and demanding Special Forces career training, he said. Nowadays, about 80 percent finish, he said. "No one thought that could be done," Parker said.

A Medal is Born

From *Airman*, Fall 2007

The Air Force Combat Action Medal wasn't so much made, as it was born.

Its design came from a reading assignment about an Air Force hero. It took shape in the mind of a colonel's wife. An idea turned into reality using weaving machinery that had to be specially made, using a diagonal design that had never been used for a U.S. medal.

In the end, the Air Force Combat Action Medal turned out to be one of the most unique of its kind in America.

It all started when Air Force Chief of Staff T. Michael Moseley asked all newly selected brigadier generals and senior executive service civilians to read the book "A Question of Loyalty" by Douglas Waller. The book chronicles the famous court martial of Brig Gen William "Billy" Mitchell, an early advocate of airpower.

Air Force Deputy Chief of Staff for Personnel Lt Gen Roger Brady read the book. He was struck by the personal insignia General Mitchell had painted on the aircraft he flew during the World War I allied offensive against Germany in 1918 over Saint-Mihiel, France. General Mitchell had planned and led nearly 1,500 allied aircraft in that offensive, which was the first time in history that airpower was employed based on a broad, strategic plan.

General Brady suggested to General Moseley that a medal based on Billy Mitchell's logo might be appropriate to capture the spirit of the Air Force advocate and recognize the participation of Airmen in combat operations. General Moseley agreed. An idea was born.

Col Mike Gamble, who works for Air Force manpower and personnel, took General Brady's rough sketch and gave it to his wife, Susan. She's a professional artist and master designer for the U.S. Mint. The jump from designing coins to crafting a medal wasn't a big one for her.

"I wanted to keep a World War I feel to the medal while also updating the design," she said.

She made three medal prototypes. General Moseley picked the one that had a ribbon sporting bold orange and yellow diagonal stripes, a first in U.S. medal design. The ribbon stands out in a rack of other Air Force ribbons. All Air Force ribbons are aligned vertically.

"You can see the diagonal stripe in foreign decorations, but this is the first time in a U.S. military decoration," said Charles Mungo, from the Institute of Heraldry at Fort Belvoir, VA.

The institute designs and develops insignia, flags, decorations, and agency seals for the armed forces, federal government agencies, and the executive branch. When they got Mrs. Gamble's prototype, institute designers created blueprints for two manufacturers, one for the ribbon and one for the medal.

The diagonal stripe is so rare the institute had difficulty finding a company that could loom the ribbon. There were no American companies with the equipment needed to weave a diagonal stripe. But, John Balducci, an Air Force civilian at the Air Staff responsible for awards and decorations, found a company willing to order the special equipment needed to meet the requirement that the medal and ribbon be "Made in America."

The medal also has unique piercings, or openings, punched around its eagle and wreath. This, too, required specific tools and alignment for the precision needed.

"'This is one of the more bold designs for a military medal that has been produced in quite some time," Mr. Mugno said. "It's one of the greatest medals ever designed."

Airmen have received the medal well, especially by the first six Airmen to receive it.

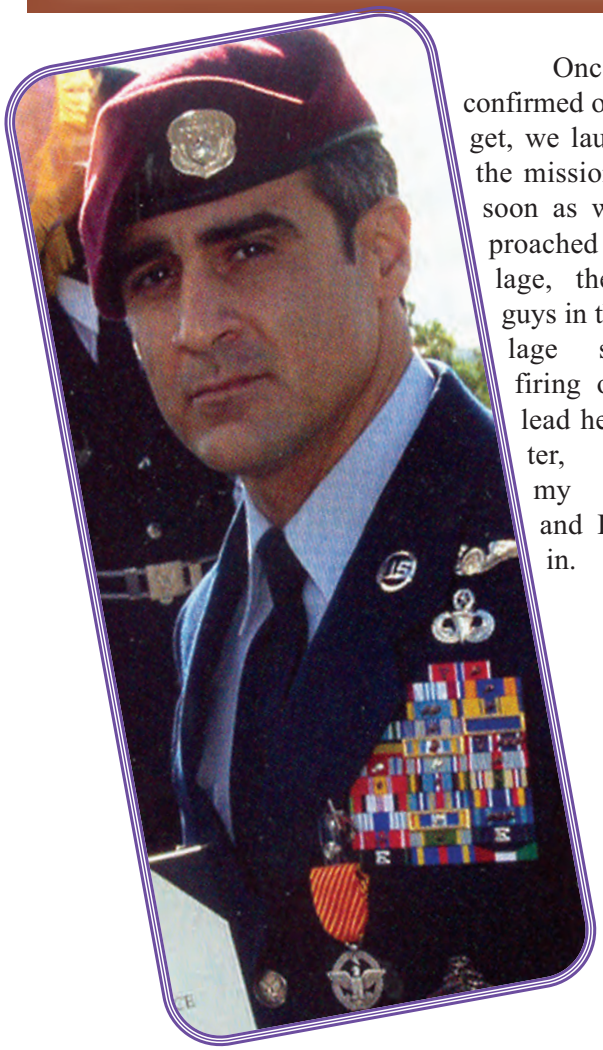
"I'm glad our Airmen are able to distinguish themselves as having seen real combat and not just deploying and staying behind the fence, eating meals, and going to bed every night," said medal recipient Senior Master Sgt Ramon Colon-Lopez.

"It's important because we're recognized as a total force," said Master Sgt Charlie Peterson, the first reservist to receive the medal. "To get recognized the same as a person on active duty tells me that we are a total force."

The two sergeants donated their medals to the U.S. Air Force Enlisted Heritage Hall at Maxwell Air Force Base, AL. They want to keep Air Force history alive, in the same spirit of those who proposed the medal.

- Orville F. Desjarlais Jr.

Senior Master Sargent Ramon Colon-Lopez
Pararescueman
Air Force Pararescue/Combat Rescue Officer School
Kirtland Air Force Base, NM
Date of Event: 11 March, 2004



Once we confirmed our target, we launched the mission. As soon as we approached a village, the bad guys in the village started firing on the lead helicopter, which my team and I were in.

We landed in a dry riverbed and started hearing a lot of pings on the aircraft. As soon as we hit the ground, the flight engineer told us to "Get out, get out, get out!" That was when we saw the muzzle flashes coming at us. The pings we heard weren't rocks hitting the helicopter, but bullets. So, we immediately got out and couldn't find any cover. We were in the middle of a dry river bed. We found the biggest rocks we could to get behind for cover and started engaging and chasing away the enemy. We had about three other helicopters coming in after us, so we started suppressing the threat for them. (The enemy) started retreating, but still engaged us. We ended up proceeding with the assault and chased those guys out. We successfully continued into the village to get who we came for, a bad guy who was pushing a lot of drugs to fund terrorism. He was also known to have weapons stashed there. Two of the enemy ended up getting killed and we apprehended 10 others, including the drug kingpin's brother. A few Americans got injured, but nobody was killed.

Before a flag-bearing color guard, Air Force Chief of Staff Gen T. Michael Moseley salutes Senior Master Sgt Ramon Colon-Lopez after presenting him the Air Force Combat Action Medal.

DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
5109 LEESBURG PIKE
FALLS CHURCH, VIRGINIA 22041-3258

REPLY TO
ATTENTION OF
DASG-ZA

25 AUG 2006

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Management of Soldiers with Tension Pneumothorax

1. Decompression of a tension pneumothorax must be performed with a 3.25-inch, 14-gauge needle/catheter unit. Although shorter needle/catheter units (e.g., 2.5-inch, 14-gauge) may be available for intravenous line placement, it is imperative that a 3.25-inch catheter be used when tension pneumothorax is suspected. Both civilian and military data show that catheters shorter than 3.25 inches may fail to reach the pleural space.

2. Three steps are required in effective diagnosis and treatment of tension pneumothorax: (1) the patient must have a traumatic chest injury with trouble breathing or signs of tension pneumothorax; (2) primary site selection for catheter placement is mid-clavicular line, second intercostal space; and (3) a 3.25-inch, 14-gauge needle/catheter unit should be inserted to the hub.

3. As of 3 Apr 06, the component list for the Medical Equipment Set (MES) Combat Lifesaver (CLS) Bag (Unit Assemblage 1245), Version 2005, includes one 3.25-inch, 14-gauge needle/catheter unit (National Stock Number 6515011535373). In addition, the component list for the MES Surgical Instrument Supply Set/LIN 65480 carried by 91W combat medics includes two 3.25-inch, 14-gauge needle/catheter units. Unit commanders in theater may seek refresher training for CLSs and 91W combat medics, as needed, from trained medical personnel.

4. POC for this memorandum is Mr. Donald I. Parsons, Department of Combat Medic Training, Ft Sam Houston, TX, at (210) 221-4741, DSN 471-4741, or e-mail donald.parsons@amedd.army.mil.

KEVIN C. KILEY, M.D.
Lieutenant General
The Surgeon General

Executive Editor's Note: Just released — New Army Policy

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL
AND FORT SAM HOUSTON
2250 STANLEY ROAD
FORT SAM HOUSTON, TEXAS 78234-6100

REPLY TO
ATTENTION OF

MCCS-FCD-L 5 December 2007

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Implementation of New Army Sleep Guidance

1. Forwarded for your implementation and incorporation into Army doctrine and training products is the new Army sleep guidance in the enclosure titled, Sleep Deprivation. This new sleep guidance is based on research and observation conducted by sleep subject matter experts at the Department of Behavioral Biology, Walter Reed Army Institute of Research. This sleep guidance was further refined by the Combined Arms Doctrine Directorate (the proponent for continuous operations doctrine) and Doctrine Literature Division, Directorate of Combat and Doctrine Development, US Army Medical Department Center and School (USAMEDDC&S) (the proponent for behavioral health/combat and operational stress control). All subject matter experts involved in the development of the new Army sleep plan guidance concur with the immediate implementation of this guidance into doctrine and training products, as appropriate.

2. The new Army sleep guidance will be incorporated into the revision of Field Manual (FM) 6-22.5, Leaders and Soldiers Guide for Combat and Operational Stress Control, Appendix A, Sleep Deprivation. This manual is currently under development and scheduled for printing in fiscal year (FY) 08. This new Army sleep guidance requires all Soldiers to receive 7 to 8 hours of continuous uninterrupted sleep during each 24-hour period.

3. Appendix A, FM 6-22.5, Sleep Deprivation will be posted on AKO. To view this document, login to AKO, go to files, go to US Army Organizations, and select MEDCOM, AMEDD Pubs/Policies, Medical Field Manuals, Appendix A, Sleep Deprivation.

4. Point of contact for this action is Mr. Curtis Jones, commercial (210) 221- 9951, DSN 471-9951, DSN FAX 471-9662. E-mail address is: mailto:curtis.jones@amedd.army.mil

FOR THE COMMANDER:

//signed//

Encl
as

MARK W. HEGERLE
Colonel, MS
Director, Combat and Doctrine
Development

Appendix A

Sleep Deprivation

This sleep guidance is provided by the Walter Reed Army Institute of Research, and supported by extensive research. This guidance is based on current research as of September, 2007 and applies to all levels of military operations, to include both training and tactical environments. Unit sleep plans should be based on this guidance.

OVERVIEW

A-1. Sleep is a biological need, critical for sustaining the mental abilities needed for success on the battlefield. Soldiers require 7 to 8 hours of good quality sleep every 24-hour period to sustain operational readiness. Soldiers who lose sleep will accumulate a *sleep debt* over time that will seriously impair their performance. The only way to *pay off* this debt is by obtaining the needed sleep. The demanding nature of military operations often creates situations where obtaining sleep may be difficult or even impossible for more than short periods. While essential for many aspects of operational success, sheer determination or willpower cannot offset the mounting effects of inadequate sleep. This concept is applicable for all levels of military operations, including basic training and in all operational environments.

A-2. Therefore, sleep should be viewed as being as critical as any logistical item of resupply, like water, food, fuel, and ammunition. Commanders need to plan proactively for the allocation of adequate sleep for themselves and their subordinates.

A-3. Individual and unit military effectiveness is dependent upon initiative, motivation, physical strength, endurance, and the ability to think clearly, accurately, and quickly. The longer a Soldier goes without sleep, the more his thinking slows and becomes confused, and the more mistakes he will make. Lapses in attention occur and speed is sacrificed in an effort to maintain accuracy. Degradation in the performance of continuous work is more rapid than that of intermittent work.

A-4. Tasks such as requesting fire, integrating range cards, establishing positions, and coordinating squad tactics are more susceptible to sleep loss than well-practiced, routine physical tasks such as loading magazines and marching. Without sleep, Soldiers can perform the simpler and/or clearer tasks (lifting, digging, and marching) longer than more complicated tasks requiring problem-solving, decision-making, or sustained vigilance. For example, Soldiers may be able to accurately aim their weapon, but not select the correct target. Leaders should look for erratic or unreliable task performance and declining planning ability and preventive maintenance not only in subordinates, but also in themselves as indicators of lack of sleep

A-5. In addition to declining military performance, leaders can expect changes in mood, motivation, and initiative as a result of inadequate sleep. Therefore, while there may be no outward signs of sleep deprivation, Soldiers may still not be functioning optimally.

SLEEPING IN THE OPERATIONAL ENVIRONMENT

A-6. For optimal performance and effectiveness, 7 to 8 hours of good quality sleep per 24 hours is needed. As daily total sleep time decreases below this optimum, the extent and rate of performance decline increase.

A-7. Basic sleep scheduling information for planning sleep routines during all activities (predeployment, deployment, precombat, combat, and postcombat) is provided in Table A-1. Basic sleep environment information and other related factors are provided in Table A-2.

Table A-1. Basic sleep scheduling factors

FACTOR	*EFFECT*
Timing of Sleep Period	• Because of the body's natural rhythms (called "circadian" rhythms), the best quality and longest duration sleep is obtained during nighttime hours (2300-0700). • These rhythms also make daytime sleep more difficult and less restorative, even in sleep-deprived Soldiers. • The ability to fall and stay asleep is impaired when bedtime is shifted earlier (such as, from 2300 to 2100 hours). • This is why eastward travel across time zones initially produces greater deficits in alertness and performance than westward travel.
Duration of Sleep Period	• **IDEAL** sleep period equals 7 to 8 hours of continuous and uninterrupted nighttime sleep each and every night. • **MINIMUM** sleep period—There is no minimum sleep period. Anything less than 7 to 8 hours per 24 hours will result in some level of performance degradation.
Napping	• Although it is preferable to get all sleep over one sustained 7 to 8 hour period, sleep can be divided into two or more shorter periods to help the Soldier obtain 7 to 8 hours per 24 hours. Example: 0100-0700 hours plus nap 1300-1500 hours. • Good nap zones (when sleep onset and maintenance is easiest) occur in early morning, early afternoon, and nighttime hours. • Poor nap zones (when sleep initiation and maintenance is difficult) occur in late morning and early evening hours when the body's rhythms most strongly promote alertness. • Sleep and *rest* are not the same. While *resting* may briefly improve the way the Soldier feels, it does not restore performance the way sleep does. • There is no such thing as *too much sleep*—mental performance and alertness always benefit from sleep. • Napping and sleeping when off duty are not signs of laziness or weakness. They are indicative of foresight, planning, and effective human resource management.
Prioritize Sleep Need by Task	• **TOP PRIORITY** is leaders making decisions critical to mission success and unit survival. Adequate sleep enhances both the speed and accuracy of decision-making. • **SECOND PRIORITY** is Soldiers who have guard duty, who are required to perform tedious tasks such as monitoring equipment for extended periods, and those who judge and evaluate information. • **THIRD PRIORITY** is Soldiers performing duties involving only physical work.
Individual Differences	• Most Soldiers need 7 to 8 hours of sleep every 24 hours to maintain optimal performance. • Most leaders and Soldiers underestimate their own total daily sleep need and fail to recognize the effects that chronic sleep loss has on their own performance.

Table A-2. Basic sleep environment and related factors

Ambient Noise	• A quiet area away from intermittent noises/disruptions is **IDEAL**. • Soldiers can use earplugs to block intermittent noises. • Continuous, monotonic noise (such as a fan or *white noise*) also can be helpful to mask other environmental noises.
Ambient Light	• A completely darkened room is **IDEAL**. • For Soldiers trying to sleep during daytime hours, darken the sleep area to the extent possible. • Sleep mask/eye patches should be used if sleep area cannot be darkened.
Ambient Temperature	• Even small deviations above or below comfort zone will disrupt sleep. • Extra clothing/blankets should be used in cold environments. • Fans in hot environments (fan can double as source of white noise to mask ambient noise) should be used.
Stimulants (Caffeine, Nicotine)	• Caffeine or nicotine use within 4 to 6 hours of a sleep period will disrupt sleep and effectively reduce sleep duration. • Soldier may not be aware of these disruptive effects.
Prescription Sleep-Inducing Agents (such as: Ambien®, Lunesta®, and Restoril®)	• Sleep inducers severely impair Soldiers' ability to detect and respond to threats. • Sleep inducers should not be taken in harsh (for example, excessively cold) and/or unprotected environments. • Soldiers should have *nonwork* time of at least 8 hours after taking a prescribed sleep inducer.
Things That do not Improve or Increase Sleep	• Foods/diet—no particular type of diet or food improves sleep, but hunger and thirst may disrupt sleep. • Alcohol induces drowsiness but actually makes sleep worse and reduces the duration of sleep. • Sominex®, Nytol®, melatonin, and other over-the-counter sleep aids induce drowsiness but typically have little effect on sleep duration and are, therefore, of limited usefulness. • Relaxation tapes, music, and so forth may help induce drowsiness but they do not improve sleep.

MAINTAINING PERFORMANCE DURING SUSTAINED OPERATIONS/CONTINUOUS OPERATIONS

A-8. Cold air, noise, and physical exercise may momentarily improve a Soldier's feeling of alertness, but they do not improve performance.

A-9. The only countermeasures that effectively improve performance during sleep loss are stimulants (caffeine and prescription stimulants including Dexedrine® and Provigil®). However, these countermeasures are only effective in restoring performance for short periods (2 to 3 days), and they do not restore all aspects of performance to normal levels. Caffeine is just as effective as the prescription stimulants.

CAFFEINE COUNTERMEASURE

A-10. Pharmacological countermeasures such as caffeine are for **short-term use only (2 to 3 days) and do not replace sleep**.

A-11. Caffeine occurs in varying content in a number of drinks, gums, and nonprescription stimulants:

- 12 ounces (oz) caffeinated soda: 40 to 55 mg.
- No-Doz®: 1 tablet: 100 mg.
- Vivarin®: 1 tablet/caplet: 200 mg.
- Caffeine gum (StayAlert®): 1 piece: 100 mg.
- Jolt® cola: 71 mg.
- Red Bull® Energy Drink (8.3 oz): 80 mg.

Note: liquids will increase urine output, which may result in interrupted sleep. To avoid this, caffeine should be ingested in pill, tablet, or other nonliquid forms.

A-12. Sleep loss effects are most severe in the early morning hours (0600—0800). Countermeasures against sleep loss, such as caffeine, are often required and are very effective during this early morning lull.

A-13. Table A-3 below summarizes advice on using caffeine to maintain performance when there is no opportunity for sleep. Clock times provided are approximate and can be adapted to individual circumstances.

Table A-3. Using caffeine under various conditions of sleep deprivation

Condition Under Which Caffeine Is Used	*Guidelines for Use*
Sustained Operations (No Sleep)	• 200 milligrams (mg) starting at approximately midnight. • 200 mg again at 0400 hours and 0800 hours, if needed. • Use during daytime hours only if needed. • Repeat for up to 72 hours.
Night Shifts with Daytime Sleep	• 200 mg starting at start of nighttime shift. • 200 mg again 4 hours later. • Last caffeine dose: No sooner than 6 hours before sleep (for example, last dose at 0400 hours if daytime sleep is anticipated to commence at 1000 hours).
Restricted Sleep	• 200 mg upon awakening. • 200 mg again 4 hours later. • Last caffeine dose: No sooner than 6 hours before sleep.

SLEEP RECOVERY

A-14. Ultimately, the Soldier must be allowed recovery sleep. Following a single, acute (2 to 3 days) total sleep loss, most Soldiers will usually recover completely if allowed a 12-hour recovery sleep period, preferably during the night.

A-15. Following chronic, restricted sleep during continuous operations, Soldiers may need several days of 7 to 8 hours nightly sleep to fully recover.

WORK SCHEDULES

A-16. Usual work schedules are 8 hours on/16 hours off. Sixteen hours off allows enough time to attend to maintenance duties, meals, personal hygiene, and so forth, while still obtaining 7 to 8 hours of sleep.

A-17. To the extent possible, commanders should attempt to consolidate their own and Soldiers' off-duty time into a single, long block to allow maximum sleep time. If the usual 8 hours on/16 hours off schedule are not possible, the next best schedule is 12 hours on/12 hours off. In general, 12 hours on/12 hours off is superior to 6 hours on/6 hours off, and 8 hours on/16 hours off is superior to 4 hours on/8 hours off. This is true because time off is consolidated into a single, longer block.

A-18. **On/off shifts should total 24 hours.** Shifts that result in shorter or longer *days* (such as 6 hours on/12 hours off—an 18-hour day) will impair Soldier alertness and performance.

NIGHT SHIFT WORK

A-19. In general, Soldiers will not adapt completely to night shift work, even if they are on a fixed night shift.

A-20. To protect Soldiers' daytime sleep, the commander should not attempt to schedule briefings, meals, and Soldiers' routine maintenance duties during the Soldiers' sleep time.

A-21. Caffeine can be used during the night shift to improve performance.

A-22. Morning daylight exposure in night shift workers coming off shift should be avoided by wearing sunglasses from sunrise until the Soldier commences daytime sleep.

TIME ZONE TRAVEL

A-23. Trying to *preadapt* sleep and performance to a new time zone by changing sleep/wake schedules ahead of time to fit the new time zone is of little benefit.

A-24. During travel, Soldiers should not be awakened for meals (for example, while in flight to a new location). This sleep time should be protected.

A-25. After deploying to a new time zone, sleep and performance will not adapt for several days. During this time, Soldiers might also experience gastrointestinal disturbances and find it difficult to fall asleep and stay asleep at night.

A-26. When reaching the new time zone, Soldiers should—

- **Immediately conform to the new time zone schedule (**for example, for those on day work, sleep only at night).
- **Avoid daytime naps**. Sleeping during the day will make it more difficult to sleep that night and to adapt to the new time zone.
- **Use caffeine during the day** (morning and only through early afternoon) to help maintain performance and alertness.
- **Stay on a fixed wake-up and lights-out schedule, t**o the extent possible.

SPECIFIC SLEEP LOSS EFFECTS

A-27. Sleep loss makes the Soldier more susceptible to falling asleep in an environment with little stimulation (such as guard duty, driving, or monitoring of equipment). This is especially important when considering tasking sleep deprived Soldiers for guard duty during evening and early morning shifts. Leaders should be aware that putting Soldiers on guard duty who are sleep deprived or in a sleep deficit places those Soldiers at high risk of falling asleep while conducting this mission-critical duty. Commanders should consider the level of their Soldiers' sleep deprivation when establishing guard duty rosters. When significant sleep loss exits, leaders should consider altering the length of duty or manning guard posts with *teams* of two or more to maximize security efforts.

A-28. Even in high tempo environments, sleep loss directly impairs complex mental operations such as (but not limited to)—

- **Orientation with friendly and enemy forces** (knowledge of the squad's location).
- **Maintaining camouflage, cover, and concealment**
- **Coordination and information processing** (coordinating firing with other vehicles and dismounted elements).
- **Combat activity** (firing from bounding vehicle, observing the terrain for enemy presence).
- **Force preservation and regrouping** (covering disengaging squads and conducting reconnaissance).

- **Command and control activity** (directing location repositioning, directing mounted defense, or assigning fire zones and targets).

A-29. Soldiers suffering from sleep loss can perform routine physical tasks (for example, loading magazines and marching) longer than more complex tasks (for example, requesting fire and establishing positions), but, regardless of the Soldier's motivation, the performance of even the simplest and most routine task will eventually be impaired.

A-30. With long-term (weeks, months) chronic sleep restriction, mood, motivation, and initiative decline. The Soldier may neglect personal hygiene, fall behind on maintaining equipment, be less willing to work or less interested in work, and show increased irritability or negativity.

A-31. Sleep-deprived commanders and Soldiers are poor judges of their own abilities.

A-32. Sleep loss impairs the ability to *quickly* make decisions. This is especially true of decisions requiring ethical judgment. If given enough time to think about their actions, Soldiers will tend to make the same decision when sleep deprived that they would make when fully rested. However, when placed in a situation in which a snap judgment needs to be made, such as deciding to fire on a rapidly approaching vehicle, sleep deprivation may negatively impact decision making.

Determining Sleep Loss in the Operational Environment

A-33. Sleep can be measured by having Soldiers keep a sleep log, but compliance is likely to be very low and reliability is poor.

A-34. The best way to evaluate a Soldier's sleep status is to observe his behavior. Indications of sleep loss include, but are not limited to increased errors, irritability, bloodshot eyes, difficulty understanding information, attention lapses, decreased initiative/motivation, and decreased attention to personal hygiene.

A-35. Sleep loss can be confirmed by asking the obvious question: "When did you sleep last and how long did you sleep?" or "How much sleep have you gotten over the last 24 hours?" The commander or leader should direct this question not only to his Soldiers, but to himself as well.

A-36. Sleep-deprived Soldiers may be impaired despite exhibiting few or no outward signs of performance problems, especially in high tempo situations. The best way to ensure that soldiers are getting enough sleep is for leaders to establish schedules that provide at least 7 to 8 hours of sleep in 24 hours.

Common Misconceptions about Sleep and Sleep Loss

A-37. It is commonly thought that adequate levels of performance can be maintained with only 4 hours of sleep per 24 hours. In fact, after obtaining 4 hours of sleep per night for 5 to 6 consecutive nights a Soldier will be as impaired as if he had stayed awake continuously for 24 hours.

A-38. Another misconception is that Soldiers who fall asleep at inappropriate times (for example, while on duty) do so out of negligence, laziness, or lack of willpower. In fact, this may mean that the soldier has not been afforded enough sleep time by his unit leaders.

A-39. It is common for individuals to think that they are less vulnerable to the effects of sleep loss than their peers either because they *just need less sleep* or because they are better able to *tough it out*. In part, this is because the Soldier who is sleep deprived loses the self-awareness of how his performance is impaired. Objective measures of performance during sleep loss in such persons typically reveal substantial impairment.

A-40. Some individuals think that they can *sleep anywhere* and that they are such *good sleepers* that external noise and light do not bother them. However, it has been shown that sleep is invariably lighter and more fragmented (and thus less restorative) in noisy, well-lit environments (like the tactical operations center). Sleep that is obtained in dark, quiet environments is more efficient (more restorative per minute of sleep).

A-41. Although it is true that many people habitually obtain 6 hours of sleep or less per night, it is not true that most of these people only *need* that amount of sleep. Evidence suggests that those who habitually sleep

longer at night tend to generally perform better and tend to withstand the effects of subsequent sleep deprivation better than those who habitually obtain less sleep.

The Joint Special Operations University (JSOU) will hold its annual Joint Special Operations Medical Officer Orientation Course (JSOMOOC) 08-A, 7-11 April 2008.

This is a secret level interactive course designed to orient medical officers, senior non-commissioned officers, and governmental civilians newly assigned to, forecasted to be assigned to, or currently in direct support of SOF operations. The course will familiarize attendees with the USSOCOM mission, roles, and capabilities with a focus on medical operations in the joint SOF setting. Areas emphasized include: operations/plans, current lessons learned, intelligence, force health protection, operational risk assessment, health surveillance, and SOF relevant clinical subjects.

Individuals are selected to attend through a nominative process and class size is limited. A secret clearance is required to attend this course.

JSOU POCs are Lt Col John McAtee: DSN: 579-4377, Com: (850) 884-4377 or Maj Kari Smith, DSN: 579-5847, Com: (850) 884-5847

Further information on registration, course description, and other course dates can be found on the JSOU web page at: https://jsoupublic.socom.mil/courses/jsomooc/index.php

Executive Editor's Note: It is the command surgeon's intent to have a USSOCOM SOF Surgeon's Conference in conjunction with JSOMOOC. Since all of the component surgeons and the TSOC surgeons brief at JSOMOOC, as well as others from my staff, is becomes a great target of opportunity. Plans include, after this year, having the JSOMOOC at MacDill AFB, which will make the combination even more valid.

Fentanyl for Pain Control in Special Operations

Robert F. Kacprowicz, MD; Troy R. Johnson, MD; Dan S. Mosely, MD

Abstract

Opiate medications have been used for the control of severe pain due to combat trauma for hundreds of years. Morphine has long been the drug of choice for use on the battlefield, but it has several limitations which can make it difficult to use in modern warfare. Since its discovery in 1963, fentanyl has gradually emerged as one of the most effective alternatives to morphine. With fewer adverse effects and multiple routes of administration, fentanyl appears to be a very effective choice for the management of moderate to severe pain due to combat trauma. Available data support the use of fentanyl in Special Operations, but only after a thorough review of the pharmacology, adverse effects, dosing, and routes of administration.

Introduction

Opiates have been the analgesic of choice for the relief of moderate to severe pain for over 3500 years and have been the drug of choice for relief of pain from combat related injuries since the American Civil War. The first opiate used was a simple extract from the poppy plant, *Papaver somniferum*. The list of currently available opiates has expanded to include not only derivatives of the original poppy plant, but also very potent, purely synthetic compounds with over a thousand times the potency of the original formulation. Along with increased potency have come variable methods of administration. Oral, IM, IV, transdermal, transbuccal, and transnasal routes are now used for delivery of a variety of opiate compounds. This article will discuss a brief background of opiates, their pharmacology, side-effects, and precautions. We will focus on fentanyl in its two distinct delivery forms and their use in the Special Operations and prehospital environments.

Background

Opium and opiates were first noted in 1500 BC in the Ebers Papyrus' description of a poppy extract used to soothe crying children in ancient Egypt.[1] The writings of Theophrastus (3rd century B.C.) note the term opium from the Greek word for juice of a plant.[2] Hippocrates (BC 460 to 377 BC) and Galen of Pergamon (AD 131 to 200) likewise used opium for a wide variety of ailments.[3] The Swiss physician Paraclesus is credited with extracting the alkaloid laudanum by placing opium into brandy in the sixteenth century.[1] In 1804, German pharmacologist Setürner isolated and purified morphine, one of the more than 20 distinct alkaloids found within crude opium.[4] This derivative saw widespread use by the Union Army, via subcutaneous injection, during the Civil War.[5] This continued throughout the nineteenth century, and many of the derivatives were exploited for their analgesic and euphoric properties. In 1898, Bayer and Company introduced a semisynthetic diacetylated morphine, promoting it as a less addictive but equally effective antitussive.[6] The trade name given to the new drug was heroin, and by 1912, it was more readily available over-the-counter than codeine and had proved to be more potent than morphine.[7] Recognition of heroin's high abuse potential led to the Harrison Narcotic Control Act of 1914, which ultimately served to restrict the sale of narcotics and preceded an outright ban on heroin distribution in 1924. Dr. Everette May and Dr. Eddy worked to develop opiates that relieved pain without the potential for abuse and to discover synthetic substitutes for opiates — called opioids. Based on May's work on benzomorphans, the drug pentazocine was introduced in the 1960s. Pentazocine was the first drug used in clinical practice as a painkiller which combined the pain-relieving effects of morphine with the effects of opiate antidote.[8] In 1960 Dr. Paul Jannsen, working for Jannsen Pharmeceutica, formulated N-(1-phenethyl-4-piperidyl)-propionalide citrate. This compound proved to be much more potent than morphine and exhibit significantly less side-effect. In 1963 it was released to the public and fentanyl, the first fully synthetic highly lipophilic phenylpiperidine derivative, was born.[9]

Opioid Pharmacology and Pathophysiology

The natural opiates, morphine and codeine, are the dried extract from the seedpod of the poppy plant *Papaver somniferum*.[10] Semisynthetic opioids, heroin, naloxone, and oxycodone, are created by the chemical alteration of opium's alkaloids.[10] Synthetic opioids, methadone, and fentanyl, demonstrate pharmacologic properties of opium but are purely synthetic and synthesized de novo.[1]

Opioids can be absorbed by virtually any method but have a significant first-pass metabolism by the liver. Oral administration therefore requires a significantly larger dose in order to achieve similar effects. Most opioids undergo hepatic conjugation with glucuronic acid, undergo hepatic oxidation, or are hydrolyzed by tissue esterases to form metabolites that are excreted by the kidney.[10] The presence of active metabolites varies among the different opiods and greatly affects the potency and duration of their effects.

Opioids produce their effects by interacting with specific receptors within the central and peripheral nervous systems. They resemble the body's three known endogenous opioid peptides: enkephalins, endorphins, and dynorphins.[11] Three major classes of opioid receptors mediate the pharmacologic effects: mu (μ), kappa (κ), and delta (δ).[10,11] The specific analgesic effects of opioids are a function of several factors: affinity for the receptor, intrinsic receptor activity, presence of active metabolites, and genetic variation within the population.[12]

In general opioids hyperpolarize the nociceptive (pain) neurons and inhibit neurotransmitter release. Opioid-receptor activation results in inhibition of adenyl cyclase activity, creating K+ influx, and inhibiting Ca++ influx. This hyperpolarizes the cell thus raising the threshold for activation.[10,11] The clinical effect is reduction of pain perception while still maintaining sensory perception.

With the identification of the opiate receptors in 1973 our understanding of the types of receptor and effects has greatly increased.[13] Opioids typically bind to more then one receptor, but the affinity to the different opioids receptors produces different effects. Mu (μ1) is associated with morphine-like analgesia. Mu (μ2) receptors, found mostly in the supraspinal and spinal cord, produce the euphoric effect and are also responsible for respiratory depression, miosis, inhibited GI motility, bradycardia, and psychological aspects of chemical dependence.[12] Kappa (κ) receptors are found in the spinal cord and produce the effects of dysphoria and depersonalization. The delta (δ) receptors contribute to spinal analgesia and respiratory depression but are the least understood of the opioids receptors.[14,15] The euphoric and sedative effects of the mu (μ2) and delta (δ) -receptors appears to be mediated by the release of dopamine in the mesolimbic area of the brain.[1]

Opioids can be broken down into three functional groups: agonist, antagonist, and mixed (agonist-antagonist). Agonists primarily bind on μ and κ receptors and result in the effects outlined above. In contrast, opioid antagonists (Naloxone, Narcan) occupy the receptors but do not activate the receptors. Antagonists competitively block receptor activation and inhibit binding of opioid agonists. Mixed agonist-antagonist opioids (Buprenorphine [Buprenex], Butorphanol [Stadol], Nalbuphine [Nubain]) produce varied effects depending on the predominance of agonistic or antagonistic activities in the different types of receptors. Typically mixed agonist-antagonist produce a certain level of receptor activation, and analgesia, but create a "ceiling" effect were further activation is inhibited. Thus, mild to moderate pain can be controlled but further administration of the medication will not produce additional relief.[10,11]

Adverse Effects of Opioids

The adverse clinical effects of opioids are generally mediated through a combination of opioid receptor stimulation, especially the μ2 receptor, and histamine release. Major side-effects are respiratory depression, CNS depression, and indirect cardiovascular effects.

The most common cause of death from opiate toxicity is respiratory depression resulting in respiratory arrest. Respiratory depression from opioids appears to be due to a combination of both central and peripheral effects. Peripheral chemoreceptor-mediated ventilatory responses are blunted and the central respiratory centers of the medulla oblongata appear to be affected as well.[11] Respiratory depression can initially be subtle and manifest as small decreases in tidal volume; therefore, reliance solely on respiratory rate to detect respiratory depression can be unreliable and should be discouraged.[16,17] Close monitoring for respiratory compromise through clinical and adjunctive means (Pulse OX, end tidal CO_2) is warranted.

Decreased levels of consciousness from central nervous system depression range from mild sedation to coma. Profound CNS depression can impair the gag response and coupled with centrally mediated nausea and vomiting may result in pulmonary aspiration of gastric contents.[11]

Most opiates also have indirect cardiovascular effects though histamine release. The opioid-mediated release of histamine is via an undefined, direct, nonallergic mechanism.[18] This can result in itching, warmth, and urticaria. Histamine release also induces vasodilation and increased peripheral vascular permeability that can pre-

cipitate hypotension and edema. Pretreatment with a combination of H1 and H2 antagonists can decrease these hemodynamic effects.[11]

The miosis that is seen with opiate use generally occurs within five minutes of administration and can last up to six hours. This is primarily from μ-related stimulation of the visceral nuclei of the oculomotor nuclear complex and the parasympathetic nerve that innervates the pupil. [11]

Fentanyl

After release to the medical community in 1963, fentanyl was recognized for possessing potent analgesic qualities without histamine release. Medical professionals quickly came to appreciate the reduced cardiovascular effects seen with morphine.[19] The lack of side-effects led to rapid adoption in operative pain management and sedation. As civilian trauma management became more centralized, fentanyl became the drug of choice for the management of trauma in the peri-operative setting. Providers in austere settings did not adopt fentanyl as quickly; however, primarily due the IV-only nature of the early preparation and secondarily due to the limited analgesic duration (45 to 60 minutes). In 1993 the FDA approved an oral preparation of fentanyl citrate, Oralet, that was marketed for pediatric sedation. Several studies documented the success for sedation and pain control in this population.[20-23] Though initially met with great enthusiasm, use waned and this preparation was taken off the market due to perceived financial infeasibility by the manufacturer. Fortunately, a different manufacturer released a chemically identical preparation in 2000 for the treatment of break-through pain in cancer patients. This was marketed as Actiq and several studies soon showed it usefulness in this setting.[24-27] Coincidentally, several physicians within the Special Operations community began to search for an alternative to morphine on the modern battlefield. With the advent of hypotensive resuscitation on the battlefield and subsequent decrease in IV line placement in hemodynamically stable combat trauma victims, the need for a long acting, oral analogue to morphine became obvious. In addition, Special Operations Medics and physicians had long known that the administration of morphine via the IM route was both unpredictable and often provided suboptimal pain relief.[28,7,8] Many alternatives to morphine were researched; Dr. Russ Kotwal presented oral transucosal fentanyl citrate as a possible solution. Kotwal and colleagues subsequently formulated a successful pain treatment protocol within a Special Operations Joint Task Force for the treatment of isolated extremity injuries in hemodynamically stable patients in the prehospital combat setting.[30] Following this initial trial, Wedmore et al., endorsed oral fentanyl for use in the austere wilderness setting.[31] It has now been endorsed by the Committee on Tactical Combat Casualty Care as the analgesic of choice for moderate to severe pain in combat.[32]

Pharmacology

Fentanyl is highly lipid soluble, equilibrates rapidly, and has no active metabolites. Fentanyl does not cause the release of histamine and therefore, does not cause the same degree of hypotension seen with morphine.[19] IV fentanyl does cause significant sedation and can cause respiratory depression.[33] However, IV fentanyl has a short duration of action, typically less than one hour, and generally closer to 30 minutes.[34] In typical analgesic doses, respiratory depression appears to be infrequent and very short-lived.[35]

When given in large IV bolus, fentanyl has been observed to cause chest wall rigidity necessitating chemical paralysis to ventilate the patient.[36] This is the most serious and feared side-effect of fentanyl administration, but chest wall rigidity appears to be rare at doses less than 15mcg/kg.[36] In a recent study of 841 patients given fentanyl for sedation analgesia, no episodes of chest wall rigidity were seen.[35]

Fentanyl has been extensively studied in the medical literature, and both the oral lozenge form and intravenous forms have been well documented to relieve pain with few adverse effects in both the adult and pediatric patient populations.[38-41] Intravenous fentanyl has been shown to be very effective in relieving combat trauma pain in the out of hospital setting at doses of 1 to 2mcg/kg.[42] In addition, Kotwal and colleagues found oral transmucosal fentanyl to be very effective at reducing pain in combat with only minor side-effects and only one episode of transient respiratory depression.[30]

In summary, in analgesic doses, fentanyl appears to be safe and effective for the relief of moderate to severe pain and has fewer serious side-effects than morphine.

Intravenous Fentanyl Use

The usual dosage of fentanyl for pain relief intravenously is 1mcg/kg. This dosage provides an onset of action within 30 seconds and duration of action of 20 to 40 minutes.[43] Doses larger than 2mcg/kg can cause significant respiratory depression and have been shown to cause hypoxemia and blunted response to hypercarbia in healthy volunteers.[44] Dosages of this magnitude should not be given in the out of hospital setting.

Medication errors due to fentanyl dosing in micrograms (mcg) as opposed to the more commonly used milligram (mg) dosing can cause significant dosing errors of up to 10 times the correct dose.[45] This mistake is usually due to the confusion or misreading of the dosage in-

crements, and can be catastrophic, leading to chest wall rigidity, prolonged respiratory depression, and hypotension. Extreme caution should be used to avoid this medication error, particularly in the out of hospital setting.

Oral Transmucosal Fentanyl Citrate

Oral transmucosal fentanyl citrate, (OTFC) is a solid form of fentanyl citrate incorporated into a sweetened white lemon or raspberry flavored soluble matrix on a plastic handle. It is intended for oral administration over 15 minutes. Fentanyl is approximately 10 times more potent than morphine and is metabolized in the liver and intestinal mucosa by cytochrome P450 3A4 isozyme to an inactive metabolite, norfentanyl. OTFC is rapidly absorbed through the oral mucosa with the onset of action of five to ten minutes, and has terminal half life of six to seven hours. Of the total dose administered only 25% is absorbed by the oral mucosa. The rest of the medication is swallowed and undergoes significant first pass metabolism with only 1/3 of the swallowed dose reaching the systemic circulation (25% of the total). This gives a total absorbed dose of 50% of the administered preparation. The mucosal portion of the absorbed medication accounts for its rapid onset and the swallowed preparation accounts for the duration of effect. Maximum and mean serum concentration increase in a dose dependant manner.[45]

OTFC possesses a number of advantages compared with both IV fentanyl and morphine when used for analgesia. In the out-of-hospital setting, it can be rapidly administered and has a quick onset of action with prolonged duration of effect. Additionally, administration does not depend on placement of an IV or erratic absorption from IM administration.[45]

The suggested dose for oral fentanyl in the lozenge or lollipop form is 400 to 800mcg. Doses of 800mcg generally result in serum levels of 2ng/mL. In clinical trials respiratory depression has not been seen at or below this serum level.[45] A 1600mcg dosage is available, but not recommended in the out-of-hospital setting due to a significant risk of adverse effects in opiate naive individuals.[30]

Side-Effects

Common side-effects from both IV and oral fentanyl preparations include pruritis in 50%, vomiting in 40%, and occasional transient oxygen desaturation below 94%.[31]

As previously mentioned, the most severe side-effects of respiratory depression, bradycardia, and chest wall rigidity can occur, but have not been seen in the doses recommended for use here.[36]

Precautions

Only those trained in airway management and carrying naloxone for reversal of fentanyl's effects should use IV fentanyl in the out-of-hospital setting.

OTFC use should be closely monitored. Kotwal and colleagues suggest taping the fentanyl lollipop to the casualty's finger to allow the lozenge to fall out of the mouth should sedation occur.[30] If an attended casualty becomes sedated, removal of the lozenge from the mouth will immediately stop absorption.[45] Furthermore, it is highly recommended that any patient receiving this drug is monitored closely for any sign of respiratory compromise by both clinical and non-invasive methods (pulse oximetry, end-tidal CO_2 measurement). Likewise, naloxone should be available to medical personnel should excessive sedation and respiratory depression occur.

It should be noted that use of OTFC in opiate non-dependent patients is not approved by the FDA. Currently, the pre-hospital, combat application of this drug is considered an off-label use and every unit surgeon should take this into account when implementing a protocol for its use in his/her particular environment. The following is a recommended protocol to be used by pre-hospital extenders (Medics, Corpsmen, Special Forces medical sergeants, etc):

All providers and extenders will undergo formal training in the indications, contraindications, precautions, adverse effects, and reversal of fentanyl prior to issuance.

OTFC will be used for casualties in the austere setting when the following conditions are met:

- Rapid, narcotic analgesia is required.
- The patient must be alert and cooperative with adequate hemorrhage control.
- The patient can be monitored either directly or through the use of electronic monitoring devices.
- There are no contraindications to the use of narcotics (allergies, previous use of other narcotics or sedative-hypnotics, etc).
- The maximum dose for a single patient is 800mcg in a six hour period.
- Use must be clearly documented and related to follow-on care providers.
- Naloxone will be used per protocol for any patient with adverse side-effects due to this protocol.

Conclusion

Morphine and its derivatives have been used for pain control for over 3500 years. Since the Civil War, U.S. forces have used morphine derivatives for control of combat related pain with all of the inherent limitations. In modern warfare, Special Operations medical personnel have ac-

knowledged the limitations of morphine and are actively searching for alternatives. Fentanyl is perhaps the most promising alternative and appears to be uniquely suited for the management of pain in the combat setting. Fentanyl appears to be safer, more effective, and easier to use than morphine. While the available data is promising, providers must familiarize themselves with the pharmacology, dosing, side-effects, and management of complications of the use of fentanyl prior to using this alternative medication in the out-of-hospital setting. Although IV administration is probably optimal for pain control, OTFC appears to be a relatively safe and effective alternative to reduce pain in the out-of-hospital setting. Additional studies will still be required to fully understand its usefulness and adverse effects. Until then, proper understanding of this medication and precautions will need to be instituted in a protocol based fashion in order to ensure patient safety and avoidance of adverse events.

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Robert F. Kacprowicz, MD is a 1996 medical graduate from Northwestern University. He has deployed in support of OIF and OEF. He is the former Medical Director of the Pararescue and Combat Rescue Officer School, and the current Program Director for the San Antonio Uniformed Services Health Education Consortium Residency in Emergency Medicine and is a Clinical Assistant Professor of Emergency Medicine at the University of New Mexico.

Troy Johnson, MD is a 1995 medical graduate of USUHS. He is board certified in emergency medicine and has multiple deployments in support of the Global War on Terrorism. He is an Adjunct Assistant Professor in Military and Emergency Medicine at USUHS and is currently the Deputy Commander for Clinical Services at Fort Drum, NY.

Dan S. Mosely, MD is a 1996 medical graduate of USUHS. He is board certified in emergency medicine and is currently the Command Surgeon of Systems Performance Office. He is also an Adjunct Assistant Professor in Military and Emergency Medicine at USUHS and has multiple deployments in support of the Global War on Terrorism.

Lateral Canthotomy in Orbital Compartment Syndrome: Special Operations Medics on the Battlefield Can Save the Eye

Glenn D. Burns, MD; Stephen M. DeLellis MPAS, PA-C

Abstract

The primary medical role of the Special Operations Forces (SOF) Medic is to stabilize the patient and prevent loss of life, limb, and eyesight on the battlefield. Significant time and resources are invested to ensure that SOF Medics are the best trained and most proficient combat Medics in the world. While considerable focus is placed on teaching the intricacies of saving life and limb, it seems as though only tacit emphasis is placed on the preservation of eyesight.

Loss of vision can mean not only decrement of lifestyle for the patient, but could also mean loss to the military of a highly trained operator with years of irreplaceable experience. It is the conclusion of the authors that in addition to the current approach of medical management for orbital compartment syndrome, the skills to perform a lateral canthotomy and cantholysis could easily be introduced into the SOF medical training curriculum. This is a relatively straightforward procedure which could significantly reduce the morbidity from a potentially blinding injury.

Introduction

Orbital compartment syndrome, although rare, is a significant complication of acute facial trauma. It can readily lead to permanent loss of vision if not diagnosed early and treated appropriately and aggressively. The current mainstay of treatment taught to Special Operations Forces (SOF) Medics and contained in the Special Operations Forces Medical Handbook has been medical management with rapid (48 hour) referral to an eye specialist**.** This is largely due to the simple fact that penetrating injury to the globe has been the major injury pattern seen.

With the significant increase in operational tempo seen by these Medics over the past several years, ophthalmologic injury patterns have increased multi-fold in incidence and have lead to another look at the need for additional training in this area. Furthermore, a review of the Joint Theater Trauma Registry (JTTR) located in Iraq revealed a number of cases resulting in preventable loss of eyesight. Further record review revealed that where a SOF Medic provided initial care and resuscitation, this was the only individual available to provide definitive care for this type of injury. Without exception, the procedures outlined in this article, namely the lateral canthotomy and cantholysis were not performed. It is the intent of this article to recommend an easy, practical addition to the current training regime of the SOF Medic.

Materials/Methods

An exhaustive review of the JTTR was conducted, reviewing all injuries designated as "eye trauma." We found and evaluated 146 records dating back to the beginning of combat operations in Operation Iraqi Freedom and Operation Enduring Freedom. Cases were reviewed for specific mention or implication of retrobulbar compartment syndrome, retrobulbar hematoma, post-traumatic vision loss, or post-traumatic glaucoma in the diagnosis; also evaluated were cases in which an emergent lateral canthotomy and/or cantholysis was performed by an ophthalmologist or other care provider (OR trauma specialist). Of these, sixteen were noted to imply in the record that lateral canthotomy would have improved outcomes if performed earlier in the course of treatment. Four cases directly involved SOF Medics, though this was not reflected in the medical record.

The core curriculum for SOF Medics at the Special Operations Combat Medic (SOCM) Course, the Special Forces Medical Sergeants (SFMS) Course, and the Special Operations Combat Medical Skills Sustainment Course was reviewed. Furthermore, the main field resource available for SOF Medics, namely the Special Operations Medical Handbook, was reviewed for the management of eye trauma. Also, course material experts for the education of the SOF Medics were polled to verify what was taught during formal training in the above-mentioned evolutions.

A literature search was performed in an attempt to determine the minimum level of training necessary to establish a baseline for para-professionals to be able to perform this procedure; no information was found. Additionally, a search was conducted to determine standardized education of lateral canthotomy and cantholysis; no source outside of dedicated residencies in ophthalmology or emergency medicine was found. A survey was performed of the ophthalmologists and ophthalmology residents at two U.S. Army and one U.S. Navy hospital, as well as deployed ophthalmologic surgeons and emergency physicians at the 332nd Expeditionary Medical Group. The survey revealed a high degree of comfort with the concept of teaching this procedure to SOF Medics. There was universal concurrence that this procedure should be performed in the field due to a very low complication rate and high potential for significantly improved outcomes.

Discussion

Classically, orbital compartment syndrome has been associated with blunt trauma, or as an iatrogenic post procedure complication. A review of even the most current text books, including Will's Eye Manual, does little to comment on orbital compartment syndrome as a complication of penetrating injury. However, combat actions over the last several years have lead to an obvious shift in the paradigm, as it is now more routinely seen in theater accompanying penetrating injury.[1] Presumably, this is due to the fact that unique injury patterns are occurring as a result of blast injuries from improvised explosive devices (IEDs) and the subsequent multi-system complications, which are contributing to the new types of morbidity from the modern battlefield.

With the advent of improved personal protective devices (PPD), such as improved body armor, better helmets, torso and limb protection, etc., Soldiers are surviving what were previously considered lethal attacks. Unfortunately, PPD does not protect the entire body. Therefore, Soldiers tend to survive IED attacks, only to suffer the sequelae of blast pressure and injuries from secondary projectiles. The eyes are particularly vulnerable. While modern ballistic eyewear protects the eyes from frontal insult, the periphery of the orbit, specifically the lateral aspect, remains vulnerable.

Acute facial trauma, either blunt or penetrating, may lead to retrobulbar hemorrhage from either venous or arteriolar sources into the retrobulbar space. This area of the skull is more a potential space than an actual cavity as it is occupied by the globe anteriorly with seven immobile bones of the eye socket on the periphery and a relatively immobile interconnecting fascial layer.[2] Even trace amounts of venous or arterial bleeding can lead to an increase in retrobulbar pressure and rapidly overfill this potential space.

Retrobulbar hemorrhage is followed by displacement of the globe anteriorly to the extent allowable by the canthal tendons (and to a lesser degree the prolapse of bulbar fat). Anterior displacement squeezes the globe between the immobile eyelids and the now expanding hematoma. When anterior displacement of the globe reaches the limits of its anatomical restraints, intraorbital and intraocular pressures can go up precipitously, leading to permanent damage to the optic nerve.[3] Penetrating trauma may produce direct injury to the eye or any of the periocular structures.[4]

Vessels that provide watershed blood flow to the sensitive structures of the eye, namely the postciliary, prelaminar, and choroid capillaries – are at risk. These structures lie within the musculature of the eye and as such are compressed with minimal expansion of the retrobulbar space; they are especially vulnerable to anatomic disruption, even at relatively low pressures. Finally, with increasing pressures, the ophthalmic artery itself may become compromised resulting in true orbital compartment syndrome. The end result of orbital compartment syndrome may be central retinal artery occlusion, anterior ischemic neuropathy, and blindness if not reversed emergently.[5]

The diagnosis of orbital compartment syndrome has traditionally been made at the tertiary care level with the use of intraocular pressure devices such the Medtronic TonoPen™, with little emphasis being placed on its diagnosis and management by personnel in the field. Current SOF medical guidelines for treatment of increasing intraocular pressure (IOP) merely call for pharmacologic management and referral within 48 hours.[6] Traditional teaching has emphasized saving of life and limb, with only tacit emphasis on the rescue of eyesight. Loss of vision can mean not only loss of lifestyle for the patient, but also loss to the military of a highly trained operator with years of irreplaceable experience. This medical management of acute eye trauma has been considered the acceptable pattern in the past as it was consistent with the injury pattern previously seen by SOF Medics. However, as the type of injury has evolved, so has the need for more rapid diagnosis and definitive battlefield care.

The surgical expertise necessary for the SOF Medic to perform these procedures is already present, as they are already both familiar and comfortable with such aggressive interventions as cricothyrotomies and tube

thoracostomy. While only a cursory ophthalmologic exam is possible on the battlefield, it is sufficient to evaluate for orbital compartment syndrome and the need for lateral canthotomy and cantholysis.

Signs and symptoms suggestive of orbital compartment syndrome are: decreased ocular motility, proptosis, nausea and vomiting associated with eye pain, afferent pupilary defect, a hard globe on palpation, and significantly decreasing visual acuity over a course of time.[4,5] Decreasing visual acuity (for all practical purposes, the vital sign of the eye) over time should be considered one of the most alarming factors in the SOF Medic's exam, though the presence of any or all of the aforementioned signs or symptoms should cause the SOF Medic to consider orbital compartment syndrome. Serial examinations, especially with delays to more definitive care, are paramount as signs and symptoms of retrobulbar compartment syndrome may not be present, or obvious, on initial presentation. Once ischemic retinopathy from retrobulbar hemorrhage manifests, time is of the essence to salvage the eye – and the 48 hours currently taught to SOF Medics[6] is beyond what some authors have recommended as a more effective goal of six hours.[7]

Procedural risk to the globe while performing the lateral canthotomy and cantholysis can be minimized with a basic review of anatomy and cautious application of the procedure. While hemorrhage, infection, and injury to the other structures of the eye (such as lateral canthal ligament) can occur when performing this procedure, they are typically much more amenable to reconstructive or pharmacologic therapy than any retinal injury resulting from ischemia. Incisions made during the performance of the lateral canthotomy, even by relatively inexperienced providers, have been shown to generally heal without suturing or significant scarring.[8] It could be stated that compared to the risks associated with *not* performing this procedure, those associated with completing it are minimal.

The goal of this procedure, as with any procedure performed on the battlefield, is to save the eye until more definitive treatment may by obtained. The hands-on training to gain competency has been shown to require minimal resources and time when experienced providers with a basic understanding of simple procedures are involved. Furthermore, it has been shown that didactic models are an effective, easy, and inexpensive means of supplementing hands-on training. An instructional video outlining this procedure can be found on the world wide web at *http://www.brown.edu/Administration/Emergency_Medicine/eye.htm*[9] (must capitalize exactly as shown here).

Of special note: It is generally stated that palpation of the globe of the eye after trauma is relatively contraindicated, especially by the mid-level provider. In this case however, with an index of suspicion and in the absence of more advance methods of ophthalmologic exam, cautious palpation can be performed prior to proceeding in an effort to assess for orbital compartment syndrome on the battlefield. The risk/benefit of such a course of action significantly supports cautious exam.[10] However, it is notable that this recommendation is controversial and should ONLY be performed by an experienced provider who has made every reasonable effort to assure there is no penetration of the globe itself. Under most circumstances, the presence of proptosis alone would be a clinical indication for performing the procedure, and as such, no palpation would be necessary.

Traditionally, even rural first-responders could realistically expect to transport their patients to an established treatment facility within the "golden hour," but the same is not true for the SOF Medic in the field. Definitive care for the SOF patient may be many hours or even days away; as such, special consideration for this patient population and SOF medical protocol must be made.

Careful consideration should be given to increasing intraocular pressure (IOP) in the face of globe rupture. Mixed opinions have been elicited through conversation with various ophthalmologic consultants. It appears to be the majority opinion that little harm would be done by performing lateral canthotomy and cantholysis if accomplished without placing additional stress on the globe. It would be tragic if the globe could be salvaged from penetrating trauma or rupture, only to discover that vision was lost due to increased IOP.

Conclusion

SOF Medics receive extensive training in anatomy and physiology, pharmacology, trauma management, and surgical technique. Our SOF Medics confidently and competently perform invasive surgical procedures as a cricothyrotomy or tube thoracostomy. Nevertheless, a review of battlefield eye trauma outcomes, as well as the SOF medical curriculum, suggests a need for broader thinking in the arena of eye trauma management.

A simple review of the anatomy of the eye and its surrounding structures, medications typically used for anesthesia and intraocular pressure reduction, as well as review of the surgical techniques via live tissue models, should be sufficient to provide these exceptionally well-prepared Medics to perform this procedure in the field. Additionally, the Special Operations Forces Medical Handbook (01 June 2001) reviews common eye prob-

lems and eye injuries, but it does not cover loss of vision due to increased IOP. Introducing the concept of the lateral canthotomy and cantholysis into continuing education forums within the SOF community (Special Operations Combat Medical Sustainment Course) would cost little in terms of time, manpower, and money, but could prove invaluable to the trauma patient in need.

Fortunately, the practice of assessing, treating, and reassessing is ingrained into the SOF Medic mindset throughout training. SOF Medics perform in a stellar fashion when dealing with insults to the head, neck, thorax, abdomen, and limbs. They confidently assess, treat, and monitor the most challenging of trauma patients with little more than an aid bag of rudimentary supplies. The tools to salvage eyesight, threatened by increasing IOP from retrobulbar hemorrhage, exist in that aid bag. Educating SOF Medics tools to salvage the threatened eyesight could prove to be an invaluable investment.

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Capt Glenn Burns, MD, FAAEM is a 2002 graduate of the Uniformed Services University of the Health Sciences. He earned his board certification in Emergency Medicine after completing residency at Wright State University where he also served as Chief Resident. He is currently a physician serving with the U.S. Special Operations Command in OIF and holds an academic appointment as an Assistant Professor of Military and Emergency Medicine at the Uniformed Services University School of Medicine. Prior to medical school, Capt Burns spent eleven years serving in an operational capacity in the Special Operations community.

CPT Steve DeLellis MPAS, PA-C, is an Army Physician Assistant currently serving with the U.S. Army Special Operations Command (USASOC). Steve is a former Special Forces Medic (18D). Previous assignments include the 82d Airborne Division, the 1st Bn, 75th Ranger Regiment, 3rd Bn, 3rd Special Forces Group and several assignments within USASOC. His operational experience includes tours in Panama (Just Cause), the Philippines, Somalia (UNOSOM II), Haiti (Restore Hope), Serbo-Croatia, Afghanistan (OEF) and Iraq (OIF). Steve is currently deployed on his sixth tour to Iraq.

Fascioliasis and Fasciolopsiasis: Similar Names, Similar Diseases?

Lynden Bowden, MD, MPH

ABSTRACT

This article reviews plant-borne helminth infections caused by *Fasciola hepatica/gigantica* and *Fasciolopsis buski*. Besides having similar names, both infections are caused by trematodes (flatworms or flukes). As with nearly all helminth infections, eosinophilia may be present, there is usually a delayed clinical presentation, and diagnosis is made with the proper identification of parasite eggs in the stool or serological testing. However, fascioliasis and fasciolopsiasis have more similarities including: egg morphology, parasite development, the involvement of aquatic plants and snails in the lifecycle, and preventive measures. Despite these similarities there are some important differences including: geographical distribution, definitive hosts, clinical presentation, and treatment. The SOF medical professional will have a greater understanding and be able to more easily identify both of these infections by being able to compare and contrast the two. Though these are not the most common helminth infections, these diseases are prevalent and may be of particular importance to providers working in Southeast Asia or South America.

Accreditation/Designation Statement

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FINANCIAL DISCLOSURE

The author of **Fascioliasis and Fasciolopsiasis: Similar Names, Similar Diseases?**, **Lynden Bowden, MD, MPH,** indicated that, within the past year, he has had no significant financial relationship with a commercial entity whose product/services are related to the topic/subject matter.

OBJECTIVES

1. Understand the epidemiology and geographic distribution of fascioliasis and fasciolopsiasis.
2. Be able to describe the lifecycle of fascioliasis and fasciolopsiasis.
3. Know the key similarities and differences in the clinical presentation, diagnosis, and treatment of fasci oliasis and fasciolopsiasis.
4. Describe prevention strategies for fascioliasis and fasciolopsiasis.

Introduction

Parasitic worms (helminths) are a great success in an evolutionary sense, but are equally successful at causing a massive burden of human and animal disease. It has been said by one renowned parasitologist, "There are more different *species* of parasitic worms in the world than there are people in the world."[1,2] Thus, many people suffer from infections of multiple worm species. Indeed, common helminth infections such as schistosomiasis, onchocerciasis, and soil-transmitted helminths (*Ascaris* species, hookworms, pinworms) affect hundreds of millions of people worldwide. These diseases receive much attention from the World Health Organization (WHO) through well-established public health programs such as the Partners for Parasite Control and Onchocerciasis Control Program.[3,4] However, other helminth infections that do not receive as much attention also contribute to the overall burden of helminth-associated disease. These helminths include "food-borne" trematode infections.[5] Two of these infections are fascioliasis (caused by *Fasciola hepatica* or *Fasciola gigantica*) and fasciolopsiasis (caused by *Fasciolopsis buski*).

Fascioliasis and fasciolopsiasis are infections caused by "aquatic plant-borne" trematodes.[6,7] In order to better understand this classification a quick review of helminth taxonomy is warranted. Helminths are classified several ways. Parasitologists classify helminths morphologically into annelids (segmented worms like leeches), nematodes (roundworms like *Ascaris lumbricoides*), and platyhelminthes (flatworms).[1] Platyhelminthes are commonly classified as cestodes (tapeworms like *Taenia solium*, pork tapeworm) and trematodes (flukes).[1] Healthcare professionals typically further classify helminths by the tissue or organ system in

Table 1. Key comparisons between fasciolopsiasis and fascioliasis[8]

Disease	Fasciolopsiasis	Fascioliasis
Organism	*Fasciolopsis buski*	*Fasciola hepatica, Fasciola gigantica*
Type of parasite	Trematode (Fluke, flatworm)	Trematode (Fluke, flatworm)
Adult	Large, up to 7cm in length	3cm in length
Eggs	130-159 x 78-98 µm	120-150 x 63-90 µm
	Oval, thin shelled, yellow, operculum not noticable	Oval, thin shelled, yellow, operculated
Human Reservoir	Intentional	Unintentional
Animal Reservoir	Pigs	Sheep
	Dogs	Cattle
		Water buffalo
Intermediate host	Snails (planorbid)	Snails (lymnaeid)
Aquatic plant	Water chesnuts, water bamboo, water caltrop	Watercress
Site of infection	Small intestine	Liver, bile ducts, skin
Clinical presentation	Diarrhea	RUQ pain
	Vomiting	Elevated LFTs
	Anorexia	Biliary colic
	Abdominal pain, intestinal obstruction	Obstructive jaundice
	Edema of face, abdominal wall, and legs	Migratory inflamation of skin (ectopic infection)
	Acities	
Diagnosis	Eggs in feces apprear in 3 months	Eggs in feces apprear in 3-4months
Geographic distribution	Rural SE Asia	Worldwide, more common in:
	Central and South China	South America (Bolivia, Ecuador, Peru)
	India	Egypt
	Thailand	Georgia
		Russia
		Vietnam
Treatment	Praziquantel	Triclabendazole - NOT FDA approved, bithionol

which they reside or cause infection (for example, schistosomes are classified as "blood flukes"). Still another classification scheme is by the parasite's intermediate host (for example, dracunculiasis is copepod-mediated, while schistosomiasis is snail-mediated). In the case of *F. hepatica/gigantica* and *F. buski*, classification is by second-intermediate host – an aquatic plant. Infections result from eating parasite-encysted plants, thus they are also food-borne infections. In addition to *Fasciola hepatica*, *Fasciola gigantica*, and *Fasciolopsis buski,* three other plant-borne trematodes cause disease. These include *Gastrodiscoides hominis*, *Watsonius watsoni*, and *Fischoederius elongates*.[6]

Fascioliasis and fasciolopsiasis have important similarities that go beyond names, taxonomy, and clinical features common to all helminthic infections. Indeed, important differences exist as well. The remainder of this article details these key similarities and differences that are summarized in Table 1.

Epidemiology

It is estimated that worldwide 40 million people have food-borne trematode infections out of the 700 million people at risk. Accordingly, the reported prevalence of fascioliasis is 2.39 million people infected out of the more than 180 million at risk.[5,9] Others place the estimated prevalence much higher: Up to 17 million people may be infected worldwide (the discrepancy in the reported and estimated prevalence is due to underreporting of the disease in many countries).[5] Over the past several decades, fascioliasis has been reported in 61 countries and has a geographic distribution throughout Asia, Africa, South America, Europe, and Oceania.[5-8] In 51 countries, the incidence of fascioliasis is increasing, making it an emerging disease throughout the world.[5,10] The following countries have the highest reported prevalence: Bolivia, Ecuador, Egypt, France, Iran, Peru, and Portugal. The most reliable data on prevalence was obtained from eight countries used in a WHO study group report (the above mentioned countries excluding France, but including China and Spain).[5] Parasitologists have studied some hyperendemic areas in depth and there is good epidemiological data from published reports. For example, the Bolivian altiplano (high plain) is a hyperendemic area in South America that has been well studied; in some communities the prevalence of people shedding eggs was 65 to 92 percent.[5,11] An estimated 360,000 people in Bolivia are infected.[5] In the nearby countries of Ecuador and Peru, as many as 20,000 and 792,000 are infected, respectively.[5] Infections occur mainly in rural areas where the consumption of aquatic plants such as watercress is high. A recent case-control study conducted in Peru, found fascioliasis to be positively associated with familiarity with aquatic plants, drinking alfalfa juice, and dog ownership.[12] Other studies revealed that females shed more eggs and have a higher rate of infection than males.[5,6] It is thought that this gender difference exists due to cultural or behavioral factors such as females being the members of the family who wash household items in water, and prepare food including aquatic plants.

Fasciolopsiasis is present mainly in Southeast Asian countries with formal epidemiological surveys taking place in the following countries: China, Taiwan, Bangladesh, India, Vietnam, and Thailand.[6,8] Fasciolopsiasis has also been detected in Laos, Cambodia, Indonesia, Singapore, Myanmar (formerly Burma), Malaysia, and the Philippines.[6,8] There are no reported cases of fasciolopsiasis in Japan or Korea.[6] Most of these studies are prevalence surveys of villages, local regions, or specific age groups making it difficult to make a general statement about the prevalence of fasciolopsiasis. In one large study in central Thailand there was an estimated 100,000 people infected in a population of 500,000.[6] Another study conducted in northern Thailand reported a prevalence of 7 percent.[6] In China, a survey that included 10 provinces found a very wide range of prevalence from 1 to 85 percent.[6] Other epidemiological relationships include females being more infected than males, and children under 15 years of age being more infected than adults. The 10 to 14-year-old age group was the most heavily infected.[6] These relationships were found in other countries too, including Thailand, Bangladesh, and Taiwan.[6] Higher rates of infection were also found to be associated with: high infection rate in pigs, one's proximity to plantations that cultivate aquatic plants, socioeconomic status, and villages that lack food inspection and sanitation programs.[6] It is hypothesized that the globalization of aquaculture is a major factor in the worldwide emergence of food-borne trematode infections since this industry has grown exponentially in recent decades.[10] Several studies have shown that the closer one lives to freshwater, the greater one's risk of having a foodborne trematode infection.[10]

In the United States, fascioliasis is rare and occurring cases are usually imported.[13] In one case series article, it was reported that 7 of 58 specimens submitted to a major U.S. reference laboratory tested positive for *F. hepatica*.[13] Likewise, there have been only few cases of imported fasciolopsiasis in the USA.[5,8]

Identification of adult flukes and eggs

Adult *Fasciola hepatica* flukes are 20 – 30mm long and 8 – 12mm wide.[14] *Fasciola gigantica* is reported to be slightly larger; however, the sizes of *F. he-*

patica and *F. gigantica* overlap. It has been reported that the life span of *F. hepatica* in humans is 9 to 13.5 years.[6] Eggs are elliptical in appearance with dimensions of 120 – 150µm by 63 – 90µm.[15] They are thin shelled and have a "cap" at top called an operculum.

F. buski is one of the largest flukes that infect humans and with a commonly reported length of 7.5cm (up to 10cm according to some parasitologists[6]) and width of 2.0cm (range 2.0 – 7.5cm by 0.8 – 2.0cm).[16] The eggs range in size from 130 to 159µm by 78 to 98µm and are operculated.[16] The operculum, however, is less noticeable in *F. buski* eggs than in *F. hepatica* eggs.

Figure 1. *Fasciola hepatica* egg. Note the crescent shaped operculum that "caps" the top of the egg (denoted in the figure by the *****). Eggs of *Fasciolopsis buski* are similar in size, shape, and color, but the operculum is usually less noticeable. Image available for public use through the Carlo Denegri Foundation Atlas of Human Parasitiology available at: http://www.cdfound.to.it/_atlas.htm.

Lifecycle, plant and animal hosts

The lifecycles of these two trematodes are nearly identical as depicted in Figure 2. Differences in the lifecycle are noted in **bold type** below.

Fasciola hepatica/gigantica: Unembryonated eggs are discharged from adult trematodes into the **biliary ducts** and thus the stool of humans or other mammals. As stool is excreted into freshwater, eggs mature and release miracidia, which invade a suitable snail intermediate host of the family ***Lymnae***. In the snail, the trematodes develop into cercariae. The snail releases cercariae and they attach to aquatic plants where they encyst as metacercariae. Humans and other mammals become infected by ingesting metacercariae attached to aquatic plants. Metacercariae exist in the duodenum and migrate through the intestinal wall, the peritoneal cavity, and the liver parenchyma into the biliary ducts, where they develop into adults. They develop into adult flukes in approximately three to four months and occupy the biliary ducts.[15]

Fasciolopsis buski: Unembryonated eggs are discharged from adult trematodes into the **intestine** and stool of humans or other mammals. As stool is excreted into freshwater, eggs mature and release miracidia, which invade a suitable snail intermediate host of the family ***Planorba***. In the snail, the trematodes develop into cercariae. The snail releases cercariae and they attach to aquatic plants where they encyst as metacercariae. Humans and other mammals become infected by ingesting metacercariae attached to aquatic plants. Metacercariae excyst in the duodenum and **attach to the intestinal wall**. There they develop into adult flukes in approximately **three months**, attached to the intestinal wall where they will live for about one year.[16]

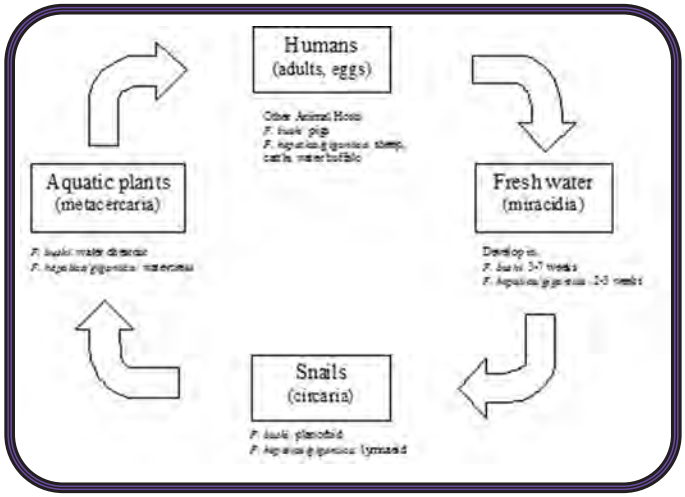

Figure 2 Lifecycle of *Fasciola hepatica/gigantica* and *Fasciolopsis buski*.

First intermediate hosts: snails

As mentioned above, Lymneid snails serve as first intermediate hosts of *F. hepatica/gigantica*. This family of snails has a worldwide distribution. *Galba truncatula* is the Lymneid mainly found in Europe, while *Pseudosuccinea columella* is mainly found in the Americas.[5,6] The ability of these Lymneid species to adapt to new environments (including some very high altitude regions) has made fascioliasis an emerging disease throughout the world.[5,6] The common Lymneids that serve as hosts for *F. gigantica* are from the genus *Radix*, which are less adaptable to new environments than the Lymneids that serve as hosts for *F. hepatica*. Thus, there is a more limited geographic distribution of *F. gigantica*.[6]

Planorbid snails of genera *Segmentia*, *Hippeutis*, and *Gyraulus* serve as first intermediate host of *F. buski*.

Depending on temperature and specific snail species, it can take 46 to 59 days for the parasite to undergo development in the snail tissues.[6] In some infected planorbid snails the mortality rate is 100 percent because developing *F. buski* causes permanent damage to snail tissues.[6] The effect on the parasite lifecycle is that there is a short time period allowed for development in the snail.[6] Curiously, there are unconfirmed instances where Planorbid snails serve as intermediate hosts of *F. hepatica*.[6]

Second intermediate hosts: aquatic plants

Watercress (*Nasturtium officinale*) is classically reported as the second intermediate plant host of *F. hepatica/gigantica*.[14,17,18] Watercress is an aquatic plant that grows in freshwater. It is a green leafy vegetable that grows in most temperate and tropical areas of the world. Wild watercress is collected and eaten, but it is also cultivated in small family gardens and farms.[18] The plant is also produced commercially on large farms and sold in supermarkets. A fascioliasis outbreak of 18 cases in France in 2002 was associated with consuming cultivated watercress produced at a commercial farm.[18] The investigation revealed that Lymneid snails were present in watercress beds as well as runoff water from a neighboring cattle farm. Other vegetables upon which metacercaraie are known to encyst includes varieties of wild, aquatic mint.[5,9] Experimental studies revealed that metacercariae preferentially encyst on plants that have a rough as opposed to a smooth epidermis.[5] These studies also found that lettuce, parsley, and clover were shown to support *Fasciola* metacercariae.[5]

Figure 3 Watercress (*Nasturtium officinale*) pictured here was obtained from a commercial farm in the United States. Watercress is the aquatic plant classically associated with fascioliasis. Cultivated watercress played a role in a fascioliasis outbreak in France in 2002. *Photographed by author, 2007.*

Water chestnut (*Eliocharis tuberosa*) is classically reported as the second intermediate aquatic plant host of *F. buski*.[5,14] It mainly grows in Southeast Asia. Other aquatic plants that serve as hosts for *F. buski* include: water caltrop (*Trapa natans* or *Trapa bicornis*), water lotus, water lily, water bamboo, water morning glory, water hyacinth, and duckweed.[5,6] Not surprisingly, *F. buski* metacercariae may also encyst upon watercress.

It is also important to know that metacercariae encyst on the water surface and there is sufficient evidence to show that human and animal infections are due to ingesting infected drinking water.[6]

Figure 4 Aquatic plant environments like this one in the Southern Philippines can harbor infective metacercariae of aquatic plant-borne trematodes. *Photographed by author, 2006.*

Definitive hosts: humans and other mammals

Fascioliasis is a disease of large grazing herbivores such as sheep, goats, cattle, buffalo, and horses. It is probably the most common helminth infection in cattle.[9] One alternative name given to the disease is "Sheep Liver Rot." Pigs, deer, elk, donkeys, camels, llamas, and rabbits are also reported as less common hosts.[6-8] Research has shown that *F. hepatica* is highly adaptable to new definitive hosts and experts regard humans as unintentional definitive hosts. Research also shows that *F. hepatica* seems to more readily infect humans than *F. gigantica*.[6]

Figure 5 Fascioliasis is probably the most common helminth infection in cattle. Infected cattle grazing near a river (in this case the Niger River in Mali) could introduce the parasites into freshwater sources. This, in turn, could lead to infection in humans when contaminated water (or plants growing in the water) is consumed.
Photographed by author, 2007.

Fasciolopsisasis is a disease in which humans are intentional definitive hosts.[6,8] Pigs are the most common non-human definitive host, but usually harbor fewer parasites than humans.[6] Rabbits, monkeys, and guinea pigs were also found to be susceptible to infection in laboratory tests. Cattle, buffalo, and horses do not serve as hosts for *F. buski*.[6] There is some debate among experts whether dogs are important definitive hosts for *F. buski*.[1,6]

Clinical presentation

In fascioliasis, immature flukes migrate from the gastrointestinal tract to the liver and biliary tract. In this acute phase of infection, symptoms may include abdominal pain, hepatomegaly, fever, diarrhea, vomiting, and eosinophilia.[14,19] Occasionally, urticaria, dypnea, cough, and dyspepsia are also present.[5] These may be the only symptoms for several months. In the chronic phase, adult flukes reside in the hepatic and common bile ducts and patients may experience biliary colic, obstructive jaundice, ascending cholangitis, and pancreatitis.[14,19,20]

Ectopic infections occur in which flukes migrate to the skin or the eye. There was a reported case in which an 11 year-old girl from Vietnam was found to have a fluke inside a puncture wound over her knee.[21] In another case from Vietnam, a small, hard, migrating puritic mass was noticed on a 48 year-old woman's chest.[21] When incised, an immature fluke appeared. In these cases, the flukes were identified using DNA analysis and found to be *F. gigantica.* There is at least one reported occurrence of *F. hepatica* infecting the anterior chamber of a woman's left eye in a highly endemic area of Iran.[22]

In fasciolopsiasis, adult flukes live in the host's duodenum and jejunum exclusively, unless there is a very heavy parasite burden. Clinical manifestations stem from the fluke's direct effects on these organs. Tissue changes include ulceration, hemorrhage, and inflammation.[6,14] The pathological changes of the bowel are manifested as clinical signs related to physical trauma, obstruction, or toxicity of the small bowel.[6,14] Light infections are usually asymptomatic, but may cause diarrhea. The diarrhea is mainly watery; however, undigested food and mucus may be present due to malabsorption. Accompanying signs and symptoms may include periods of constipation, abdominal pain, eosinophilia, headaches, dizziness, and abdominal distention. Moderate infections may cause nausea, vomiting, fever, and bowel obstruction. In heavy infections, poor appetite, malnutrition including vitamin B12 deficiency, ascities, and facial edema progressing to anasarca may be part of the presentation.[6,14] Ascites, edema, and anasarca are attributed to the body's absorption of toxic and allergic metabolites produced by the parasite.[6]

Diagnosis and treatment

In fascioliasis, the cornerstone of diagnosis is the identification of eggs in the feces. However, stool examinations may be negative in newly acquired infections (since flukes do not mature and produce eggs until about three to four months after initial infection), or in even older infections (due to the intermittent nature of fluke egg production).[8,14] Another pitfall is the possibility of "false" fascioliasis — that is, eggs are identified in the feces but are due to the patient's ingestion of infected raw liver or another food that contains eggs that are simply passing through the digestive tract in the process of digestion.[6] It is also possible to identify eggs from bilary or bile aspirate. Since egg identification can be difficult, the use of serological tests such as complement fixation and electrophoresis are available. These tests have the advantage of being positive soon after infection and much earlier than a stool exam.[6,14,23] Enzyme-linked immunoabsorbent assay (ELISA) tests are commonly used and are highly sensitive and specific. Radiographic imaging studies prove very useful in the diagnosis of fascioliasis. Ultrasound and computed tomography are the most commonly used modalities. Findings include: common bile duct and intrahepatic bile duct dilatation, bile duct wall thickening, nodular lesions, and flukes in the gallbladder.[20,24] Saba et. al., classify fascioliasis based on motile echogenic images and symptom duration.[25]

Acute fascioliasis is defined as symptoms of infection for a duration of less than four months and no motile echogenic images in the gallbladder. Chronic fascioliasis is defined as symptoms of infection for a duration of longer than four months or motile echogenic images in the gallbladder. Endoscopic retrograde cholangiopancreatography (ERCP) is both diagnostic and therapeutic. Findings in this study include: motile curved filling defects and irregularities of the bile duct wall. Once identified, one can extract flukes using a balloon or basket. In one case, 20 flukes were removed from a single patient.[20] Magnetic resonance cholanigography proved useful in at lease one case to monitor a patient's response to drug therapy.[26] Percutaneous liver biopsy is not useful since it rarely reveals eggs or parasites.[20]

In fasciolopsiasis, diagnosis cannot be made based on clinical signs and symptoms alone. Diagnosis is made by the identification of eggs in the feces that resemble those of *F. hepatica*. It is rare to recover actual flukes from a patient; however, there was one reported case in which a Vietnamese boy vomited several flukes.[27] Sequences of DNA extracted from these flukes were compared to sequences of known *F. buski* DNA in the GenBank database. The sequences were nearly identical, thus confirming the diagnosis of fasciolopsiasis.

Drug therapy for fascioliasis includes the use of triclabendazole, bithionol, and praziquantel. Among these triclabendazole has proven especially efficacious in the treatment of fascioliasis.[28] Studies showed that the cure rate was 79 percent after one dose and 93-100 percent after two doses.[6] Unfortunately, triclabendazole for human use (Egaten®, Novartis, Basel, Switzerland) is not commercially available in the United States. However, triclabendazole for veterinary use (Fasinex®, Novartis, Basel, Switzerland) is available and has been used effectively to treat livestock since 1983.[13] The mechanism of action of triclabendazole is not completely understood, but the drug probably acts to disrupt the fluke's microtubules.[29,30] In addition, triclabendazole seems to inhibit the release of proteolytic enzymes. These effects cause immobility and death of the fluke. Once absorbed (a fatty meal will increase absorption) it reaches peak serum concentrations in eight hours.[29] Most of the drug (and its metabolites) is eliminated in the feces. In animal studies, there have been no adverse fetal effects. Triclabendazole is excreted in breast milk. Side effects may include transient diarrhea, and abdominal cramps. Treatment with triclabendazole may induce biliary obstruction, which may occur due to dying flukes. Though dosage has not been established, a single dose of 10mg/kg body weight is the usual pediatric and adult dose.[29,31,32] In more severe cases, two doses at 20mg/kg body weight 12 hours apart is recommended.[29] Triclabendazole, manufactured for humans, comes in 250mg tablets. Tablets should be stored at less than 104 degrees Fahrenheit (40 degrees Celsius).[29] SOF healthcare providers should know that triclabendazole in not an FDA approved medication. However, it is important to be familiar with the drug because foreign healthcare providers may use it.

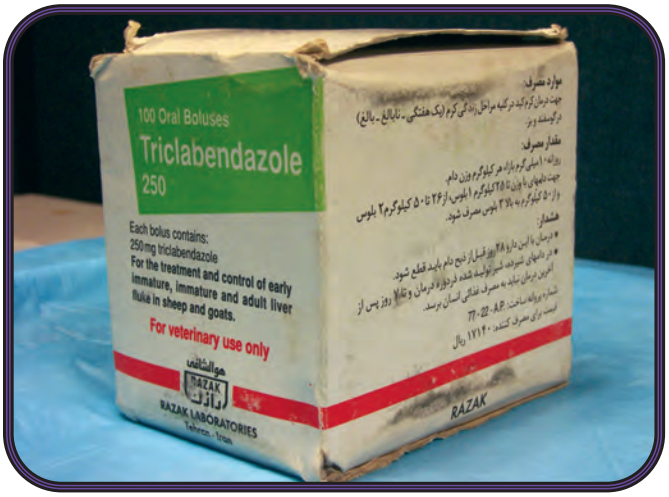

Figure 6 Triclabendazole pictured here is the drug of choice for the treatment of fascioliasis. However, it is not FDA-approved for human use. This veterinary formulation was manufactured in Iran where fascioliasis is common (in animals and humans) in areas near the Caspian Sea.
Photographed by author, 2007.

Bithionol is an investigational drug and is available through the CDC Drug Service.[33] Its mechanism of action involves blocking oxidative phosphorylation of the parasite.[31] The dosing regimen for bithionol is 30 to 50mg/kg/day divided into three times per day on alternating days for 5 to 15 days.[31,32] Side effects of bithionol include nausea, vomiting, loss of appetite, abdominal pain, dizziness, photosensitivity, and purtitis.[31] One or more of these side effects may be present in 50% of patients taking bithionol.[13]

Praziquantel is the drug of choice for treatment of fasciolopsiasis. Praziquantel (Biltricide®, Bayer, West Haven, CT) acts to increase the fluke's cell membrane permeability.[31,34] Increased permeability leads to the loss of intracellular calcium. This causes rapid muscle contraction and paralysis. In addition, bleb formation and vacuolization occurs, leading to disintegration of the tegument. Praziquantel is rapidly absorbed, undergoes extensive first-pass metabolism, is highly protein binding, reaches peak serum concentrations in less than 1.5 hours, has a half-life of one to three hours, and is excreted in the urine.[34] It is a FDA Pregnancy Category B drug.

It is excreted in breast milk and nursing mothers are advised to stop breast feeding for 72 hours once the drug is started. Potential side effects include: dizziness, drowsiness, fever, abdominal cramps, nausea, vomiting, (bloody) diarrhea, increased sweating, and skin rash.[31,34] Contraindications include known praziquantel hypersensitivity and ocular cysticercosis (permanent ocular lesions result from death of parasites in the eye).[34] Key drug interactions (through the induction of cytochrome p450 enzymes) that act to decrease serum levels of praziquantel include: rifampin, phenytoin, and dexamethasone.[34] Drug interactions that increase praziquantel levels (through the decrease of cytochrome p450 enzyme activity) include: ketoconazole, cimetidine, and erythromycin.[34] Caution should be exercised when using praziquantel in patients with liver disease, as they will have increased serum drug concentrations. For fasciolopsiasis, the dose is 25mg/kg three times a day (dose spaced 4 to 6 hours apart) for one day.[31,32,34] This is the accepted dose for adults and children over four years of age. Dosing has not been established in children younger than four years of age. Praziquantel comes in 600mg tablets scored to allow use of ¼ of a tablet. Tablets should be stored at less than 86 degrees Fahrenheit (30 degrees Celsius).

Prevention strategies

Knowledge of specific foods that may contain infectious metacercariae is important for individual avoidance and protection. Khat (*Catha edulis*) is a plant that is chewed for its psychotropic effects. It is popular in Yemen and Horn of Africa nations. It requires moisture to thrive and serves as a host plant for *F. hepatica*. The practice of storing freshly picked plants in wet banana leaves probably contributes to the persistence of metacercariae.[14,35] Zeitoon-parvardeh is an appetizer served in Iran. It is prepared by mixing a wild aquatic plant called choochagh (*Eryngium coucasicum*), walnuts, olives, garlic, and spices.[17] It is usually eaten immediately or stored for up to two weeks.[17] Delar is another food served in Iran.[17] It is a paste prepared by mixing an aquatic plant called khlivash (*Mentha pulegium*) with salt. This preparation can be stored and eaten over several months. Experimental studies have shown that foods prepared with raw liver such as liver-sushi in Japan, or a dish called "tab-wan" (raw liver, lemon and chili) from Thailand may cause infection.[36]

There are many traditional food preparation and storage practices that contribute to the presence of plant-borne trematode infections. Targeting changes in these practices may help prevent disease. The most common practice is simply eating raw plants that are infected. Another practice is the tradition of peeling water caltrop with one's teeth prior to consumption.[1,14] The storage of aquatic plants in basins of water or damp covers for an extended period of time is yet another practice that may propagate infection. Several studies have examined methods of food treatment to include: chemical treatments, drying, heating, freezing, and irradiation.[17] To different extents these treatments will detach, inactivate, or kill metacercariae (for a comprehensive review see the article by Ashrafi et. al.).[17] The quickest and most effective ways to kill or inactivate *F. buski* metacercariae are boiling; soaking plants in vinegar, salt solution, or soy sauce; and exposure to direct sunlight.[17] Barriers to using effective treatments include extended preparation time and changes in food characteristics such as taste, temperature, and texture.[17]

There are many community level prevention strategies available to halt plant-borne trematode infections. At the heart of prevention are the use of clean water and the proper treatment of human and animal excreta. Programs to increase disease awareness among consumers, producers of raw aquatic plants, and livestock farmers also play a role.[6] Controlling agriculture practices such as curbing the runoff from animal farms into watercress beds, and stopping the practice of using night soil or other untreated manure is also necessary. The use of molluscicides to kill snail hosts may also be an effective strategy.[8] In some endemic areas, mass chemotherapy of livestock, humans, or both have been advocated. As the aquaculture industry grows, proper regulations need to be put in place to halt the continued emergence of plant-borne trematode infections. Currently, there are no vaccines available to protect against plant-borne trematode infections, but Polish researchers have developed a recombinant enteral vaccination that was up to 80 percent effective in preventing *F. hepatica* infection in rats.[37]

Conclusion

The SOF healthcare professional should be familiar with fascioliasis and fasciolopsiasis because deployed Soldiers living in austere conditions in endemic areas are at risk of acquiring these infections. Fascioliasis and fasciolopsiasis are two infections caused by trematodes that have a similar lifecycle involving snails, water, and aquatic plants. Egg morphology and symptoms of early infection are also similar. Key differences include adult fluke size, geographic distribution, late clinical presentation, and treatment drug of choice. Disease transmission occurs when parasites, snails, water, aquatic plants, and humans (or other mammalian definitive hosts) meet to complete the lifecycle. Prevention and control of

these diseases depend on breaking the parasite lifecycle. Knowledge of local foods, consumption of clean water, and avoidance of raw or undercooked aquatic plants in endemic areas are the best strategies for prevention in individuals. Sanitary agriculture practices, molluscicides, and mass chemotherapy are large scale, community-based, programs that may stop disease transmission. SOF healthcare professionals should suspect disease transmission in endemic areas and look for opportunities to implement these community prevention programs whenever possible.

MAJ Lynden "Pete" Bowden graduated from Creighton University in 2000. He completed a transitional internship at Tripler Army Medical Center. Dr. Bowden served as a Brigade Surgeon and deployed with 3BCT, 1AD to Iraq in 2003. He graduated from the Uniformed Services University of the Health Sciences with a Master's of Public Health degree in 2004, and completed a residency in Preventive Medicine at Madigan Army Medical Center in 2005. Dr. Bowden's current assignment is as Battalion Surgeon for the 96th Civil Affairs Battalion (Airborne), which has included deployments to the Philippines and Africa.

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The Military Acute Concussion Evaluation (MACE)

Louis French, PsyD, Michael McCrea, PhD, Mark Baggett, PhD

Abstract

Traumatic brain injury (TBI), in both times of peace and times of war is a significant public health issue for the military. Even at its most mild, TBI (concussion) can degrade fighting effectiveness, put individuals at increased risk for another injury, and in some cases cause persistent difficulties in cognition, and aspects of physical and emotional functioning. Key to the appropriate treatment of those with TBI is the identification of those that have suffered TBI. This article describes one such tool for the identification of TBI in a military setting, the Military Acute Concussion Evaluation (MACE) including its history, administration, and interpretation.

Introduction

In the current operational environment of OIF/OEF, blast injuries from devices such as improvised explosive devices (IEDs) produce a high number of mild traumatic brain injuries (mTBI). The continued use of IEDs against our forces suggests that mTBI will remain a focus of medical evaluation and treatment. The effects of mTBI or concussion can decrease individual or unit mission effectiveness, and potentially cause further risk to the safety of the individual or his peers. While TBI might be suspected after any injury that causes a significant blow to the head, there is also risk for brain injury related to the concussive force of explosive devices. In some cases, a blow to the head or blast exposure will cause no injury, while in other cases this external force will cause disruption in brain processes. This disruption may range from a brief, temporary period of being dazed or confused, to a lengthier period of loss of consciousness. In those circumstances, it is useful to have an instrument to assess potential cognitive or physical changes from this injury. Ideally, such an instrument is validated for its ability to serve in that role, has sensitivity to subtle cognitive changes that are perhaps not obvious in casual conversation, is brief, and does not require administration by a physician or psychologist.

This risk in wartime is in addition to that already substantial risk in young adulthood. In fact, young men, the group at greatest risk in the civilian population, has its rates largely matched by young women in the military, a figure that demonstrates the inherent risk in service.[1] From 1997 through 2006, there were 110,000 servicemembers who had at least one TBI-related medical encounter, with 11.6% being hospitalizations. As expected, the numbers of TBI associated with battle injuries and the war time activity has increased since September 2001 relative to the period from 1997 to September 2001. In 2007; however, there was a marked increase in those that have two or more ambulatory visits at least seven days apart while deployed to/within 365 days of returning from Operation Enduring Freedom (OEF) or Operation Iraqi Freedom (OIF) with the rates more than doubling over the previous year.[2]

Definition of TBI

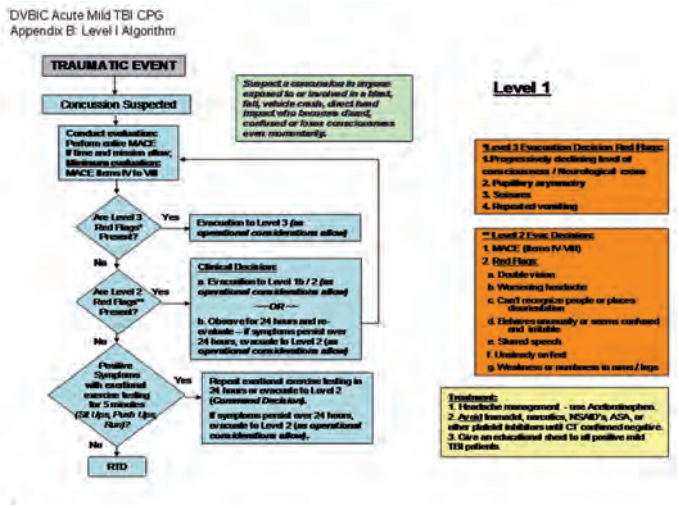
The Defense and Veterans Brain Injury Center (DVBIC) defines traumatic brain injury as an injury to the brain resulting from an external force and/or acceleration/deceleration mechanism from an event such as a blast, fall, direct impact, or motor vehicle accident, which causes an alteration in mental status, typically resulting in the temporally related onset of symptoms such as: headache, nausea, vomiting, dizziness/balance problems, fatigue, trouble sleeping/sleep disturbances, drowsiness, sensitivity to light/noise, blurred vision, difficulty remembering, and/or difficulty concentrating. This definition, developed for use in military settings, is consistent with other widely accepted definitions such as those by the CDC and WHO.

History

The need for medical management of concussion (mTBI) is well recognized in the sports world. This involves two components.[1] One is the acute care management of the injured at the time of injury. This is to identify and treat any potential neurosurgical emergencies. The other is the monitoring of concussion symptoms over time to monitor progress in recovery and determine when an individual is fit to return to the playing field. McCrea and colleagues in a prospective cohort study of 1631 collegiate football players examined the course of recovery after a

subset of the players sustained a concussion.[2] These athletes showed the greatest number of physical and cognitive symptoms in the acute phase immediately after concussion, with a course of recovery over five to seven days, at which time most were again at their baseline. However, about 10% remained symptomatic at one week's time, and players demonstrated different patterns of recovery in their symptom reporting, cognition, and balance.

In November 2006, the DVBIC assembled 32 military and civilian experts to create a literature-based clinical practice guideline with regard to the assessment and management of mTBI in a military operational setting. That group produced a set of guidelines (see http://www.dvbic.org/pdfs/clinical_practice_guideline_recommendations.pdf for the full document). For illustrative purposes, a graphical representation of the Level I practice guideline is shown below. As can be seen, this guide-



line relies on the use of the Military Acute Concussion Evaluation (MACE; see on page 71 for full instrument) a tool developed earlier that year by the Defense and Veterans Brain Injury Center. The MACE has both a history and evaluation component. The history component can confirm the diagnosis of mTBI after establishing that trauma has occurred and that during the course of this traumatic event, i.e. the service member having experienced an alteration in consciousness. The evaluation component, designed to be easily used by medics and corpsmen, can be administered within five minutes. It utilizes the Standardized Assessment of Concussion (SAC) to preliminarily document neurocognitive deficits in four cognitive domains: orientation, immediate memory, concentration and delayed recall. [3]

The SAC was developed in response to and in accordance with the recommendations of the Colorado and American Academy of Neurology Colorado Guidelines. The SAC was also designed to be consistent with the neuropsychological literature on those domains of function thought to be most sensitive to the effects of mild traumatic brain injury/concussion, and the tests best suited to measuring those functions in brain injury patients.[4,5] The SAC has been shown in multiple studies to have validity in detecting and characterizing mental status abnormalities resulting from concussion.[6,7]

MACE Administration

The MACE has full instructions in its administration. The MACE and instructions are available at http://www.dvbic.org/cms.phpp=Medical_care. The MACE is designed for use fairly immediately post-injury. There are no data to support its use beyond the acute injury period, although it may have sensitivity to persistent cognitive deficits after the first week. The first eight parts of the MACE describes the incident that caused injury or concern for injury, determines whether a TBI actually occurred, based on the TBI definition, and asks about current symptoms. In practice, when possible, it is useful to determine whether the reported symptoms have a temporal relationship to the injury itself. That is, if tracking recovery from injury, one must be sure that the symptoms being examined did not antedate the injury. These first sections of the MACE are generally equivalent to the Brief Traumatic Brain Injury Screen (BTBIS and better known as the DVBIC 3 Question Tool). The BTBIS[10] is a TBI screening that has had initial validation of its ability to determine the presence of a TBI when given as a questionnaire. While it has questions about TBI related symptoms, it provides only self report of cognition and other factors. The MACE is intended to be individually administered and can more carefully detect and characterize potential cognitive dysfunction as a result of the injury. Parts 9 through 13 of the MACE provide the formal cognitive examination and a neurological screening. This screening involves examination of the eyes for pupil reactivity; examination of verbal fluency and output; and motor changes such as gait disturbance or pronator drift. In the scored portion, one point is given for each correct response. However, there may not be equal clinical significance to each item. For example, if a service member were to lose a point for the month or year, it would be suggestive of more diffuse cognitive impairment than the inability to recall one of five learned words after a delay. There are alternate forms available for the words and digits, as there have been case reports of service members memorizing MACE word lists, so that they might remain deployable with their unit.

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Interpretation

There is no definitive cutoff below which cognitive dysfunction is present. In studies of some non-concussed patients the mean score was 28. In the initial

validation studies of the SAC, a score of 25 provided the best combination of sensitivity and specificity to mental status changes. Therefore, in practice, a score below 25 may represent clinically relevant cognitive impairment.

The authors of the SAC provide several guidelines to be followed in the interpretation of the SAC performance in sports related concussion, but the guidelines and cautions for interpretation are equally useful in a military setting (p.47):

- The SAC provides a standardized, objective measure of mental status changes following concussion, but the examiner must not rely solely on the SAC or any other instrument as a stand-alone method of diagnosing concussion or determining a subject's recovery and readiness to return to play after injury. The SAC is intended to complement, not substitute for, the advice of a physician or other qualified healthcare provider. All aspects of the injury examination (e.g., mental status evaluation, physical exam, symptom survey, witness accounts, etc.) must be equally considered in the assessment and management of concussion.
- Concussion may manifest with signs other than mental status or neurocognitive abnormalities, such as physical signs or other post-concussion symptoms. Therefore, a comprehensive physical exam and survey of symptoms should accompany any mental status exam, including the SAC.
- Any unusual signs and symptoms reported or displayed by a subject following suspected concussion must be seriously considered by the examiner, regardless of performance on the SAC or any other assessment measure. The presence of any post-concussion signs or symptoms, on the SAC or otherwise, should preclude any subject from returning to competition and indicates the need for close monitoring of the subject's condition. Persistent symptoms indicate the need for further evaluation by a physician.

Louis M. French, PsyD

Dr. French received his doctorate in clinical psychology, focused on assessment, from the George Washington University. He completed fellowships in clinical and experimental neuropsychology at the National Institute of Mental Health and in neuropsychology, focusing on traumatic brain injury, at the Defense and Veterans Brain Injury Center (DVBIC) at Walter Reed Army Medical Center. He is currently the TBI Service Chief at the hospital and site director for the DVBIC at Walter Reed, where he oversees operations related to the identification and treatment of individuals with traumatic brain injury. He serves or has served on a number of federal or DoD panels on issues in traumatic brain injury, including the Army Surgeon General's Taskforce on TBI.

Michael McCrea, PhD, ABPP

Dr. Michael McCrea is the Executive Director of the ProHealth Care Neuroscience Center based in suburban Milwaukee, Wisconsin. Dr. McCrea is a board-certified clinical neuropsychologist and has headed up the Neuropsychology Service at Waukesha Memorial Hospital since 1996. He earned his doctoral degree from the University of Wisconsin-Milwaukee, then completed his clinical training in neuropsychology at Vanderbilt University School of Medicine, followed by a postdoctoral fellowship at Northwestern University Medical School. Dr. McCrea has been an active researcher in the neurosciences, with numerous scientific publications, book chapters, and national and international lectures on the topic of traumatic brain injury. Most recently, he authored the text *Mild Traumatic Brain Injury and Postconcussion Syndrome: The New Evidence Base for Diagnosis and Treatment* published by Oxford University Press.

Mark R. Baggett, PhD

LTC Mark Baggett is the Deputy Command Psychologist for the Directorate of Psychological Applications at the U.S. Army Special Operations Command. He holds a bachelor's in psychology from the University of California at Santa Cruz and a master's and Ph.D. in clinical psychology from Pacific Graduate School of Psychology, Palo Alto, CA. Prior to his current assignment, he served as the Command Psychologist for the JFK Special Warfare Center and School for two years; he served as an intern in clinical psychology, a neuropsychology fellow; chief of tele-health service at Walter Reed Army Medical Center; the division psychologist, 2nd Inf. Div.; chief of psychology service, Martin Army Hospital, Fort Benning, GA; command psychologist for the U.S. Army Infantry Center, Fort Benning; and chief of psychology service and chief of neuropsychology, Womack Army Medical Center, Fort Bragg.

Military Acute Concussion Evaluation (MACE)

Defense and Veterans Brain Injury Center

Patient Name: _____

SS#: _____-_____-_____ **Unit:** _____

Date of Injury: ____/____/____ **Time of Injury:** _____

Examiner: _____

Date of Evaluation: ____/____/____ **Time of Evaluation:** _____

History: (I – VIII)

I. **Description of Incident**
Ask:
a) What happened?
b) Tell me what you remember.
c) Were you dazed, confused, "saw stars"? ❒ Yes ❒ No
d) Did you hit your head? ❒ Yes ❒ No

II. **Cause of Injury** (Circle all that apply):
1) Explosion/Blast 4) Fragment
2) Blunt object 5) Fall
3) Motor Vehicle Crash 6) Gunshot wound
7) Other _____

III. **Was a helmet worn?** ❒ Yes ❒ No Type _____

IV. **Amnesia Before: Are there any events just BEFORE the injury that are not remembered? (Assess for continuous memory prior to injury)**
❒ Yes ❒ No If yes, how long _____

V. **Amnesia After: Are there any events just AFTER the injuries that are not remembered? (Assess time until continuous memory after the injury)**
❒ Yes ❒ No If yes, how long _____

VI. **Does the individual report loss of consciousness or "blacking out"?** ❒ Yes ❒ No If yes, how long _____

VII. **Did anyone observe a period of loss of consciousness or unresponsiveness?** ❒ Yes ❒ No If yes, how long _____

VIII. **Symptoms** (circle all that apply)
1) Headache 2) Dizziness
3) Memory Problems 4) Balance problems
5) Nausea/Vomiting 6) Difficulty Concentrating
7) Irritability 8) Visual Disturbances
9) Ringing in the ears 10) Other _____

Examination: (IX – XIII)

Evaluate each domain. Total possible score is 30.

IX. **Orientation:** (1 point each)

Month:	0	1
Date:	0	1
Day of Week:	0	1
Year:	0	1
Time:	0	1

Orientation Total Score _____/5

X. **Immediate Memory:**
Read all 5 words and ask the patient to recall them in any order. Repeat two more times for a total of three trials. (1 point for each correct, total over 3 trials)

List	Trial 1	Trial 2	Trial 3
Elbow	0 1	0 1	0 1
Apple	0 1	0 1	0 1
Carpet	0 1	0 1	0 1
Saddle	0 1	0 1	0 1
Bubble	0 1	0 1	0 1
Trial Score			

Immediate Memory Total Score _____/15

XI. **Neurological Screening**
As the clinical condition permits, check
Eyes: pupillary response and tracking
Verbal: speech fluency and word finding
Motor: pronator drift, gait/coordination
Record any abnormalities. **No points are given for this.**

XII. Concentration

Reverse Digits: (go to next string length if correct on first trial. Stop if incorrect on both trials.) 1 pt. for each string length.

4-9-3	6-2-9	0	1
3-8-1-4	3-2-7-9	0	1
6-2-9-7-1	1-5-2-8-5	0	1
7-1-8-4-6-2	5-3-9-1-4-8	0	1

Months in reverse order. (1 pt. for entire sequence correct)
Dec-Nov-Oct-Sep-Aug-Jul-Jun-May-Apr-Mar-Feb-Jan
0 1

Concentration Total Score ____/5

XIII. Delayed Recall (1 pt. each)

Ask the patient to recall the 5 words from the earlier memory test (Do NOT reread the word list.)

Elbow	0	1
Apple	0	1
Carpet	0	1
Saddle	0	1
Bubble	0	1

Delayed Recall Total Score ____/5
TOTAL SCORE _____/30

Notes: _____

_____

Diagnosis: (circle one or write in diagnoses)

No concussion
850.0 Concussion without Loss of Consciousness (LOC)
850.1 Concussion with Loss of Consciousness (LOC)

Other diagnoses _____

_____

Defense & Veterans Brain Injury Center
1-800-870-9244 or DSN: 662-6345

Military Acute Concussion Evaluation (MACE)

Defense and Veterans Brain Injury Center

Instruction Sheet

Purpose and Use of the MACE

A concussion is a mild traumatic brain injury (TBI). The purpose of the MACE is to evaluate a person in whom a concussion is suspected. The MACE is used to confirm the diagnosis and assess the current clinical status.

Tool Development

The MACE has been extensively reviewed by leading civilian and military experts in the field of concussion assessment and management. While the MACE is not, yet, a validated tool, the examination section is derived from the *Standardized Assessment of Concussion* (SAC) (McCrea, M., Kelly, J. & Randolph, C. (2000). *Standardized Assessment of Concussion (SAC): Manual for Administration, Scoring, and Interpretation*. (2nd ed.) Waukesa,WI: Authors.) which is a validated, widely used tool in sports medicine. Abnormalities on the SAC correlate with formal comprehensive neuropsychological testing during the first 48 hours following a concussion.

Who to Evaluate

Any one who was dazed, confused, "saw stars" or lost consciousness, even momentarily, as a result of an explosion/blast, fall, motor vehicle crash, or other event involving abrupt head movement, a direct blow to the head, or other head injury is an appropriate person for evaluation using the MACE.

Evaluation of Concussion

History: (I – VIII)

I. Ask for a description of the incident that resulted in the injury; how the injury occurred, type of force. Ask questions A – D.

II. Indicate the cause of injury

III. Assess for helmet use. Military: Kevlar or ACH (Advanced Combat Helmet). Sports helmet, motorcycle helmet, etc.

IV – V Determine whether and length of time that the person wasn't registering continuous memory both **prior** to injury and **after** the injury. Approximate the amount of time in seconds, minutes or hours, whichever time increment is most appropriate. For example, if the assessment of the patient yields a possible time of 20 minutes, then 20 minutes should be documented in the "how long?" section.

VI – VII Determine whether and length of time of **self reported** loss of consciousness (LOC) or **witnessed/observed** LOC. Again, approximate the amount of time in second, minutes or hours, whichever time increment is most appropriate.

VIII Ask the person to report their experience of each specific symptom since injury.

Examination: (IX – XIII)

Standardized Assessment of Concussion (SAC).

Total possible score = 30
Orientation = 5
Immediate Memory = 15
Concentration = 5
Memory Recall= 5

IX Orientation: Assess patients awareness of the accurate time
Ask: WHAT MONTH IS THIS?
WHAT IS THE DATE OR DAY OF THE MONTH?
WHAT DAY OF THE WEEK IS IT?
WHAT YEAR IS IT?
WHAT TIME DO YOU THINK IT IS?
One point for each correct response for a total of 5 possible points. It should be noted that a correct response on time of day must be within 1 hour of the actual time.

X Immediate memory is assessed using a brief repeated list learning test. Read the patient the list of 5 words once and then ask them to repeat it back to you, as many as they can recall in any order. Repeat this procedure 2 more times for a total of 3 trials, even if the patient scores perfectly on the first trial.
Trial 1: I'M GOING TO TEST YOUR MEMORY, I WILL READ YOU A LIST OF WORDS AND WHEN I AM DONE, REPEAT BACK AS MANY WORDS AS YOU CAN REMEMBER, IN ANY ORDER.
Trial 2 &3: I AM GOING TO REPEAT THAT LIST AGAIN. AGAIN, REPEAT BACK AS MANY AS YOU CAN REMEMBER IN ANY ORDER, EVEN IF YOU SAID THEM BEFORE.
One point is given for each correct answer for a total of 15 possible points.

XI Neurological screening
Eyes; check pupil size and reactivity.
Verbal: notice speech fluency and word finding
Motor: pronator drift- ask patient to lift arms with palms up, ask patient to then close their eyes, assess for either arm to "drift" down. Assess gait and coordination if possible. Document any abnormalities.
No points are given for this section.

XII Concentration: Inform the patient:
I'M GOING TO READ YOU A STRING OF NUMBERS AND WHEN I AM FINISHED, REPEAT THEM BACK TO ME BACKWARDS, THAT IS, IN REVERSE ORDER OF HOW I READ THEM TO YOU. FOR EXAMPLE, IF I SAY 7-1-9, YOU WOULD SAY 9-1-7.
If the patient is correct on the first trial of each string length, proceed to the next string length. If incorrect, administer the 2nd trial of the same string length. Proceed to the next string length if correct on the second trial. Discontinue after failure on both trials of the same string length. Total of 4 different string lengths; **1** point for each string length for a total of **4** points.
NOW TELL ME THE MONTHS IN REVERSE ORDER, THAT IS, START WITH DECEMBER AND END IN JANUARY.
1 point if able to recite ALL months in reverse order.
0 points if not able to recite ALL of them in reverse order.
Total possible score for concentration portion: **5.**

XIII Delayed Recall
Assess the patient's ability to retain previously learned information by asking he/she to recall as many words as possible from the initial word list, without having the word list read again for this trial.
DO YOU REMEMBER THAT LIST OF WORDS I READ A FEW MINUTES EARLIER? I WANT YOU TO TELL ME AS MANY WORDS FROM THE LIST AS YOU CAN REMEMBER IN ANY ORDER.
One point for each word remembered for a total of 5 possible points.
Total score= Add up from the 4 assessed domains: immediate memory, orientation, concentration and memory recall.

Significance of Scoring

In studies of non-concussed patients, the mean total score was 28. Therefore, a score less than 30 does not imply that a concussion has occurred. Definitive normative data for a "cut-off" score are not available. However, scores below 25 may represent clinically relevant neurocognitive impairment and require further evaluation for the possibility of a more serious brain injury. The scoring system also takes on particular clinical significance during serial assessment where it can be used to document either a decline or an improvement in cognitive functioning.

Diagnosis

Circle the ICD-9 code that corresponds to the evaluation. If loss of consciousness was present, then circle 850.1. If no LOC, then document 850.0. If another diagnosis is made, write it in.

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Continuing Medical Education Test

Fascioliasis and Fasciolopsiasis: Similar Names, Similar Diseases?

If you are a physician, PA, or nurse, place your answers on the Uniformed Services University of the Health Sciences (USUHS) Evaluation Form and send it in with your test. If you are a Medic, Corpsman, or PJ, please place your answers on the SOCOM Evaluation Form and send it in with your test.

Part 1. Multiple choice. Choose the best answer for the items below.

1. Which of the following is TRUE about helminth infections:
   a. They are easily diagnosed with a physical exam only, no labs are required.
   b. Patients usually present with sudden onset of severe symptoms.
   c. White blood cell differential may show increased amount of eosinophils.
   d. Parasites are almost always seen in the stool of an infected individual.
   e. They have a short clinical course with little consequence to the infected individual.

2. *Fasciola hepatica* and *Fasciolopsis buski* are examples of:
   a. Nematodes
   b. Cestodes
   c. Blood flukes
   d. Trematodes
   e. Soil-transmitted roundworms

3. Which of the following is TRUE about the epidemiology of *F. hepatica* and/or *F. buski:*
   a. Worldwide, *F. hepatica* infections are more prevalent than *F. buski* infections.
   b. Worldwide, 2.4 million people are at risk of becoming infected with *F. hepatica.*
   c. Most epidemiologic data about *F. buski* infections was obtained through well established national disease surveillance programs.
   d. Prevalence rates of *F. hepatica* are nearly the same throughout many villages in Southeast Asia.
   e. Worldwide, 180 million people are infected with one or both of these parasites.

4. Which of the following is TRUE about the geographical distribution of fasciolaiasis:
   a. It is a common infection found throughout most of the United States.
   b. It is an infection seen only in Southeast Asia.
   c. Thus far, it has not been an infection found in Western European countries such as France.
   d. Infections do not occur in high altitude areas of South American countries.
   e. Infections have been found in 61 countries throughout the world.
5. When comparing *F. hepatica* and *F. buski* adult flukes, one will note that:
   a. *F. hepatica* are longer than *F. buski.*
   b. *F. hepatica* are shorter than *F. buski.*

c. *F. hepatica* is the same size as *F. buski.*
d. *F. hepatica* is usually white or light pink while *F. buski* is light brown or yellow.
e. *F. hepatica* is round while *F. buski* is flat.

6. When comparing *F. hepatica* and *F. buski* eggs, one will note that:
   a. *F. hepatica* eggs are always larger than *F. buski* eggs
   b. *F. hepatica* eggs are more yellow while *F. buski* eggs are more brown
   c. Neither eggs have an operculum.
   d. *F. hepatica* eggs are spherical and have an operculum, while *F. buski* eggs are ellipsoid and do not have an operculum.
   e. *F. hepatica* eggs and *F. buski* eggs look similar in size and shape and both are operculated.

7. Which of the following is NOT true about the lifecycle of *F. hepatica*:
   a. The first intermediate host is a snail of the family *Lymnae*.
   b. Once swallowed, the parasite migrates into the biliary ducts.
   c. Adult flukes reside in the liver parenchyma.
   d. The form of the parasite that is released from the egg is the miracidia.
   e. The form of the parasite that encysts on aquatic plants is the metacercaria.

8. Which of the following is NOT true about the lifecycle of *F. buski*:
   a. Adult flukes reside in the intestine of humans and other mammals.
   b. Planorbid snails serve as the first intermediate host.
   c. The form of the parasite that encysts on aquatic plants is the miracidia.
   d. It takes about three months for the parasite to grow to an adult once it has invaded a human.
   e. Adult flukes may live attached to the intestinal wall for about one year.

9. Which of the following conditions would be LEAST likely to support the lifecycle of *F. hepatica*:
   a. Coexistence of humans, freshwater, *P. columella* snails, and *Nasturtium officinale.*
   b. Coexistence of sheep, freshwater, *G. truncatula* snails, and aquatic mint.
   c. Coexistence of humans, freshwater, and Lymneid snails.
   d. Coexistence of *Nasturtium officinale*, water buffalo, freshwater, and Lymneid snails.
   e. Coexistence of *Trapa natans*, Planorbid snails, freshwater, and camels.

10. Consumption of which of the following traditional food preparations could put a person at risk for acquiring fascioliasis:
    a. Khat
    b. Zeitoon-parvardeh
    c. Delar
    d. “tab-wan”
    e. All of the above

11. Which of the following traditional food preparation and storage practices is LEAST likely to put one at risk of a plant-borne trematode infection:
    a. Wrapping picked aquatic plants in moist banana leaves.
    b. Drying plants in the sun.
    c. Consuming undercooked plants.
    d. Storing plants in water filled basins.
    e. Peeling plants with one’s teeth.

12. Community level prevention programs for plant-borne trematode infections include all of the following EXCEPT:
    a. Projects that promote the use of clean water and adequate sanitation.
    b. Immunization initiatives.
    c. Use of molluscicides to kill snails.
    d. Mass chemotherapy of humans and animals.
    e. Educational projects to increase the awareness of plant-borne trematodes in the community.

Part 2. Matching. Match the most specific item in A with each item in B. Items in A can be used once, more than once, or not at all.

A.

a. helminth infections
b. acute fascioliasis
c. praziquantel
d. fasciolopsiasis
e. triclabendazole
f. *Fasciolia hepatica/gigantica*
g. obstructive jaundice
h. ocular cysticercosis
i. *Fasciolopsis buski*
j. plant-borne trematode infections
k. chronic fascioliasis
l. ERCP
m. percutaneous liver biopsy
n. bithionol
o. *Fasciolia gigantica*
p. MR cholangiography

B.

1. _____ Disease with the symptoms of hepatomegaly, cough, and diarrhea

2. _____ Disease with the symptom of bowel obstruction

3. _____ Most efficacious in treating fascioliasis

4. _____ Migrate through the liver

5. _____ Disease that involves having ascities

6. _____ Reside in the duodenum

7. _____ Disrupts parasite microtubules

8. _____ Motile echogenic images of the gallbladder

9. _____ Drug of choice for the treatment of fasciolopsiasis

10. _____ Test that rarely indicates the presence eggs or parasites

11. _____ Investigational drug available through the CDC

12. _____ Organism causing ectopic infections

13. _____ Contraindication for praziquantel

14. _____ Not FDA-approved

15. _____ Affects parasite cell membrane permeability

16. _____ Eosinophilia

If you are a physician, PA, or nurse, send in the Uniformed Services University of the Health Sciences (USUHS) Evaluation Form with your test.

If you are a Medic, Corpsman, or PJ, send the SOCOM Evaluation Form with your test.

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Journal of Special Operations Medicine
Volume 8, Edition 1 / Winter 08
Date of Original Release Mar 08

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Fascioliasis and Fasciolopsiasis: Similar Names, Similar Diseases?

	3 - Agree	2 - Neutral	1- Disagree
Educational Value:		**3 2 1**	
I learned something new that is important.		_ _ _	
I verified some important information.		_ _ _	
I plan to discuss this information with colleagues.		_ _ _	
I plan to seek more information on this topic.		_ _ _	
Readability Feedback:			
I understood what the authors were trying to say.		_ _ _	
Overall, the presentation of the article enhanced my ability to read and understand it.		_ _ _	

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What changes will you make in your practice as a result of reading the article?

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Fascioliasis and Fasciolopsiasis: Similar Names, Similar Diseases?

Part 1 -- Multiple choice - Please circle the correct answer.

1. A. B. C. D. E.
2. A. B. C. D. E.
3. A. B. C. D. E.
4. A. B. C. D. E.
5. A. B. C. D. E.
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9. A. B. C. D. E.
10. A. B. C. D. E.
11. A. B. C. D. E.
12. A. B. C. D. E.

Part 2 --Matching - Please circle the correct answer.

B1. A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P.
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B16. A. B. C. D. E. F. G. H. I. J. K. L. M. N. O. P.

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Fascioliasis and Fasciolopsiasis: Similar Names, Similar Diseases?

Part 1 -- Multiple choice

1. A. B. C. D. E.
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3. A. B. C. D. E.
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11. A. B. C. D. E.
12. A. B. C. D. E.

Part 2 -- Matching

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ATTN: SOCS-SG
7701 TAMPA POINT BLVD
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ABSTRACTS FROM CURRENT LITERATURE

The following paper document improved survival with increased use of plasma. I think this effort will be on par with tourniquets for impact on the battlefield.
I have two requests:

1. *Support increased use when ever possible*
2. *If asked about research needs describe the need for and if possible funding for lyophilized plasma, so we can get it out of the CSH/FST and into the hands of medics as soon as possible.*

John B. Holcomb, MD, FACS
COL, MC, US Army
Trauma Consultant for The Surgeon General Commander, U.S. Army Institute of Surgical Research

The Ratio of Blood Products Transfused Affects Mortality in Patients Receiving Massive Transfusions at a Combat Support Hospital.

Borgman, Matthew A. MD; Spinella, Philip C. MD; Perkins, Jeremy G. MD; Grathwohl, Kurt W. MD; Repine, Thomas MD; Beekley, Alec C. MD; Sebesta, James MD; Jenkins, Donald MD; Wade, Charles E. PhD; Holcomb, John B. MD

Journal of Trauma-Injury Infection & Critical Care. 63(4):805-813, October 2007.

ABSTRACT

Background: Patients with severe traumatic injuries often present with coagulopathy and require massive transfusion. The risk of death from hemorrhagic shock increases in this population. To treat the coagulopathy of trauma, some have suggested early, aggressive correction using a 1:1 ratio of plasma to red blood cell (RBC) units. **Methods:** We performed a retrospective chart review of 246 patients at a U.S. Army combat support hospital, each of who received a massive transfusion (>=10 units of RBCs in 24 hours). Three groups of patients were constructed according to the plasma to RBC ratio transfused during massive transfusion. Mortality rates and the cause of death were compared among groups. **Results:** For the low ratio group the plasma to RBC median ratio was 1:8 (interquartile range, 0:12-1:5), for the medium ratio group, 1:2.5 (interquartile range, 1:3.0-1:2.3), and for the high ratio group, 1:1.4 (interquartile range, 1:1.7-1:1.2) ($p < 0.001$). Median Injury Severity Score (ISS) was 18 for all groups (interquartile range, 14-25). For low, medium, and high plasma to RBC ratios, overall mortality rates were 65%, 34%, and 19%, ($p < 0.001$); and hemorrhage mortality rates were 92.5%, 78%, and 37%, respectively, ($p < 0.001$). Upon logistic regression, plasma to RBC ratio was independently associated with survival (odds ratio 8.6, 95% confidence interval 2.1-35.2). **Conclusions:** In patients with combat-related trauma requiring massive transfusion, a high 1:1.4 plasma to RBC ratio is independently associated with improved survival to hospital discharge, primarily by decreasing death from hemorrhage. For practical purposes, massive transfusion protocols should utilize a 1:1 ratio of plasma to RBCs for all patients who are hypocoagulable with traumatic injuries.

H5N1 Influenza — Continuing Evolution and Spread

Robert G. Webster, PhD, and Elena A. Govorkova, MD, PhD

The New England Journal of Medicine Volume 355:2174-2177, November 23, 2006 Number 21

EXTRACT

There is no question that there will be another influenza pandemic someday. We simply don't know when it will occur or whether it will be caused by the H5N1 avian influenza virus. But given the number of cases of H5N1

influenza that have occurred in humans to date (251 as of late September 2006) and the rate of death of more than 50%, it would be prudent to develop robust plans for dealing with such a pandemic.

The epicenters of both the Asian influenza pandemic of 1957 and the Hong Kong influenza pandemic of 1968 were in Southeast Asia, and it is in this region that multiple clades of H5N1 influenza virus have already emerged. The Asian H5N1 virus was first detected in Guangdong Province, China, in 1996, when it killed some geese, but it received little attention until it spread through live-poultry markets in Hong Kong to humans in May 1997, killing 6 of 18 infected persons. The culling of all poultry in Hong Kong ended the first wave of H5N1, but the virus continued to circulate among apparently healthy ducks in the coastal provinces of China.

Avian Influenza A (H5N1) Infection in Eastern Turkey in 2006

Ahmet Faik Oner, MD; Ali Bay, MD, Sukru Arslan, MD; Hayrettin Akdeniz, MD; Huseyin Avni Sahin, MD; Yasar Cesur, MD; Serdar Epcacan, MD; Neziha Yilmaz, MD; Ibrahim Deger, MD; Baran Kizilyildiz, MD; Hasan Karsen, MD; Mehmet Ceyhan, MD

The New England Journal of Medicine Volume 355:2179-2185, November 23, 2006, Number 218

Abstract

Background: An outbreak of highly pathogenic avian influenza A (H5N1) that had previously been detected throughout Asia, with major economic and health repercussions, extended to eastern Turkey in late December 2005 and early January 2006. **Methods:** We documented the epidemiologic, clinical, and radiologic features of all cases of confirmed H5N1 virus infection in patients who were admitted to Yuzuncu Yil University Hospital in Van, Turkey, between December 31, 2005, and January 10, 2006. **Results:** H5N1 virus infection was diagnosed in eight patients. The patients were 5 to 15 years of age, and all eight had a history of close contact with diseased or dead chickens. The mean (±SD) time between exposure and the onset of illness was 5.0±1.3 days. All the patients had fever, and seven had clinical and radiologic evidence of pneumonia at presentation; four patients died. Results of enzyme-linked immunosorbent assay and rapid influenza tests were negative in all patients, and the diagnosis was made by means of a polymerase-chain-reaction assay. **Conclusions:** H5N1, which causes a spectrum of illnesses in humans, including severe and fatal respiratory disease, can be difficult to diagnose.

Heart Rate: Is It Truly a Vital Sign?

Brasel, Karen J. MD, MPH; Guse, Clare MS; Gentilello, Larry M. MD; Nirula, Ram MD, MPH

Journal of Trauma-Injury Infection & Critical Care. 62(4):812-817, April 2007.

Abstract

Background: Tachycardia, often defined as heart rate >100 bpm, has been utilized as a physical sign of hypovolemic shock among the injured for decades without evidence to support its use as a predictor of injury or significant hypovolemia. We sought to determine whether admission heart rate is a valid predictor of hemodynamically significant injuries. **Methods:** Trauma registry data from 1998 to 2004 were analyzed with logistic regression to determine whether heart rate was associated with need for emergent intervention for bleeding (laparotomy, thoracotomy, or angiography), need for packed red blood cell (pRBC) transfusion in the first 24 hours, or severe injury (ISS >25) after blunt or penetrating trauma. **Results:** Records of 10,825 patients were analyzed. Overall, heart rate was neither sensitive nor specific in determining the need for emergent intervention, pRBCs in the first 24 hours, or severe injury. This was not altered by the presence of hypotension (systolic blood pressure <90 mm Hg) or age in the blunt cohort. **Conclusions:** Heart rate alone is not sufficient to determine the need for emergent interventions for hemorrhage. Although tachycardia may still indicate need for emergent intervention in the trauma patient, its absence should not allay such concern.

Long Bone Fractures Caused by Penetrating Injuries in Terrorists Attacks

Weil, Yoram A. MD; Petrov, Kaloyan MD; Liebergall, Meir MD; Mintz, Yoav MD; Mosheiff, Rami MD
Journal of Trauma-Injury Infection & Critical Care. 62(4):909-912, April 2007.

Abstract

Background: High-energy penetrating injuries are increasingly common in the civilian setting. During the years 2000 to 2003, more than 70 suicide bombing attacks occurred in Israel. These were characterized by high numbers of casualties, primarily caused by blast injuries. Injury caused by a blast can be either a primary blast effect of acceleration-deceleration of the blast wave or a secondary effect of metal fragments deliberately placed in explosives, causing severe penetrating injuries. The latter type of injury may result in severe open limb fractures. **Methods:** We identified and reviewed 91 patients with 117 long bone fractures caused by penetrating terror-related injuries treated in our institution during 2000 to 2003. The patients were divided according to the mechanism of injury, i.e., either gunshot injury or blast injuries; several parameters were compared. **Results:** Patients in the blast injury group included more children and elderly patients than the gunshot injury group did. This group also had a significantly higher Injury Severity Score and a higher number of associated injuries, including multiple fractures and mortality. The treatment modalities for the fractures were similar for both groups, as was the fracture final outcome. Local soft tissue injury was more severe in the gunshot injury group, as demonstrated by a higher number of type IIIC fractures, as well as more nerve injuries. **Conclusion:** Terror attacks may produce several modes of severe penetrating injuries causing high-grade open fractures. These should be aggressively treated by physicians remaining cognizant of other systemic and general implications of such a severe trauma.

Safety of Fentanyl for Analgesia in Adults Undergoing Air Medical Transport from Trauma Scenes

Stephen H. Thomas; William Benevelli; David F. M. Brown; Suzanne K. Wedel
Air Medical Journal, Vol 15, 1996, pp 57-59,

Abstract

Introduction: Although proper analgesia provision for patients in the in-hospital acute setting has received recent attention, little discussion has been done of prehospital pain relief. This study was conducted to evaluate the safety of fentanyl administration during air medical transport of adult trauma patients. **Setting:** Urban air medical transport program using a flight nurse/paramedic crew operating with patient care protocols and offline medical control. **Methods:** Flight records for trauma patients transported directly from the scene receiving fentanyl were analyzed retrospectively. Study parameters were obtained for the times just preceding and after fentanyl administration. A t test ($\alpha = 0.05$) comparison between before and after fentanyl administration was performed for the following study parameters: systolic blood pressure, heart rate, oxygen saturation, respiratory rate, and Glasgow coma score in non-intubated patients. Flight records were also reviewed for any administration of naloxone or subjective notation of complications possibly attributable to fentanyl. **Results:** Fentanyl was administered 154 times to 99 patients. No patient received in-flight naloxone, and no fentanyl-related complications were noted on flight record review. **Conclusion:** Administration of fentanyl for in-flight trauma analgesia in adults seems safe. Further study should investigate efficacy of in-flight fentanyl administration and determine whether prehospital opiate administration impairs emergency department evaluation of trauma patients.

Triage in Medicine, Part I: Concept, History, and Types

Kenneth V. Iserson, MD, MBA, John C. Moskop, PhD

Annals of Emergency Medicine Volume 49, Issue 3, Pages 275-281 (March 2007)

Presented at the Second Congress of Emergency Medicine, May 2004, Buenos Aires, Argentina.
This two-article series offers a conceptual, historical, and moral analysis of the practice of triage. Part I distinguishes triage from related concepts, reviews the evolution of triage principles and practices, and describes the settings in which triage is commonly practiced. Part II identifies and examines the moral values and principles underlying the practice of triage.

Triage in Medicine, Part II: Underlying Values and Principles

John C. Moskop, PhD; Kenneth V. Iserson, MD, MBA

Annals of Emergency Medicine Received 5 April 2006; accepted 10 April 2006. Published online 14 August 2006.

Presented at the Second Congress of Emergency Medicine, May 2004, Buenos Aires, Argentina.
Part I of this two-article series reviewed the concept and history of triage and the settings in which triage is commonly practiced. We now examine the moral foundations of the practice of triage. We begin by recognizing the moral significance of triage decisions. We then note that triage systems tend to promote the values of human life, health, efficient use of resources, and fairness, and tend to disregard the values of autonomy, fidelity, and ownership of resources. We conclude with an analysis of three principles of distributive justice that have been proposed to guide triage decisions.

Comparison of the effectiveness of trauma services provided by secondary and tertiary hospitals in Malaysia

Dinesh Sethi, MD, FFPH; Syed Aljunid, PhD, MD; Sulong B. Saperi, MD; Felicity Clemens, MS; Pollyanna Hardy, MS; Diana Elbourne, PhD; Anthony B. Zwi, PhD, FFPHM

Presented at the 7th World Conference on Injury Prevention and Safety Promotion, June 2004,
Annals of Emergency Medicine Volume 49, Issue 1, Pages 52-61.e1 (January 2007)

ABSTRACT

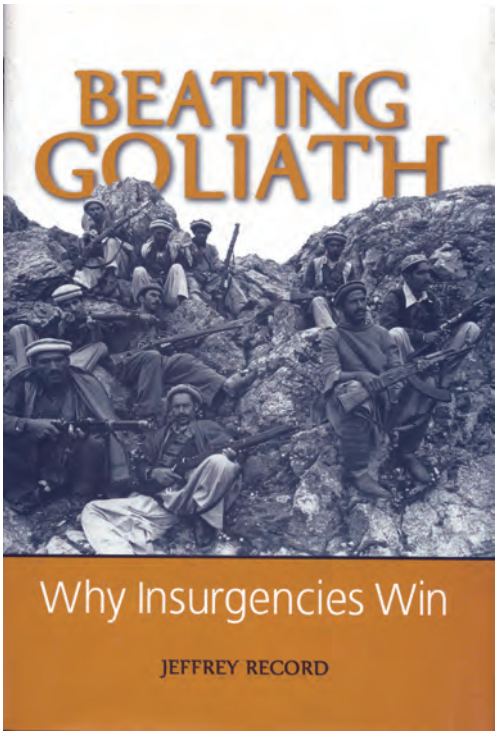
Study objective: The trauma services provided by six hospitals operating at two levels of care (four secondary or district general hospitals and two tertiary care hospitals) in Malaysia are compared in terms of mortality and disability for direct admissions to emergency departments to test the hypothesis that care at a tertiary care hospital is better than at a district general hospital. **Methods:** All cases were recruited prospectively for one year. The hospitals were purposefully selected as typical for Malaysia. There are three primary outcome measures: death, musculoskeletal impairment, and disability at discharge. Adjustment was made for potential covariates and within-hospital clustering by using multivariable random-effects logistic regression analysis. **Results:** For direct admissions, logistic-regression-identified odds of dying were associated with older age (>55 years), odds ratio (OR) 1.9 (95% confidence interval [CI] 1.3 to 2.8); head injury, OR 2.7 (95% CI 1.9 to 3.9); arrival by means other than ambulance, OR 0.6 (95% CI 0.4 to 0.8); severe injuries (Injury Severity Score >15) at a district general hospital, OR 45.2 (95% CI 27.0 to 75.7); severe injuries at a tertiary care hospital, OR 11.2 (95% CI 7.3 to 17.3); and admission to a tertiary care hospital compared to a district general hospital if severely injured (Injury Severity Score >15), OR 0.2 (95% CI 0.1 to 0.4). Admission to a tertiary care hospital was associated with increased odds of disability (OR 1.9; 95% CI 1.5 to 2.3) and musculoskeletal impairment (OR 3.5; 95% CI 2.7 to 4.4) at discharge. **Conclusion:** Care at a tertiary care hospital was associated with reduced mortality (by 83% in severe injuries), but with a higher likelihood of disability and impairment, which has implications for improving access to trauma services for the severely injured in Malaysia and other low- and middle-income settings.

Book Reviews

Beating Goliath: Why Insurgencies Win

Jeffrey Record
Potomac Books Incorporated Washington, D.C. 2007. Hardcover. 192 pages. ISBN-10: 1597970905. ISBN-13: 978-1597970907.

Review by Warner D. Farr, MD



A professor who instructed me when I attended Air War College wrote this book. Earlier in his career he published a very good work on the Vietnam War. This book, *Beating Goliath, Why Insurgencies Win*, postulates a theory and then tries to prove it by examining the record of victories by the weaker power over the stronger one. The author reviews eleven insurgent wars from the American War of Independence in 1775 to the present day and attempts to determine why the seemingly weaker side wins — sometimes. In his analysis he asks the questions: How often do insurgencies succeed against greater powers? Are they not always fighting "larger powers?" Why do some insurgencies with poorly equipped and numerically inferior forces defeat powerful nations with seemingly limitless resources?

His technique is to look at specific factors of insurgencies and determine how these factors affect the outcomes of eleven different insurgencies: six "assisted insurgencies" i.e., those where the insurgents, with help, defeated the larger opponent, and four with "absent or denied external help" in which those unsupported insurgencies lost their campaigns. The factors analyzed are the will to fight, strategy, regime type, and external support, including money, weapons, personnel, and safe areas. The six with help were our American Revolution, the Spanish against the French in 1808 (where the word "guerrilla" was first coined), the Chinese Communists against the Nationalist Chinese, North Vietnam versus South Vietnam, and the first Afghan War. The four "have nots" were the American Civil War, the Boer War, the Malayan Emergency, and the Algerian War. Six plus four equals ten, not eleven, of course. The eleventh insurgency is Iraq.

External assistance seems to correlate most with a successful insurgent force. Will, strategy, and regime type are of critical importance but external assistance seems closest to guaranteeing success. He finds few cases of unassisted insurgency victories except over extremely weak regimes. Because external support is the single most influential factor in the success of a weak insurgency force against the stronger power, it gets its own chapter. The chapter analyses many factors and indirect influences on the importance of external support and its effect on the outcome of the insurgencies.

He then turns to the present insurgency in Iraq and opines on whether the United States can win. He highlights the differences and the similarities of the two wars and how these factors influence the outcome of the war. He looks at strategies, will at all levels, political factors in the U.S. government, and the most important — external support. True to his prior writings, he compares and contrasts the Vietnam War and the Iraq War while identifying and assessing the influence of the distinctive features of the American way of war and how it affects our performance against the Iraqi insurgency. Dr. Record's analysis of the American

way of war shows how the separation of politics and war violates all of the basic tenants of counterinsurgency and is a doomed strategy in the long term. His assessment of the American way of war is correct and insightful. He points out that this "apolitical way of war" drives a strategy of attrition and search and destroy operations at the tactical level — just like Vietnam. For all this discussion of counterinsurgency not being just military, the book tends to describe insurgencies in strictly military terms and ask if the U.S. military can defeat the insurgents in Iraq.

The author's conclusions, based on his Vietnam expertise are:

1. It's best to be the stronger side

2. Weak side victors are rare and due to stronger will, superior strategy, and foreign help

3. External assistance is a common enabler

4. Democracies have limited tolerance for protracted irregular enemies

5. For the U.S., political will is proportional to perceived military costs, benefits and chances of success

6. The U.S. political system and its scientific-technologic approach to war impede our success in counterinsurgency and we should avoid direct military involvement

Insurgent victories are really the rare exception and against the rule. However, if they win, consequences can certainly change the course of history. The emphasis on external support is timely in this era of "through, with, and by." He is also right on with rule number six: the American Army wants a conventional war. Dr. Records reasoned logic and clear writing style make this a timely book to read, especially those interested in the Iraq War's outcome!

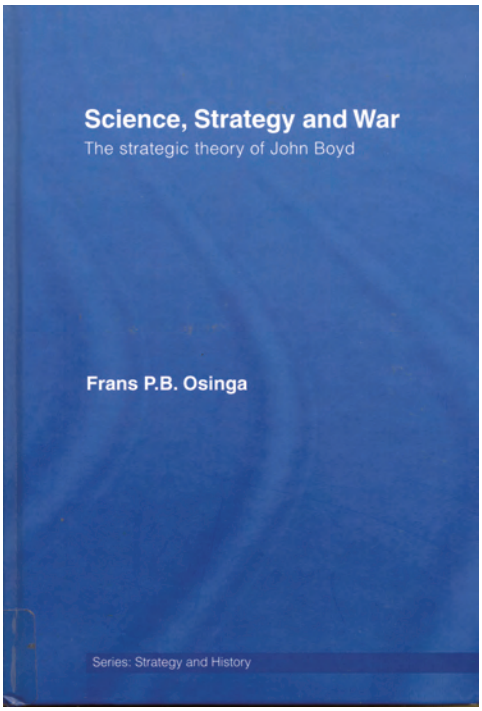
Science, Strategy, and War: The Strategic Theory of John Boyd

Strategy and History Series

Frans P.B. Osinga

Routledge: London. 2006. 313 pages. ISBN-10: 0415371031. ISBN-13: 978-0415371032.

Review by Warner Farr, MD



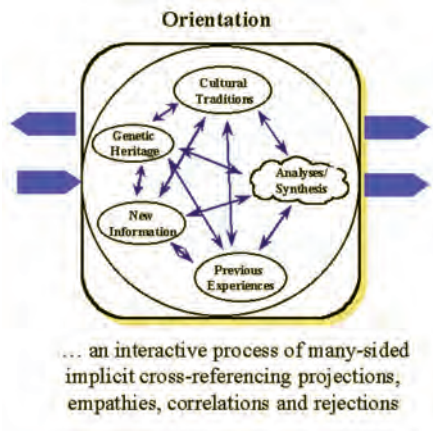
This is an in-depth analysis of the strategic theories of Colonel John Boyd, the leading USAF strategist of the twentieth century. Why should you care about Air Force strategy, you may ask. Because his thinking has had a great impact on U.S. military doctrine and defense policy over the past 25 years. Boyd is important for his introduction of scientific and philosophical developments into a methodology for strategic thinking. This book presents these complex ideas in an understandable context. Much of what has been written that is critical of the "American way of war" in Iraq and elsewhere, dwells on the fact that we want to conduct a "scientific or technological" war. Boyd is the one thinker who attempts to bridge the predominantly Air Force love of technology and the laws of warfare. A good example:

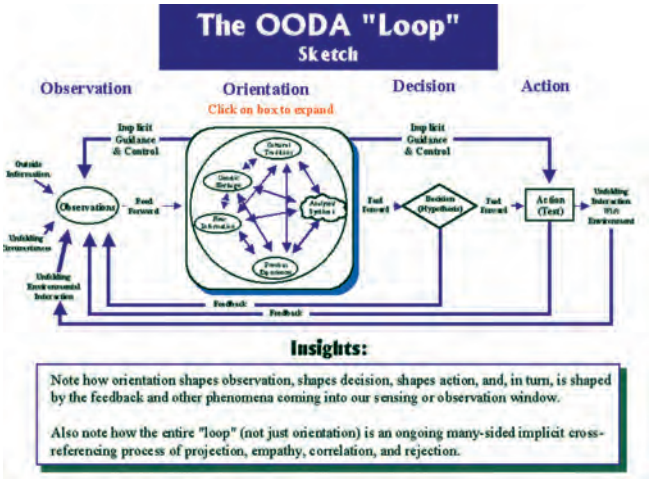
"Git thar the fustest with the mostest" –LTG N.B. Forrest, versus

"Operate inside adversary's observation - orientation – decision - action loops to enmesh adversary in a world of uncertainty, doubt, mistrust, confusion, disorder, fear, panic, chaos. . . and/or fold adversary back inside himself so that he cannot cope with events/efforts as they unfold." – Col John Boyd

This subject is complex, see the "OODA Loop" chart accompanying this book review, but the chart also shows why it is worthy of study in this particular war we are in. If you have never heard of John Boyd go to http://www.d-n-i.net/ and download his briefing slides. Then read the book's chapter one, then skip to chapter seven for a review of Boyd's influence on strategy. Now read the downloaded charts (which were never to be stand-alone charts), and then start reading the book with chapter two. It is a tough read. Look at the charts like you look at Sun Tzu-bullets of knowledge.

The author, Frans Osinga, is a serving officer of the Royal Netherlands Air Force and so brings an international flavor to this work. This book is a version of his Ph.D. dissertation so it has some academic rigor. It is also an expensive book – borrow it from the library.

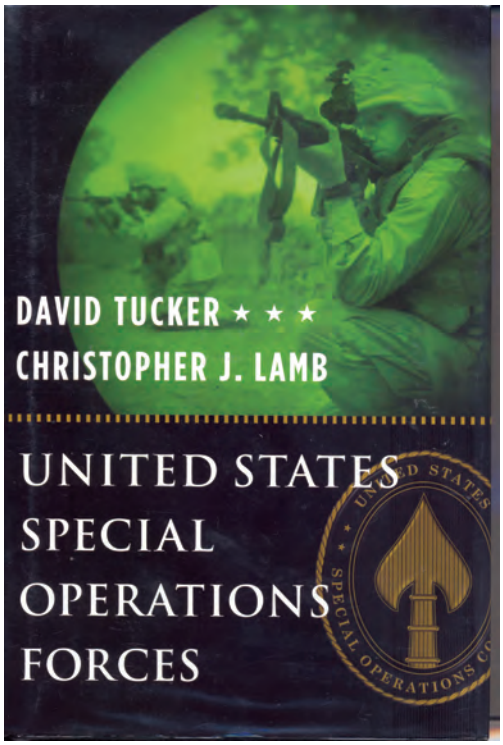




United States Special Operations Forces

David Tucker and Christopher J. Lamb
Columbia University Press: New York, 2007. 290 pages. ISBN 9789-0-231-13190-2.

Review by Warner Farr, MD



Recently, Sean Naylor, a popular columnist who writes on Special Operations, wrote an article in *Armed Forces Journal* titled *"Support Grows for Standing Up an Unconventional Warfare Command."*[1] He labeled it "An idea that wouldn't die" and discussed how, despite opposition at the highest levels, there are again calls for the establishment of an "unconventional warfare (UW) command" that would oversee those Special Operations Forces whose primary mission is not killing and capturing the enemy. He further comments that the Army's Special Forces, who specialize in working "by, with, and through" indigenous forces, have long complained that they are playing second fiddle in USSOCOM to those units that specialize in direct action.

Thinkers have postulated two possible future structures. First, a breaking away of unconventional warfare forces away from SOCOM, perhaps to a new "OSS" including some now non-DOD assets, or second, a grouping of those units under a two to three-star UW command that would remain part of SOCOM. Naylor also highlights two books. One of them is "United States Special Operations Forces" by David Tucker, an associate professor at the Naval Postgraduate School (NPS) in Monterey, CA, and Christopher J. Lamb, a senior fellow at National Defense University's Institute for National Strategic Studies at Fort McNair, Washington, D.C.[2]

The authors have taken an interestingly controversial view of Special Operations and how to reform SOF to make a greater contribution to the war on terrorism and play a more strategic role in safeguarding the nation's security. These authors explain that Special Operations Forces are:

- Distinguished by characteristics not equally valued by their own leadership
- Strategically crucial because of two mutually supporting but undeniably distinct sets of capabilities not found in conventional forces
- Not to be confused with the CIA and so-called paramilitary forces, nor with the Marines and other elite forces
- Unable to learn from the 1993 failed intervention in Somalia and the national-oversight issues it revealed
- Better integrated into the nation's military strategy and operations than ever before, but confused about their core missions in the war on terror
- Not "transformed" for future challenges as many assert, but rather in need of organizational reforms to realize their strategic potential.

These authors call for USSOCOM to be split into two four-star commands. One, an Unconventional Warfare Command, running indirect-action, unconventional warfare capabilities from within USSOCOM with added new capabilities "dedicated to understanding and influencing traditional social and communication networks." The other command, "perhaps called the Special Operations Strike Command," would take charge of the direct-action, door kicking forces.

This book hints for the change of U.S. Army Special Forces Command, the two-star headquarters at Fort Bragg, NC, now only responsible for training and equipping the SF groups (hence "A Title X HQ") into a war fighting headquarters. USSOCOM's public opinion was that "Creating a separate UW command from existing assets would only degrade USASOC's overall response capability and limit operational options to those

commanders and ambassadors for whom USASOC is tasked to support. USASOC has discussed concepts that emphasize UW and the indirect approach, including discussions with SOCOM, but USASOC has never made a recommendation to build a force structure to focus solely on one dimension."

The most far-reaching recommendations of the book are two. The first, to create integrated teams to manage these UW forces after they are separated and that there be similar teams in the rest of the government outside the Department of Defense. The second, to have the National Security Council run a series of exercises to "improve command and control of SOF's direct action capabilities." The book is an interesting read on the politics of SOF at the highest levels.

1. Retrieved 7 January 2008 from http://www.armedforcesjournal.com/2007/11/3049653,
2. Rothstein, Hy S. *Afghanistan & the troubled future of unconventional warfare.* U.S. Naval Institute Press, 2006.

Medical History

The Tao (or is it Dao?) of SOF Medicine[1]

Warner D. Farr

"If you sit by the bank of the river long enough, you will see the body of your enemy float by."

—Sean Connery's character in *"Rising Sun"*[2]

There is an old axiom in Special Forces lore that while the conventional Army's deep thinkers read the German, Clausewitz; Special Forces reads the Chinese, Sun Tzu. It refers to the idea that the German war strategist and theorist, Major General Carl von Clausewitz (1780-1831) wrote military texts and rules primarily useful for fighting conventional wars, while the Chinese war strategist, theorist, and successful general, Sun Tzu, (544 BC – 496 BC) wrote more suitably for those planning an unconventional war based on spies, deception, and wining without pitched battles — unconventional warfare. Every time America enters into a war featuring irregular forces, Sun Tzu increases in popularity, and Iraq is no exception. Many commentators are discussing Sun Tzu like it was just invented.[3] Others believe it is the basis for understanding the current actions of the Chinese government.[4] While Clausewitz wrote volumes, Sun Tzu's writings were handed down as sparse sayings carved on buried bamboo sticks, similar to PowerPoint® bullets and open to very wide interpretation. Many of the editions of *The Art of War* by Sun Tzu include a commentary by both the translator and later Chinese military strategists. They also vary widely in translation quality.

Sun Tzu's book, *The Art of War*, begins with: *"Master Sun said: War is a vital matter of State. It is the field on which life or death is determined and the road that leads to either survival or ruin and must be examined with the greatest care."*[5]

Two of the most commonly quoted Sun Tzu sayings are: *"Hence the saying: Know the enemy, know yourself, and victory is never in doubt, not in a hundred battles. He who knows self but not the enemy will suffer one defeat for every victory. He who knows neither self nor enemy will fail in every battle"*[6] and *"Hence to fight and conquer in all your battles is not supreme excellence; supreme excellence consists in breaking the enemy's resistance without fighting."*[7]

There is much more for the serious reader, but the above is a small sampling of the writings of "Master Sun." He dwells on "The Way," said in Chinese as the Tao, or Dao, and defines it as *"what brings the thinking of the people in line with their superiors. Hence you can send them to their deaths or let them live, and they will have no misgivings one way or another."*[8]

Since Sun Tzu wrote this treatise 2500 years ago, is there anything in it for the Medics? Any sage advice to use on commanders? Especially considering that military medicine was not exactly well developed at that time. When the unconventional warfare combat theorists start quoting Sun Tzu, what can you counter with? One medical quote comes from the chapter entitled *"9. Maneuvering Armies."* This chapter deals with terrain and what kinds are favorable or unfavorable to one's army. The first English translation, by Lionel Giles, in 1910, was: *"All armies prefer high ground to low and sunny places to dark. If you are careful of your men, and camp on hard ground, the army will be free from disease of every kind, and this will spell victory. When you come to a hill or a bank, occupy the sunny side, with the slope on your right rear. Thus you will at once act for the benefit of your soldiers and utilize the natural advantages of the ground."*[9]

Most Sun Tzu texts are accompanied by commentaries of later Chinese strategists and generals. Wang Xi, in the eleventh century A.D., says, *"When people spend a long time in dark and wet places they become depressed and ill."*[10] While Mei Yaochen (1002-1060) concurs, saying, *"Those who know these things can be certain of victory by the force of their momentum."*[11] Obviously in Sun Tzu's time, military medicine was mostly preventive in nature and dwelt on the proper locations of camps. What we would now call "field sanitation" was more advanced than the therapeutic side of military medical practice. Army surgeons of that era, the Chinese warring states period, were most closely related to today's environmental science officers and preventive medicine officers as opposed to modern day war trauma surgeons. Another translation, translated nearly ninety years later says: *"Take care of the physical health and stay where there are plenty of resources. When there is no sickness in the army, it is said to be invincible."*[12]

A twenty first century online translation words the stanza: *"Provide for your army's heath and place men*

correctly. Your army will be free from disease. Done correctly, this means victory."[13]

Note the linking of health and resources. Again, in that era, food and shelter were the mainstays of military health, not pharmaceuticals and surgery as today. Also, note that the ancient Chinese have a high regard for not only the necessity of preventive medicine but also for its effectiveness as a force multiplier.

Looking at resources, medicine was included in the above quoted "plenty of resources." Not a Class VIII pharmaceutical supply line and not a robust casualty evacuation system, but still resources essential to health of the army-supplies. Sun Tzu says: *"So, armies cannot survive without supplies, cannot service without provisions, cannot survive without stockpiled materials."*[14]

The precariousness and opportunity of the supply and evacuation system of the enemy is also remarked upon; "*Generally there are five attack fires . . . and fifth, the burning of the provision route and supply transport lines."*[15]

The Art of War is truly a very short book and the above quotes and comments seem at first reading to be the sum of the medical portion of the text. However, the text has an overall "medical" flavor in a way. In both Sun Tzu's view of war and in medicine there is the parallel of less is better; prevention is better than cure; avoiding battle is preferred over pitched battles. Medicine and war both involve strategizing how to deal with disharmony and in both a deep understanding of the problem becomes the key to the resulting solution.

Sun Tzu divides warriors into grades of skill. The expert warrior disarms his enemy without fighting, the next most skilled ruins the enemy's alliances, while the lesser skilled win in battle, and the least skilled besiege enemy cities. This is similar to an old Chinese medical story: *A lord of ancient China once ask his physician, a member of a family of healers, which of them was the most skilled in the art. The physician, whose reputation was such that his name became synonymous with medical science in China, replied, "My eldest brother sees the spirit of sickness and removes it before it takes shape, so his name does not get out of the house."*

"My elder brother cures sickness when it is still extremely minute, so his name does not get out of the neighborhood."

"As for me, I puncture veins, prescribe potions, and massage skin, so from time to time my name gets out and is heard among the lords."[16]

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Previously Published

Surgery in Afghanistan: A Light Model For Field Surgery During War

E. Fosse and H. Husurn

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Owing to a poor capability for evacuation, mobile medical teams were sent to the area of Gazni in Afghanistan to work with local paramedics as part of a medical programme for the area. The teams were equipped to perform major surgery. During one month a surgical team inside Afghanistan performed 53 operations. The operations were performed in the patients' homes at night. The team had to move frequently so as not to be spotted by the Soviet and government surveillance. Equipment equivalent to a light field hospital was stored in a safe place and the team carried supplies for one or two days on their bicycles. One postoperative death and one wound infection were recorded.

It is concluded that adequate surgery can be performed inside territories where enemy forces have air control and under primitive conditions with an acceptable rate of complications. However, due to the nature of the guerrilla warfare with scattered military confrontations over vast areas, the average time between injury and treatment for war casualties was 36 hours.

Introduction

The number of qualified doctors was already insufficient before the Soviet invasion of Afghanistan (Dupree, 1980). An increasing number of refugees had been noted during the past 10 years. In Pakistan, 3.5 million refugees were registered; the number in Iran was about 2.4 million (U.S. Committee for Refugees, 1988). The number of displaced persons inside Afghanistan was not known. The population of Afghanistan before the invasion was estimated to be about 15 million (Dupree, 1980). The primitive conditions, together with the military situation with no fixed front line made organization of medical and surgical care difficult (Halbert et al., 1988a, Halbert et al., 1988b).

In order to provide primary healthcare and surgical services to a community in the Gazni province, the Norwegian Afghanistan Committee (a volunteer organization) in 1985 started a medical programme in cooperation with the largest guerrilla movement in the area. The programme included the training of local paramedics and sending of international medical teams to the area. The teams operated inside Afghanistan for periods of three months and had to travel through areas controlled by Soviet and government forces. Three teams a year have covered the months between March and December since 1985. It was difficult to refer patients to Afghan or Pakistani hospitals for long periods. The teams were therefore equipped to perform major operations. For one three-month period every year a surgical team with a qualified specialist in general surgery, an anesthetist, and a scrub nurse were sent to the area. Otherwise the teams were manned for general practice. The teams were financed mainly by Norwegian government funds. Most team members had experience from work in other parts of the world, either in development projects or as members of rescue teams. We present here the experience of one surgical team during a one month period in Afghanistan in 1986.

Methods

The team consisted of a general surgeon, a scrub nurse who was also a qualified midwife and a nurse anesthetist. A period of six weeks were spent on entrance and exit from the area due to temporary fighting at the border. No elective operations were performed during the last 10 days before departure to allow some observation time, thus the actual operating time in the area was approximately 30 days.

Owing to daily surveillance and infiltration by the Soviet and government forces, the team had to be mobile. The team members were disguised as Afghans and moved from one village to another on bicycles every eight hours with their guards. All equipment was carried on six bicycles.

Surgical equipment equivalent to that of a light field hospital was stored in a village central to the area of operation (Fosse et al., 1988). The equipment carried on bicycles was supplemented from the central storeroom every second day. No operating table was included, but the team carried a light stretcher on the bicycles (Apothekernes fellesinnkjop, Oslo, Norway) and this was used as an operating table. A small portable X-ray machine (Flying Eagle, Shanghai, China) and a 2.5kW generator (Honda, Tokyo, Japan) were transported in a specially designed box on a donkey, together with films and development fluids. Examination by X-ray had to be planned in advance and could seldom be used as an acute diagnostic tool.

Equipment was sterilized by boiling in a kettle for 20 min. A small grate was made with metal pins in the bottom of the kettle to keep the packages from getting wet. During daytime the team split up. The nurses prepared equipment for operations while the doctor treated outpatients. In the afternoon the team moved to the village where surgery was to take place. One to four operations could be performed every night five days a week. All surgery was carried out in the home of one of the villagers.

One condition for accepting a room as an operating theatre was that it had a wooden paneled roof. Most homes had dried leaves as inner insulation of the roof, thereby dirt and insects could drop into the operating field. Sterile gloves, but no operation gowns were used during surgery. A simple head lamp bought in a sports shop was used to illuminate the operating field. One or two local paramedics were included in the operating team in a systematic fashion as part of their training programme. The paramedics were mainly responsible for the postoperative treatment and the immediate contact with the patient and his family.

Table I. Categories of operations

Missile injuries	11
Other injuries	12
Elective orthopaedic	4
Gastroenterological disease	3
Hernias	10
Anal fistula	1
Gynaecological disease	3
Infections	7
Skin tumors	3
Total	53

All missile wounds were treated openly (Owen-Smith, 1981). Fractures were treated by cast or external fixation (Livingston, 1985). Wide wound excision and open treatment with adequate drainage were performed in all cases.

Antibiotics were administered to 10 patients, of whom three had missile injuries and two had osteomyelitis.

As the team could only observe the patients for a few hours after operation, regional or local anesthesia was preferred in adults, while ketamine chloride was used in children. The team possessed five per cent dextrose and dextrose/saline solution for intravenous infusion. No other electrolytes were included. There were no means for blood transfusion.

All visits and operations were registered. A total of 35 patients were examined by the team postoperatively; six patients were followed up by later teams only. Thus, follow-up was possible in 86% of the patients, in some cases for up to four years. All complications were recorded.

Results

During one month the team performed 53 operations in 46 patients, 28 males and 18 females, and treated 400 outpatients. A total of 28 patients were examined by X-ray, of which six underwent operation following examination. Median age at surgery was 22 years (range 0.5 to 65 years) at the time of operation. The categories of operations are listed in *Table I* and the surgical procedures in *Table II*. Of the operations, 22 (41.5%) were performed in children under 15 years of age.

Of the 53 operations, 11 were operations for missile or shrapnel wounds, nine primary and two secondary. In addition, one patient with a war-related injury was operated on three times. He was pushing a truck on the road when it hit a mine. The truck was thrown backwards and landed on his foot, the subsequent multiple fractures and avulsion lesions of his foot led to amputation of the first toe and two wound excisions before split-skin grafting could be performed. He recovered fully.

The time from injury to operation was a median 36h, but varied from less than one hour to six days.

Apart from the war injuries, 10 patients underwent operations for hernias and three gynaecological cases were treated. In one case bilateral oophorectomy had to be performed in a young woman because of large ovarian tumors. Two women with menorrhagia were treated with curettage.

One left-sided hemicolectomy was performed for volvulus of the colon and four days history of ileus. Local or regional anesthesia was used in 40% and ketamine chloride in 34% of the operations. Of the three laparotomies performed by the team, one was performed

under a combination of ketamine chloride and spinal anesthesia, another was performed with fentanyl/pancuronium anesthesia, while the third was performed under spinal anesthesia after pre-medication with morphine *(Table III).*

One patient died suddenly 11 days after ileus and left hemicolectomy. Pulmonary embolization or acute cardiac infarction was suspected.

One wound infection in a small child was recorded after a Z-plasty of the knee. The wound was contaminated by feces that had leaked under the postoperative plaster cast and was infected by bacteria as well as pinworms. After daily washing in soap solution and systemic treatment with mebendazole tablets, split-skin grafting was performed two weeks after the primary operation.

One patient developed septicemia after a crush injury of the right foot. He developed septic shock shortly after arrival in the operating room but recovered after wound excision and treatment with penicillin and gentamycin.

A boy with a large inguinal hernia developed a scrotal hematoma due to postoperative bleeding.

Two complications after anesthesia were observed; one man needed large doses of morphine for an infected missile wound in the left arm with an open fracture of the radius and was in need of assisted ventilation for 0.5h before he breathed spontaneously. A four-year-old girl developed bronchospasm after administration of suxamethonium chloride, but was intbated successfully*(Table IV).*

Table II. Surgical procedures

Wound excision	11
Removal of shrapnel	2
Skin grafting	7
Finger/toe amputation	6
Currettage	2
Laparotomy	3
Herniaplasty	10
Incision drainage	7
External fixation	1
Other orthopaedics	5
Plaster cast	2
Excision of the skin tumor	3
Total	59

Table III. Anaesthesia

Type of anaesthesia	*No.*	*Age, median (range)*
Local (Xylocaine 1%)	13	29 (0.5-65) years
Regional (Xylocaine 1%)	7	10 (5-45) years
Spinal (Marcain 2%)	12	37 (20-45) years
Ketamine chloride	17	8 (0.7-45) years
Spinal/ketamine chloride	1	20 years
Fentanyl/pancuronium	1	50 years
None	2	13 (1-25) years
Total	53	20 (0.5-65) years

Table IV. Complications

Age	*Operation*	*Complication*
3	Z-plasty right knee	Infection under cast, feces in wound
50	Hemicolectomy	Sudden death, pulmonary embolus?
45	External fixation	Respiratory failure, morphine intoxication
18	Bassini plasty	Scrotal hematoma
37	Toe amputation, revision	Septic shock during operation
4	Reduction of dislocated hip	Bronchospasm

Discussion

In conventional warfare the evacuation chain is based on a stepwise evacuation. In Afghanistan where the occupation force had complete air control and the war was fought by different guerrilla groups, the conventional evacuation chain gave an unsatisfactory long evacuation time (Bhatanagar and Smith, 1989). Thus, different types of mobile medical units were organized inside the occupied territories because the government forces lacked ground control (Halbert et al., 1988b).

The team was operating in a relatively small area, so as not to be cut off from the main guerrilla forces in the area. The casualties coming from more remote areas had to be transported at night through areas under enemy control explaining the varying time which elapsed from injury to treatment.

We have previously experienced the advantages of advanced surgery as close as possible to the fighting zone in conventional warfare (Fosse et al., 1988). Surgery is advised as soon after injury as possible (Jones et al., 1968; Jackson et al., 1983). The present organization was arranged in order to bring advanced surgery as close as possible to the front line.

The fact that the enemy had complete air control and even the ground control in some parts during daytime, made the mobile guerrilla model necessary. The evacuation time was significantly shorter than has been reported from the Red Cross hospital in Quetta, Pakistan (Rautio and Paavolainen, 1988; Coupland and Howell, 1989). However, no thoracic injuries or bowel injuries reached the team, indicating that the evacuation time in many cases may have been too long. The closest permanent free hospital was the Red Cross hospital in Quetta. The nearest Red Cross first-aid clinic was situated in the village of Wana at the Afghan-Pakistani border. During peacetime this clinic can be reached within one day. However, due to the military situation, the transportation could be dangerous and take much longer. The first-aid clinic in Wana was not staffed to perform surgery at the level that the surgical team could provide. Another important factor was to supply medical facilities to the civilian population in the area and thereby postponing flight. Thus, many civilian disorders were treated by the team *(Table II*).

Only three operations were performed on the floor, among them a laparotomy. We strongly recommend the use of a stretcher or a table to get the patient up off the floor. Kneeling while performing major operations is tiresome and difficult. The availability of X-ray examination was useful for follow-up in the treatment of fractures and osteomyelitis. It was, however, time-consuming and complicated. The equipment had to be installed in a safe house after transport, fresh chemicals had to be mixed and a dark room was required. Normally the generator had to be installed in the room in which the examination was performed to reduce noise outdoors and avoid being spotted from the air. The 2.5kW generator gives an uneven current when used under rough circumstances, making the estimation of exposure time difficult. However, after some training fairly good quality X-ray films were achieved.

Different sterilization techniques have been tried in the different mobile surgical units operating inside wartime Afghanistan (Simon et al., 1988). The techniques used by the team did not differ significantly from those reported by others.

Although the operations were performed under primitive circumstances, only one wound infection was recorded *(Table IV)*. This wound infection was not related to the operation, but was due to contamination of the wound by feces.

One factor for the low incidence of wound infection may be the generally low hygiene in the population. As the operations were performed in the people's homes, we believe that they had developed immunity to most bacteria present in the environment. Antibiotics were given in nine cases because contamination or infection was evident, and only in one case for prophylaxis. Prophylactic antibiotics were not used routinely due to limited stores.

The mobile organization of surgery with most operations performed at night and the constant need to move was exhausting and required psychological and physical fitness by the participants.

On the other hand, by careful planning fairly advanced surgery could be performed under primitive circumstances and the present model could be useful in other areas where one has to organize medical and emergency work under enemy occupation and where the evacuation time to a permanent, safe hospital is unacceptable. However, the mobile teams are expensive, and scattered guerrilla activity will require several teams to give sufficient coverage of war casualty treatment; but even insufficient medical coverage may have an important effect on the fighters' morale and spirit.

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Tactical Combat Casualty Care in the Assault on Punta Paitilla Airfield

LCDR James J. Mucciarone, MC USN; COL Craig H. Llewellyn, USAF SMC (Ret.); Lt Col John M. Wightman, USAF MC FS

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Department of Military and Emergency Medicine, Uniformed Services University of the Health Sciences, Bethesda, MD 20814. This manuscript was received for review in August 2005 and was accepted for publication in November 2005.

Casualties incurred during the assault on Punta Paitilla Airfield during Operation Just Cause were evaluated through reviews of records and interviews with the participants. There were eight initial casualties. One-half of all subsequent casualties were wounded trying to move to these men while still under effective hostile fire. Consistent with other studies, the most common cause of death was internal hemorrhage; the second most common was catastrophic brain injury. Rapid control of external exsanguination was the technique most likely to prevent death. Tourniquets were applied to three lower extremities for two casualties, without sequelae.

Introduction

Ongoing military actions in the global war on terrorism have produced and will continue to produce combat casualties. Initial aid is usually provided in settings that are sometimes hostile but always medically austere, and the nearest treatment facility may be minutes, hours, or days away, depending on the tactical situation. Three general environments have been envisioned for the early delivery of care (1) when under fire; (2) when in a field setting but not under fire; and (3) when evacuating casualties on a preplanned transportation platform. This has been codified under the name of tactical combat casualty care (TC3).[1,2]

As one of the initial actions of Operation Just Cause, 63 Sea, Air, and Land (SEAL) personnel crossed the beach shortly after midnight on the morning of December 20, 1989, to assault Punta Paitilla Airfield on the southern edge of Panama City, Panama. Their mission was to disable Manuel Noriega's personal aircraft and to deny use of the airfield to forces friendly to the dictator. Although this action occurred 15 years ago, the weapons and tactics were similar to those used today. The purpose of this article is to review the out-of-hospital care provided before casualty evacuation (CASEVAC) and to draw conclusions with relevancy to contemporary care of combat casualties.

Methods

This study was a retrospective chart review that was enhanced by historical data solicited from participants in the engagement. From February 2000 to May 2004, information was gathered from meetings, telephone conversations, and electronic mail. No medical records were made on the battlefield, on the CASEVAC flight, at the joint casualty collection point, or on the aeromedical evacuation flight to the United States. Out-of-hospital medical information was gathered through multiple interviews with medical and nonmedical personnel who were in the field, physicians and surgeons who were at the joint casualty collection point, a corpsman who was on the aeromedical evacuation flight, and personnel who were at Wilford Hall Medical Center. Medical information concerning the three men who were killed in action (KIA) and the one who died of wounds was retrieved from the medical examiners' reports and an interview with a forensic pathologist at the Armed Forces Institute of Pathology. All of this information was supplemented by a review of after-action reports housed at SEAL Team 4.

Observations

The assault force on Punta Paitilla Airfield consisted of six SEAL squads of eight or nine men each, organized into three platoons. Five of the six squads had a dedicated corpsman. Two additional corpsmen were assigned to the 12-man command and control element. Corpsmen who completed training before 1987 did not have a formal training path. They acquired their field medical knowledge through the U.S. Marine Corps field medical course, civilian paramedic courses, and on-the-job training. Those who completed training after 1987 attended Special Forces Medical Aid Man Training, a 21-week course on the care of sick and injured patients in Special Operations settings that included the principles of Advanced Trauma Life Support. All members of the assault

Force were trained in basic first aid, including application of tourniquets and initiation of intravenous fluid administration.

For this mission, every man carried his own battle dressing, a tourniquet, a 500ml bag of lactated Ringer's (LR) solution, and two auto injectors for intramuscular administration of 10mg of morphine. Each corpsman carried a standard-issue, trauma backpack with first-aid supplies, especially pressure dressings and additional intravenous fluids. The medical plan on the airfield was for the corpsman to stop any bleeding with pressure dressings or tourniquets, to hydrate patients with LR solution, to provide analgesia with morphine, and to rapidly evacuate the casualties. With uncontested air superiority and the next echelon of care only eight miles away, at Howard Air Base, the corpsmen assumed CASEVAC to the joint casualty collection point would occur within minutes after wounding. Because of this expectation of rapid evacuation, the corpsmen did not carry antibiotics. The joint casualty collection point was manned by two forward surgical teams. Medical capabilities consisted of triage, advanced trauma life support, and resuscitative surgery. However, there was no postoperative or other holding capability, and the next echelon of care was at Wilford Hall Medical Center in San Antonio, Texas, 1,871 miles to the north.

After patrolling just over 1km from the beach, the lead squad was hit by enfilading small-arms fire from two hangars on its left flank at 1:05 a.m. The distance between forces was 15 to 60m, and no immediate cover was available for SEAL personnel. Gunmen in the hangars fired AK-47 rifles and possibly a heavy machine gun. Eight of nine men in the lead squad were wounded during the initial volley (Table I). The second SEAL squad returned fire with M-16 and M-60 rifles. The squad leader, seeing that the first squad had sustained casualties, directed his senior enlisted man and corpsman to assist them. The movement of these two men started a second volley of fire, leading to a ninth casualty (Table I). Movement of reinforcements from the following SEAL platoon created a third volley of intense fire, which led to three more casualties (Table I). Once the SEAL force had maneuvered effectively, all hostile fire on the airfield ceased by 1:17a.m.

No care was actually rendered while under effective hostile fire. Casualties 7 and 8 sustained additional wounds while lying on the exposed concrete tarmac. Casualties 4 and 5 reportedly returned fire despite significant wounds. Those who could walk attempted to move themselves and other casualties off the tarmac and into a grassy area behind the second squad's position. Casualty 3, with a relatively minor ankle wound, successfully moved two other casualties onto the grass during the firefight. This location became an ad hoc casualty collection point, where the corpsmen treated the casualties once the incoming fire stopped.

Eventually, all except one of the 12 casualties arrived at this location. Three were KIA. Casualty 10 did not know, or did not admit, that he was wounded. No cardiopulmonary resuscitation was performed in the field. There were no reports of any airway compromise or respiratory distress among the others at the casualty collection point. Bleeding was mostly controlled with pressure dressings, but there were three exceptions. Casualty 4 had profuse hemorrhaging from his right lower extremity, with altered mental status. A tourniquet was placed on his right thigh above the knee, and then a pressure dressing was applied to the wound. Casualty 11, with high-velocity bullet wounds to both lower extremities and altered mental status, had bilateral tourniquets placed. Casualty 7, who was struck in the upper left thorax, had his wound packed with rolls of gauze, which successfully slowed the external hemorrhage. Intravenous access was attained for all eight casualties at the casualty collection point, and they all received aggressive resuscitation with LR solution, although data on the amounts of fluid infused were not available. At the casualty collection point, all casualties were inspected, and identified wounds were dressed. There were no long-bone fractures in this engagement. Despite antibiotics not being administered in the field, there were no wound infections. Current TC3 guidelines advise gatifloxacin (400mg) for patients able to take orally administered medications. Intramuscularly or intravenously administered cefotetan (2g) is the recommended alternative.[3]

An MH-60 Pave Hawk helicopter was dispatched for CASEVAC and arrived at 1:55 a.m. It departed 10 minutes later, with eight wounded men aboard, and arrived at the joint casualty collection point at 2:25 a.m. There was no report of care being delivered during the CASEVAC flight to Howard Air Base.

During this small-unit engagement on an airfield, these Special Forces personnel were subjected to effective hostile fire for 12 minutes, tactical field care was rendered for 48 minutes, and the CASEVAC flight lasted 20 minutes. The three men KIA were removed from the battle scene by a second MH-60 helicopter, at approximately 3:00 a.m. Casualty 10 was evacuated at approximately 11:00 a.m. that morning.

Discussion

The Wound Data and Munitions Effectiveness Team (WDMET) study was conducted during the Vietnam War, from 1967 to 1969. That study documented

the circumstances of wounding, the wounding mechanisms, the characteristics of all wounds, any field care, and early clinical outcomes for nearly 8.000 casualties.[4] From his review of those data, Bellamy[5] concluded that ~ 70% of casualties who were KIA died within five minutes after wounding. He identified the leading cause of death (44%) as exsanguination and speculated that 20% of casualties appeared to die from extremity hemorrhage, which theoretically could have been controlled with basic first aid. Of those, approximately one-half were not under direct fire and could have been treated by a medic or corpsman.[5] A recent study of WDMET data by McPherson and colleagues suggested that tension pneumothorax was the cause of death for 3 to 4% of fatally wounded combat casualties for whom chest X-rays were available (J.J. McPherson; D.S. Feigin; R.F. Bellamy; unpublished data).

In 2000, Mabry et al.[6] reviewed the casualties from the Battle of Mogadishu. In that incident, the leading cause of death was exsanguination (6 of 18 deaths). Two Soldiers died from penetrating thoracic injuries and one exsanguinated from femoral hemorrhage that was too proximal to be controlled in the field. Three patients died of hemorrhage after reaching medical facilities. One had a gunshot wound to the abdomen, another had a nearly complete traumatic amputation at the left hip from a rocket-propelled grenade, and the third had a gunshot wound to the pelvis. Central nervous system injury, specifically gunshot wounds to the head, was the second leading cause of death (5 of 18 deaths); this was followed by multiple blunt-force trauma resulting from the two helicopter crashes (4 of 18 deaths). One patient died of thoracoabdominal wounds after being evacuated to Germany. The exact cause of death could not be determined for two Soldiers. The lack of more exsanguinating hemorrhage cases among this small set of casualties might have been attributable to the Soldiers wearing body armor, which protected the chest and upper abdomen and was not worn by casualties in previous studies.[6]

Bellamy[5] identified exsanguinating external hemorrhage from an extremity and tension pneumothorax as potentially treatable threats to life. Any trained individual should be able to control extremity bleeding. Medics and corpsmen should be capable of performing needle thoracentesis to relieve the excessive intrathoracic pressure present in tension pneumothorax. Severe internal hemorrhage and significant injury to the central nervous system cannot be directly managed in the field.

SEAL personnel KIA at Punta Paitilla Airfield suffered catastrophic wounds. Casualties 8 and 12 died as a result of internal exsanguination; casualty 9 died as a result of a severe penetrating brain and spinal cord injury. Out-of-hospital casualty care could not have changed the outcomes for these men KIA.

The aspect of care that had the greatest positive impact in this engagement was control of external hemorrhage. Both Bellamy[5] and Butler et al.[1] identified deaths attributable to hemorrhage from extremity wounds as preventable deaths. Casualties 4 and 11 had altered mental status resulting from extremity hemorrhage; therefore, it can be assumed that they lost at least one-third of their blood volume. Casualty 4 had a tourniquet placed on his right thigh, and casualty 11 had tourniquets placed on both lower extremities. Both casualties survived to reach definitive care, neither lost a limb, and both eventually returned to unlimited active duty. In each case, the person placing the tourniquet evaluated the casualty's bleeding as severe, made a life-over-limb decision, and placed the tourniquet. This likely avoided potential additional significant blood loss that might have occurred while it was being determined whether a pressure dressing was sufficient to control the hemorrhage. Pressure dressings were applied to the wounds after the tourniquets were placed. Casualty 4 received his tourniquet from a nonmedical person. highlighting the importance of training as many people as possible in combat life-saving skills.

Insufficient data were available to determine any beneficial results from the administration of LR solution to any of the wounded. A modification of the TC3 approach recommended that casualties with controlled hemorrhage but residual altered mental status from a shock state attributable to hypovolemia should be resuscitated to the point of normal mental functioning.[3] This was accomplished for casualties 4 and 11, but a cause-and-effect relationship between the treatment and the excellent outcomes could not be established.

The one aspect of TC3 that had the most negative impact on the overall health of the unit was movement under fire to assist or to extract casualties. In one study of 1,800 combat casualties, 7.5% were attributable to attempted recovery of wounded comrades (D.S. Sitler, unpublished data). In the WDMET database,Bellamy[4] identified 6 of 34 casualties in one engagement who were wounded while trying to help others. At Punta Paitilla Airfield, casualties, 9 and 11 were injured while trying to assist the wounded. Reports indicated that both men were wounded while running in an upright position, in open terrain, with no cover or concealment. When and how to retrieve casualties caught in the open is an important aspect of care on the battlefield. It is a potential source of casualties that should be minimized with proper training and equipment.

One aspect of care that had minimal impact in this engagement was analgesia. The men had not trained with morphine autoinjectors before the operation, because they were controlled items. This inexperience led to men injecting themselves incorrectly and not adhering to the established tracking system when giving the medication. This eventually resulted in corpsmen deciding to stop its use. Even if they had continued providing it, intramuscular morphine is not well absorbed from muscle tissue by poorly perfusing casualties. It does not have initial effects until 15 to 30 minutes, and it does not reach its peak effect until 45 to 90 minutes. This results in delayed relief for the patient and the potential for creating a morphine depot in the muscle from multiple injections. This depot could be released when the patient becomes normovolemic.[2]

At the time of the firefight, the men had been in full combat gear in a tropical climate for >7 hours. After patrolling, fighting, and bleeding, it could be assumed that most casualties were hypovolemic. Experiences reported in World War II indicated that pain was poorly controlled among hypothermic and/or hypovolemic casualties, which frequently led to casualties receiving multiple injections of morphine with no analgesic effect.[7] Once stabilized in a hospital, these patients often developed decreased respirations and constricted pupils resulting from the morphine depot being released from the injection site. One study of 225 casualties in Italy in early 1944 noted that, although pain is subjective and depends on the patient, casualties with penetrating abdominal wounds were far more likely to have severe pain requiring narcotics than were those with compound long-bone fractures, extensive peripheral soft-tissue wounds, or penetrating thoracic wounds.[7]

The TC3 guidelines recommend orally administered acetaminophen, orally administered rofecoxib (no longer available), or 5mg of intravenously administered morphine every 10 minutes as needed.[3] A recently published study from Operation Iraqi Freedom suggested that oral transmucosal fentanyl citrate might be an effective alternative for patients who are hemodynamically stable with isolated, uncomplicated, orthopedic injuries or extremity wounds and who are not expected to return to duty.[8]

Conclusions

After reviewing the available information concerning the casualties at Punta Paitilla Airfield, it is our conclusion that control of extremity hemorrhage had the greatest positive impact on combat casualty care. Specifically, in this small sample, tourniquets saved lives with no sequelae.

Attempts to recover the wounded had the most negative impact, because additional casualties were created during the unsuccessful attempt while still under effective hostile fire. Combat medical personnel must be

TABLE I

LIST OF CASUALTIES

Casualty No.	Location of Wounds	Status	Treatment in Field
1	Right parietal head	WIA	Head dressing, IVF
2	(1) Back: entrance at L2 level; continued into abdomen; (2) left lower extremity	WIA	Abdominal dressing, extremity pressure dressing, IVF
3	Distal left lower extremity	WIA	Pressure dressing, IVF, IM morphine
4	Right lower extremity	WIA	Tourniquet, pressure dressing, IVF, IM morphine
5	(1) Left posterior shoulder; (2) left buttock	WIA	Pressure dressings, IVF, IM morphine
6	Right triceps	WIA	Pressure dressing, IVF, IM morphine
7	(1) Left posterior thorax; (2) fragment wound to left hand	DOW	Thoracic wound packed with gauze, IVF; hand wound not addressed in field
8	(1) Left anterior thorax: penetrated through second rib; perforated upper lobe of left lung, ascending aorta, and upper lobe of right lung; (2) left posterior thigh; (3) right anterior thigh; (4) left arm	KIA	NA
9	Left posterior head: entrance through occiput 5 inches from top of head; transected cervical spinal cord at C1–C2 level and exited out right neck 9 inches from top of head	KIA	NA
10	Right buttock	WIA	Identified 6 hours after battle, dressing applied
11	(1) Left lower extremity; (2) right lower extremity	WIA	Bilateral tourniquets, pressure dressings, IVF, IM morphine
12	Anterior abdomen: entrance 4 inches left of umbilicus; traveled left to right and front to back; perforated small bowel, severed right iliac artery, and fractured right iliac bone	KIA	NA

All wounds were gunshot wounds unless otherwise noted. WIA, wounded in action; DOW, died of wounds; IVF, intravenous fluids; IM, intramuscular; NA, not applicable.

trained in the best techniques to determine whether a casualty is worth the risk of recovering, as well as how to move to that casualty under fire, if appropriate. Exsanguinating external hemorrhage, particularly from the extremities, is the wound type most likely to benefit from early intervention. Although the risks of exposing additional personnel to injury are the same for most casualties in similar terrain, the potential gain may be greater for this category of wounds. In addition, nonmedical leaders must understand the risks and potential benefits of recovering the wounded in these scenarios, because combat medics and corpsmen frequently move in response to orders from their mission commanders. The analgesia provided to the casualties in this engagement appears to have neither controlled the pain nor harmed the patients. Unit medical officers should identify the most effective means of providing analgesia for their unit's mission and situation. No matter what analgesia is provided, personnel must be familiarized with it before they can be expected to use it properly.

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Pain Management in the Prehospital Environment

John G. McManus Jr, MD, FACEP; Donald R. Sallee Jr, MD, FAAEMe
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''Care more for the individual patient than for the special features of the disease.''
William Osler, 1899

Pain is the leading complaint among individuals presenting to emergency departments, with up to 70% of emergency department patients having pain as part of their chief complaint.[1] Therefore, pain is also a major reason why individuals seek care from prehospital providers. In fact, McLeanetal[2] found that at least 20% of prehospital patients reported moderate or severe pain. Multiple other studies[3–7] have also demonstrated that prehospital providers and emergency physicians fail to adequately recognize, assess, and treat pain. These inadequacies in prehospital pain management have resulted in recommendations to incorporate assessment scales and treatment protocols, and to undertake further pain research.[6–9] Despite these recommendations, many emergency medical services (EMS) systems still lack protocols that adequately address and treat pain in the prehospital setting.

In addition to inadequate protocols, there are many obstacles to adequate pain assessment and management in the unique prehospital environment. Some of these obstacles are agent availability, provider education level, controlled substance regulation, transport time, possible delay in transport, and lack of education and research.[6,9,10] This article presents a review of the current literature addressing some of these pain assessment and management obstacles in the prehospital setting, and provides possible suggestions and solutions for future directions in pain education, assessment, and management in the prehospital arena.

History

The introduction of an ambulance service into the United States Army in the early 1860s led to the first uses of prehospital analgesia. Many of these early ambulances carried ''medicinal'' brandy or other liquors for pain management. Civilian ambulances saw their first use of analgesia practice after the Civil War. In addition to providing liquors, these civilian ambulances carried rudimentary splints. Although not fully recognized as doing so at the time, these rudimentary splints also provided a measure of pain relief for the patient. In fact, most protocols during the early period of prehospital care involved only on-scene treatment, with transportation back to the patient's home. As medical care continued to evolve and hospital-based care gained more prominence, little attention was given to the prehospital medical care of the patient throughout most of the twentieth century. This unfortunate trend of prehospital medical treatment is exemplified by the fact that even in the 1960s at least half of these ''ambulances'' in the United States were hearses.[6] During this time, the acceptable protocols were to transport the patient to the hospital without providing on-scene or in-route medical care.

The recognition, assessment and treatment of patients' pain has recently gained much focus and importance in the management of prehospital patients.[6,9] Pain has been termed ''the fifth vital sign'' after receiving increased attention from the Joint Commission on Accreditation of Health Care Organizations (JCAHO).[11] The National Association of EMS Physicians (NAEMSP) has also issued a position paper on prehospital pain management, addressing the importance of the recognition, assessment, and treatment of prehospital pain.[6]

Protocols

One area that will help improve pain assessment and treatment in the prehospital setting is the development of pain protocols. Currently, many systems require that the paramedic contact a base hospital physician before administering any pharmacological analgesia. This can lead to a delay in the delivery of analgesia to the patient in pain.

In one study,[8] a protocol allowing paramedics to administer morphine sulfate to patients who have extremity injuries without on-line medical control led to patients receiving their first dose of pain medication several

minutes earlier. On many occasions, the patient received the pain medications before transport. Interestingly, the total amount of morphine sulfate given per patient and the number of patients receiving prehospital medication did not change when compared before and after implementation of the protocol. Also, there were no adverse events noted in this study.

Many factors need to be included in the development and implementation of these prehospital pain protocols. Protocol components are listed in Box 1.

During the development of pain protocols, it is best to have a multi-disciplinary approach. Use of local medical expertise, not only during the development of pain protocols, but also during ongoing assessment, will help improve and standardize pain assessment and treatment, especially in unique populations such as pediatric, chronic, obstetric, elderly, and trauma pain patients.[6,9]

Once established, pain protocols should address assessment, indications for medications, and complications associated with analgesia administration. Some potential complications from treatment include respiratory depression, apnea, hypotension, nausea, vomiting, and allergic reactions. Pain management protocols should also require adequate documentation and monitoring of patients who receive prehospital analgesia. Ongoing patient assessment of pain and therapy is another necessary component of a successful protocol. Communication to the receiving medical provider of the patient's pain assessment, treatment, and response to treatment needs to be addressed as well. Finally, pain management protocols and outcomes should be part of the EMS quality improvement and assurance process.

Box 1. Prehospital pain management protocol components

- Assessment and documentation of patient's pain
- Valid and reliable measurement tools for assessment
- Treatment indications and contraindications for pain
- Possible pharmacological and nonpharmacological recommendations
- Possible complications from medications and the treatment recommendations for complications
- Adequate patient monitoring and ongoing assessment during transport
- Use of local expert input for special situations; i.e., pediatric pain,chronic pain, trauma pain, and so on
- Communication of information to receiving medical personnel
- Adequate quality improvement tools to ensure protocols are appropriate, effective, and followed

Modified from Alonso-Serra, Wesley K. Position paper: Prehospital pain management. Prehosp Emerg Care 2003;7:482; with permission.

Myths

There are many assumptions or ''myths'' held by medical providers that have served as barriers to effective prehospital pain management.[12,13] Some of these are listed in Box 2.

One common myth is the belief that providers already do a good job of providing adequate pain control; however, as cited above, there are many studies to the contrary. Another belief is that administration of pain medications before arriving at a definitive diagnosis may alter presenting signs and symptoms or mask a serious underlying disorder.[12] Pain medications do not affect peritoneal signs or cause fractures to heal before further evaluation. Effective pain management also alleviates some of the patient's duress and anxiety, allowing for a more accurate evaluation.[14–16]

Another belief is that any amount of narcotic administered should provide adequate analgesia. If analgesia is provided, often the doses used are inadequate;[1,5,6,12,17] giving 2mg of morphine to a healthy adult provides little relief. The normal dose can start at 0.1mg/kg as a bolus and be titrated up to effect. Accompanying this myth is the belief that administering any narcotic can lead to chronic dependence. One study has shown that only 4 patients out of almost 12,000 developed possible opioid dependencepatients.[13] Providers also believe that use of any agent is effective for adequate pain relief. These beliefs are more prevalent in the pain management of the elderly or pediatric population.[4,18–20]

Box 2. Common provider "myths" about patients' pain

- Care providers currently do a good job providing adequate assessment and treatment of pain.

Pain medications may mask serious underlying disorders.

- Two mg of morphine provides adequate analgesia in all healthy adults.
- Pain affects all people in the same manner.
- Use of narcotics in acute pain leads to increase in addiction.
- Use of pain medications increases adverse events.

Patients often exaggerate or over-report pain.

- Prior interactions do not affect care provider's ability to remain objective.

The myth that all people experience pain in the same manner is also detrimental. The meaning and treatment of pain can be affected by the culture, age, ethnicity, and gender of the patient.[6] Culture has a powerful effect on the beliefs about, behavior under, and meaning of pain.[21] Studies have also shown that there is provider bias and under treatment of pain in patients of different culture, gender, age, and ethnicity.[22–28]

Another belief held by healthcare providers is that increased adverse effects will occur with analgesia use. It is true that care providers require close monitoring and additional training in analgesia use to prevent adverse events;[8] however, many studies have reported few to no complications in prehospital analgesia administration.[8,29,30]

Finally, the patient's and care provider's perception of current pain also affects the adequate management of pain. When the patient says that his pain is a 15 on a scale of 1 to 10, is he exaggerating to get medication or is his pain that severe? The lack of a concrete measurement and the reliance on patient self-reporting of pain level often leads to disbelief by the provider. The myth that patients are unable to adequately self-assess their pain must be overcome through provider education.[6,8,9]

Pain assessment

After protocol development, adequate pain management in the prehospital setting begins with effective assessment of pain. Articles in this issue by Todd on the measurement of pain and by Bauman et al on pediatric pain discuss the assessment and measurement tools available for pain indepth; however, the unique and often challenging prehospital environment requires some discussion and recommendations.

To be adequate, assessment of patient's pain should be individualized, comprehensive, continuous, measured, monitored, and documented.[9] Pain is unique to each individual, and is influenced by several factors, including age,[28] race,[24,27] gender,[22,25,26] culture,[21] emotions, cognitive state, expectations, and prior experience.[6,9] Despite this knowledge, current evidence has shown lack of assessment and treatment of pain by prehospital providers in regards to those factors.[3–6,9] Also, the focus on assessment has resulted in better documentation of patients' pain without better treatment of pain.[29]

Determining the ideal measurement tool used to properly assess pain also presents a challenge for the prehospital healthcare provider. The lack of objective measurement can be frustrating for the healthcare provider. Patient self-reporting is considered the ''most reliable indicator of the existence and intensity of pain.''[31] So how does one measure such self-reporting? As other authors in this issue have stated, pain is complex and multidimensional, and cannot be as easily quantified as one-dimensional parameters such as blood pressure or pulse rate. Pain involves psychological, behavioral, physiological, and emotional components.[1,6,9] The interactions of these components explain why there is variation in patients' response to pain and perception of pain. Also, the degree of injury or tissue damage alone is an inefficient method for determining a patient's appropriate pain intensity.[32] Finally, many patients in the prehospital setting are unable to self-report pain level.[29]

The ideal tool for pain measurement and assessment should include the acknowledgment, intensity, and continued measurement of the pain in regards to therapy and time. This multidimensional tool should also account for all the factors that influence a patient's pain perception and intensity. Also, the tool should remain unbiased with regards to culture, age, cognitive state, ethnicity, gender, and previous pain experiences. Because of the complexity required for the ideal multidimensional measurement tool, one-dimensional pain scales were developed for use in the acute pain setting.[9,33] The three common one-dimensional adult pain scales are the visual analog scale(VAS),[34,35] the numeric rating scale (NRS),[36] and the verbal or adjective rating scale (VRS/ARS).[37–39] These are briefly described below:

- Visual analog scale (VAS): a 100mm line with ''no pain'' at the beginning, and ''worst pain'' at the end. Patients place a mark to estimate their pain, and the distance from the origin (no pain) is measured.
- Numeric rating scale (NRS): patients rate their pain with numbers, from no pain (0) to worst pain (10 or 100).
- Verbal or adjective rating scale (VRS/ARS): patients chose the best adjective that describes their pain — none, mild, moderate, severe, or unbear able.

There are also unidimensional scales used in the pediatric population to measure and assess pain.[40–43] Children have limited cognitive ability to use most of the adult scales; however, the VAS has been used with success in children older than five. Children under five have used modified VAS scales, color scales, and the Faces Pain Scale with some success.[44,45] These scales may also be helpful in adult patients who lack the cognitive ability to communicate. The article on pediatric pain by Bauman et al., in this issue describes other one-dimensional pediatric scales and neonatal pain scales that may be used to assess children's pain. No studies have been conducted in the prehospital setting to evaluate pediatric pain scales.

There are also several multidimensional tools available for pain assessment that incorporate some of the

factors listed above associated with pain;[6,9] however, these tools are time-consuming and require extensive education to administer and evaluate. The role of multidimensional tools in the prehospital environment may be limited to EMS systems that require lengthy or specialized transport. The use of these tools would require much education and a dedicated multidisciplinary approach.

Although not ideal, the use of one-dimensional tools in the prehospital environment is usually recommended for pain assessment because of their ease of use and logistic feasibility.[6,9,33] For adult patients, the ARS and NRS are recommended for prehospital pain assessment.[6,9] Because literature is lacking regarding out-of-hospital assessment for pediatric pain, medical directors must decide which instrument may work best in his environment. Emergency Medical Services Outcomes Project (EMSOP) IV pain measurement in out-of-hospital outcomes research[42] tentatively recommends the Oucher Scale for assessment in children above three years of age, while awaiting further research.[9] It is also important that the medical director consider including a pain assessment tool in the protocol for other special populations such as the elderly and trauma, obstetric, and chronic pain patients. Another goal, if possible, is to incorporate the same pain measurement tool used by receiving providers and facilities. Also, one must remember that it is important to assess all pain, despite the level of ability to communicate with the patient. As described, there may be behavioral and physiological changes that accompany pain and could be used to aid in therapy.[46] Although observational measures may be inferior to self-report, this may be the only means of assessment in some patients. Finally, pain management does not end with proper assessment. Focus for provider education should be on the adequate treatment and relief from unnecessary suffering for the patient, not just on the initial assessment.

Pharmacologic interventions

There are few studies available that look at the safety and efficacy of prehospital analgesia. Most analgesia studies are retrospective and are considered Class III or IV levels of evidence.[47] One study[48] revealed only 38 randomized control trials relating to prehospital care since 1989, and none were related to pain assessment or management. The available literature does; however, report many options for prehospital analgesic use, and reports few adverse events.[29,30] One French observational prehospital study[29] did report a 2% cardiac-arrest-without-death rate and a 12% arrhythmia rate in critically ill, intubated patients; however, because these patients underwent rapid sequence intubation (sedation) and were critically ill, these side-effects cannot be linked directly to analgesia use alone.

The appropriate analgesic in the prehospital environment would be one that is safe, easily administered, and that possess rapid onset, short duration, and low abuse potential. The following agents are some of the more commonly used analgesics found in the prehospital environment.

Morphine sulfate

Morphine sulfate is advocated in many prehospital protocols for cardiac chest pain not relieved with nitrates. Also, morphine is finding increasing acceptance in managing hip and long bone fractures.[2,5] Morphine should be administered intravenously, and its effect can be titrated. The onset of action is in minutes, with a half-life of two to three hours. It can also be given intramuscularly to patients whose situation precludes the immediate placement of an intravenous (IV) feed; however, this route of administration has a delayed onset of action of about five minutes, and is more diffcult to titrate. When administered intramuscularly, the effects will last for three to five hours. The dose for both routes is 0.05 to 0.3mg/kg. An added benefit of morphine sulfate is the fact that undesired effects such as respiratory depression and apnea can be reversed with naloxone. Naloxone has proven to be safe in the prehospital environment and is readily available for many providers.[49]

Fentanyl

Another opioid that is used in the prehospital environment is fentanyl. Its rapid onset and potency are major advantages. It is given intravenously in doses of 1 to 4mcg/kg. An onset of action of thirty seconds to two minutes provides faster potential relief than morphine sulfate. Its duration is thirty minutes to one hour, requiring more frequent dosing by the prehospital provider. A small study in Australia[50] noted that intranasal fentanyl can provide significant pain relief in children; however, this study involved a small number of patients and was conducted in an emergency department. Oral fentanyl has also been used with success with few side-effects.[51,52] Respiratory depression may be seen in fentanyl use, but is a less common when compared with morphine sulfate; however, a rare side-effect of fentanyl, chest wall rigidity, may not be relieved by naloxone, and may require paralysis to ventilate a patient. Some organizations may be reluctant to use opioid medications, because these medications present administrative difficulties. Also, federal and state regulations may limit certain systems' and providers' type, route, dose, or use of these controlled substances.

Nalbuphine

Nalbuphine has been shown to be safe and effective for use in the prehospital environment.[53–55] Nalbuphine is a mixed narcotic agonist-antagonist with minimal respiratory and hemodynamic side-effects. Naloxone can be used to reverse any adverse side-effects. One retrospective case review of 10 patients[56] did show an increased opiate requirement in patients admitted to the emergency department. Because nalbuphine is not regulated by the Controlled Substances Act and may have a lower abuse potential than pure opioids, it may be another option for the prehospital provider.

Nonsteroidal anti-inflammatory drugs

Although nonsteroidal anti-inflammatory drugs (NSAIDS) are a group of medications that can be readily available to the pre-hospital provider, few systems use them. Certain NSAIDS, such as ketorolac, can provide meaningful pain relief for certain conditions, including renal colic. Ketoralac can be administered intravenously and intramuscularly. Although many types of NSAIDS are available over the counter and therefore assumed safe by many people, these medications can have serious side-effects when used chronically.

Nitrous oxide

Nitrous oxide can be inhaled to produce sedation and analgesia, and was first used in the prehospital setting in 1970.[57] It has been safely used in the prehospital environment with excellent results.[58] Advantages include self-administration and an onset and duration of action of three to five minutes. Supplemental oxygen should be administered while a patient is receiving this intervention. Additionally, the mask used to administer this medication should be equipped with a demand valve, and the mask should not be secured to the patient's face. As adequate analgesia is obtained, the mask will fall from the patient's face, preventing over sedation and possible hypoxia. Minor side-effects such as nausea and vomiting have been reported.[47,57] Also, because nitrous oxide is a gas, it should not be used in patients who have suspected pneumothorax or bowel obstruction. Some limitations of nitrous oxide use include regulations concerning use of a gas in an enclosed space, and its high abuse potential by providers.

Tramadol

Tramadol has been looked at in the prehospital setting as an alternative to morphine, and has been compared with nitrous oxide.[59,60] Tramadol is a centrally acting analgesic that has been shown to be useful in the treatment of many pain disorders.[61,62] Tramadol has a unique mechanism of action that combines mu-opioid activity with inhibition of serotonin/norepinephrinere uptake. A few prehospital studies that involved pain management in trauma patients[59,60] found that tramadol's analgesia and physiological effects were similar to those of other opioids, with a 30% nausea rate.

Other medications

Additional pharmacological agents that have been used in the prehospital environment include ketamine, midazolam, lorazepam, and valium. Ketamine is commonly used in emergency departments for pediatric sedation. Currently, there are no published articles on its routine use in the prehospital environment. Benzodiazepines such as midazolam, lorazepam, and valium are not analgesics, but sedatives or anxiolytics. These medications can treat the anxiety or agitation that often accompanies pain. Great care should be used when giving a patient one of these medications, because anxiety or agitation could be an indication of a more ominous condition, such as hypoxia. Also, these medications should not be used in lieu of pain medication, because benzodiazepines do not provide pain relief. Finally, caution should be used when combining benzodiaze-pines with opiates, due to their synergistic effect of lowering patient's blood pressure and producing respiratory depression and apnea.[63]

Local and regional anesthesia

There are limited data on the use of local and topical anesthetics in the prehospital setting. The use of local or topical anesthesia may be a consideration in special populations or in populations requiring long transport. Other articles in this issue describe the use and techniques of local and topical anesthetics for pain management.

The use of regional anesthesia or ''blocks'' is also described in detail in other articles in this issue. Regional anesthesia has been used with success in the wilderness and austere environments.[64,65] With the proper training and education, these techniques used in the right environment may improve pain management for these select patients.

Nonpharmacological Interventions

Appropriate therapy for patients in pain should not be limited to analgesia or anesthesia. Although pharmacologic approaches are important, there are many nonpharmacological interventions recommended to enhance pain management.[6,66–68] Also, because of provider level, medication allergies, medication availability, and possible access issues, pharmacolog-ical therapy may not be available. Nonpharmacological therapy can be assigned to three broad categories:

- Cognitive: music, guided imagery, distraction, positive reinforcement, decentralization, hypnosis

- Behavioral: relaxation techniques, biofeedback exercises, breathing control
- Physical: heat and cold application, massage or touch, position and comfort, temperature regulation, transcutaneous electrical nerve stimulation, acupuncture, chiropractic, immobilization

Although not scientifically proven, several cognitive, behavioral, and physical interventions have been shown to be effective.[68] To understand the possible mechanism of action for these nonpharmacological therapies, a basic understanding of the gate-control hypothesis is necessary. The gate-control hypothesis has been one proposed mechanism for the effectiveness of these nonpharmacological interventions.[66] This hypothesis postulates the presence of blocking or gating mechanisms along the pain pathway that prohibit pain from reaching the brain through stimulation of inhibitory neurons. These neurons can be stimulated and close the ''pain gates'' through stimulation of nonpainful receptors or excitatory messages from the brain itself.[69] A more thorough discussion of the pathophysiology of pain and this hypothesis can be found in the chapters on pathophysiology by Hansen and on chronic pain also by Hansen, elsewhere in this issue.

Cognitive

Music, guided imagery,[66] distraction,[70] and hypnosis[71–74] are examples of cognitive therapies that have been shown to be effective in reducing patient's pain. The use of cognitive interventions may help distract the patient and improve control over his pain, and may even contribute to endorphin release.[69] For cognitive interventions to be successful, they require patient cooperation and provider education.

Behavioral

Behavioral techniques have also been used with success in pain management. Some of the interventions include: relaxation techniques, biofeedback exercises, and breathing control.[75–78] These techniques also aid in distracting the patient and shifting the focus from his pain; however, these interventions also require education for the provider and patient to be effective.

Physical

Most prehospital providers probably provide physical interventions as part of their routine management to patients in pain; however, there are several techniques that are probably neglected or are not fully used. Some of the physical strategies that have been proven to be useful include heat and cold application,[79,80] massage or touch,[79] position and comfort (splinting),[81] temperature regulation, acupuncture,[82–85] and transcutaneous electrical nerve stimulation.[86,87]

Monitoring and continued assessment

After undertaking a pain management strategy, it is important to continually reassess the patient. The prehospital patient treatment form should document any clinical or subjective improvement of the patient. In addition, any clinical or technical problems encountered when administering the medication should be accurately documented. Monitoring a patient's level of sedation and pain control, particularly when using pharmacological agents that can cause physiologic change, is important for patient safety.[61] Many of the medications used for pain management can produce respiratory or hemodynamic changes.

Simple manual observation is not enough, however. Noninvasive methods already employed to monitor prehospital patients also need to be used. Following the effects of pain control interventions on parameters such as blood pressure and pulse oximetry are essential. If available, noninvasive end tidal CO_2 monitoring is another potentially important parameter to follow. All physiologic changes as well as response to therapy need to be documented and investigated by the prehospital provider.

Ongoing education for prehospital providers will improve their ability to use interventions, and to interpret, monitor, and respond to changes in the patient's condition. Prehospital pain management education should be accomplished using a multidiscipline approach incorporating not only appropriate assessment and treatment of pain techniques, but also continued assessment for changes inpatients' pain and physiology.

Quality improvement

Once a prehospital pain management protocol is established, it has to be continually evaluated. Quality improvement measurement in pain management is complex and is constantly evolving. A thorough evaluation of the quality of pain care in the prehospital setting should include the measurement of practice patterns and patient outcomes.[88] Quality control programs can increase provider awareness in pain management and improve compliance to pain protocols.[29] Box 3 lists quality assessment markers.

Provider practice pattern evaluation begins with proper education and training, with attention to identification, assessment, treatment, reassessment, documentation, and reporting of pain. Specific end points and benchmarks need to be established and communicated on a regular basis to the providers, with continued flexibility for improvement.[6,88] All forms of therapy, pharmacologic and nonpharmacologic, need to be reviewed and evaluated for effectiveness and incidence of adverse events. Provider

documentation needs to be reviewed to ensure protocol compliance and appropriate treatment. Open communication among providers and institutions should occur on a regular basis to assess appropriateness and adequacy of pain control in the prehospital setting.

Measurements of patient's outcomes are also essential for quality improvement. Gordon and associates[88] review several studies that have looked at pain management outcomes in hospitalized patients as a means to measure and improve quality pain control. Some of the outcome measures applicable to the prehospital setting are: adequate assessment of pain is documented, pain is reassessed at regular and frequent intervals, pain is treated with analgesia and other modalities when appropriate, complications and prevalence of side-effects associated with pain management are documented and addressed, patients are informed about pain management, and patient satisfaction with pain treatment and the quality of pain management across points of care transition are evaluated.

Box 3. Quality improvement markers for prehospital pain management

Provider practice pattern

1. Education and training in identification, assessment, treatment, reassessment, documentation, and reporting of pain
2. Pain end points and benchmarks need to be established and known
3. Frequent review of pain modality effectiveness
4. Chart review for documentation and protocol compliance
5. Need for continued patient assessment and identification of adverse events
6. Open communication with providers and institutions about pain management

Patient outcomes

1. Adequate assessment of pain
2. Reassessment of pain at frequent and regular intervals
3. Effectiveness of pain management with pharmacologic and nonpharmacologic modalities
4. Prevalence and adverse events associated with pain management therapy
5. Patient satisfaction with treatment of pain
6. Evaluation of the quality of pain management at transition points of care

Modified from Gordon DB, Pellino TA, Miaskowski C, et al. A 10-year review of quality improvement monitoring in pain management: Recommendations for standardized outcome measures. Pain Manag Nurs 2002;3(4):116–30; with permission.

Summary

Pain measurement and relief is complex, and should be a priority for prehospital providers and supervisors. The available literature continues to prove that we are poor pain relievers, despite the high prevalence of pain in the out-of-hospital patient population. Lack of education and research, along with agent availability, controlled substance regulation, and many myths given credence by healthcare providers, hinder our ability to achieve adequate pain assessment and treatment in the prehospital setting. Protocols must be established to help guide providers through proper acknowledgment, measurement, and treatment for prehospital pain. Nonpharmacologic therapies must also be taught and reinforced as important adjuncts to pain management. Finally, formation of quality improvement pain programs that evaluate patient outcomes and provider practice patterns will help EMS systems understand the pain management process and provide areas for improvement. Only through emphasis on pain education, research, protocol, and program monitoring development will the quality of pain assessment and management in the prehospital setting improve.

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Gunshot Wounds in Military Working Dogs

MAJ Janice Baker and CPT Christine Truesdale

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Ballistic wounds account for approximately half of the life-threatening or fatal wounds incurred by military working dogs in Afghanistan and Iraq. High-energy explosive blast injuries account for approximately the same number of serious and fatal injuries as ballistic injuries. Blunt trauma from falls or high-impact collisions round out most of the other serious cases. MWDs on patrols and "outside the wire" are susceptible to the same injuries as human servicemembers, and the veterinary units downrange are treating these dogs relatively often. In a collaborative effort between SOF and conventional veterinary forces, these cases are being analyzed for medical and operational factors in order to increase survival and increase return to duty of seriously injured MWDs in theater.

Preliminary analysis of data from gunshot wounded dogs in OEF and OIF reveals that about half of the gunshot wounds were fatal. The other half survived, although most were critically wounded. Survival cases include GSW to the head, the thorax, abdomen, and the extremities where significant hemorrhage occurred. Other than gunshot wounds to the extremities, there does not appear to be any difference in survivability based on location of the wound (i.e. head vs. thorax, etc.); however, the number of cases studied is so small (under 15) that this may not be statistically significant and can change as more cases occur.

Wound distribution of fatal wounds in MWDs does not appear to mirror human fatal wound distribution. There may be multiple reasons for this, the most obvious reason being differences in anatomy and locomotion. The four-legged, head-first stance of dogs vs. upright stance of humans may be placing them in a different orientation when facing their attackers. Also, human body armor provides significant protection for the torso. Although commercially available, none of the dogs with ballistic wounds were wearing canine body armor. Unfortunately, the extremely hot environmental temperatures (sometimes over 120 degrees F) and heavy weight of canine body armor increases their chance of heat injury. Due to the operational environment, appropriate work-rest cycles are not always possible, and the heavy weight of most canine body armor relative to their total body weight limits mobility and quickly tires out most dogs. In addition, the effectiveness of human body armor comes largely from the ceramic or other plates, which canine body armor does not contain. While it may be effective in protecting against shrapnel and explosive fragments, the increased chances of heat injury, limited mobility, extra weight, and lack of significant protection due to no ceramic plates makes canine body armor a liability that outweighs its minimal protective effect for dogs in many operational situations.

Return to duty rate in the surviving dogs has been nearly 70%, with the remaining dogs currently undergoing treatment with a good prognosis for return to duty. Some of these dogs were treated entirely in theater, recovered from their critical wounds, and returned to duty to complete their tour without ever leaving theater. This was obviously not consistent with the "doctrine" of RTD within 72 hours or MEDEVAC to higher echelon of care. However, the foresight and hard work of the veterinary teams, handlers, and human medical providers allowed these dogs to return relatively quickly to the fighting force.

Although there were other human servicemember casualties, none of the handlers of these dogs sustained significant injury during the situation in which their dog incurred ballistic injury.

Currently there are not enough cases to analyze to find statistically significant data on survival vs. fatal wounds. However, there are several common factors in the survival cases that are worth noting and offer valuable lessons learned.

First, handlers and Medics who treated seriously injured dogs in the field that survived had undergone a significant amount of canine emergency training prior to deploying. Canine training was based on Tactical Combat Casualty Care (TCCC) standards, and their care in the field reflected this. For example, Medics performed needle decompression of the chest in one case and placed a thoracotomy tube in the other.

Second, use of human medical facilities, equipment, and personnel was essential in all but one case. In most of the cases, the veterinarians felt that they and their 68T* alone (if they had a 68T) were unable to provide the level of care necessary to manage a critically injured dog, provide critical care anesthesia during surgery, or provide post-operative critical care without outside assistance. Even if they had the knowledge and equipment, they simply did not have enough skilled veterinary unit personnel to assist, and MEDEVAC to another location would have further delayed life-saving care. The veterinarian in all but one of the gunshot wound cases studied actively sought assistance from physicians (surgeons and emergency specialists), Certified Registered Nurse Anesthetists, emergency department staff, and operating room

technicians to help provide critical care and felt this care was essential in the dog's survival. The veterinarian simply cannot do everything at once. Basic tenants of triage and emergency case management state that the highest skilled person is there to THINK, and direct others to ACT.

Most of the dogs were stabilized in the emergency department of a CSH or Air Force Theater Hospital prior to being transferred to the veterinary facility. In some cases it was because the veterinarian had not yet arrived to receive the dog. In others, it was due to the immediate need for lifesaving treatment before moving the dog to the veterinary facility, or lack of certain equipment in the veterinary facility. This also allowed the veterinarian to think the case through, communicate with the theater 64F** or commander, and direct assets as necessary while other skilled medical personnel physically applied the treatments. Only one case was evacuated from a lower level of veterinary care to higher; most were treated at the initial receiving location for several days until stable, and then only evacuated higher if preparing for MEDEVAC to Germany or CONUS. It's worth noting though, that in a few of these cases the initial receiving location was at the Veterinary HQ with the 64F and the dog was already at the highest level of veterinary care available in theater.

Extensive canine CASEVAC planning by the canine units led to appropriate CASEVAC and MEDEVAC of these injured MWDs. Many locations where MWDs are located in theater do not have veterinarians. The Veterinary Corps Officers (VCO) cover wide areas that include many FOBs and may not be at their usual facility when an emergency arises. Many units are including canine CASEVAC planning in their medical planning, and before leaving on any mission, determine the best place to take an injured dog on that particular day, and pre-coordinate a rapid system of notifying the veterinarian of incoming canine casualties.

Revisiting the idea of canine emergency training; some of the aircrews involved with canine CASEVAC/MEDEVAC had trained with veterinarians and 68Ts in theater to be better prepared to manage an injured dog in their aircraft. Similarly, the VCOs and 68Ts learned the safe way to approach an aircraft to load or unload a canine patient, and in the case that they had to escort an injured dog on a flight, learned basics of communicating over the radio and using the medical equipment sets on the aircraft, expediting transfer of patients from aircrew to the veterinary team on arrival. Veterinary escort was provided from theater to CONUS in two cases by a senior Animal Care Specialist sent from CONUS for these missions. Veterinary escort was deemed necessary due to the injuries, which, although stable, may have worsened due to the effects of altitude during the MEDEVAC flights (resolved pneumothorax and resolved pneumocranium). Altitude restrictions were placed on one of the flights by the CASF flight surgeon just for the dog!

While these may be anecdotal factors, they all contributed in some way to the survival of these critically wounded MWDs. There will inevitably be more cases of ballistic wounds in MWDs in the future, and we will continue our analysis. VCOs and 68Ts can help increase chances of survival by actively providing canine trauma management training to their handlers, Medics, and other human medical providers of units that use MWDs. VCOs and 68Ts can prepare themselves for managing critically injured dogs by actively seeking training and experience in critical care monitoring and anesthesia, trauma management, blood transfusion, fluid therapy, and working safely around rotary winged aircraft.

We offer special thanks to the current and previously deployed units, handlers, Medics, and aircrews who have provided such great care and information in the project.

* Army Military Occupational Specialty 68T is an Animal Care Specialist/NCO.
** Army Officer Area of Concentration 64F is a Veterinary Clinical Medicine Officer (residency-trained surgeon, internist, intensivist or radiologist).

Picture This...

Matthew Lambdin, 18D; Daniel Schissel, MD

While conducting a Medical Civil Action Program (MED CAP) in Northern Africa, local soldiers brought in a small girl for examination. The young girl presents with obvious irritability, fatigue, and a low-grade fever. The mother states that the child is four years of age and has had the lesion noted in photos 1 and 2 for 12 months.

Photo 1

Photo 2

Using the primary lesion definitions outlined in your SOF medical handbook, how would you describe the morphology of this lesion?

What is your differential diagnosis when this lesion is observed?

Morphology

Upon inspection of her abdomen, a serpiginous, slightly erythematous palpable tract, approximately 3cm, primarily isolated to the patient's torso is noted.[1]

Differential Diagnosis

Cutaneous larva migrans**,** *Strongyloides Intestinalis*, cutaneous larva currens

Etiology and Pathophysiology

The normal life cycle of the hookworm (Ancylostomiasis) begins in the small intestine as an ovum. From there, it passes with feces into the soil where it finds the warm, moist, shaded soil it requires to develop into a larva. Once all of the environmental conditions are met, the larva develops within 24 to 48 hours into the infective filariform larval stage making it able to penetrate the human epidermis and infect the body. The hookworm larva enters the body after it has been walked on by a bare foot, laid on with contact to bare skin, or by accidentally ingesting contaminated soil.

When ingested the larva penetrates the bowl and enters the blood stream, it subsequently travels through the circulatory system to become wedged in pulmonary capillaries. Within a week it traverses into the alveoli and begins to travel up the bronchi with the help of the cilia to the trachea and then onto the pharynx. Upon arriving at the pharynx, the larva is swallowed and re-enters the gastrointestinal tract to complete its development. The adult hookworm then attaches itself to the walls of the intestine and begins to parasitize the host, reproduce, and release more ova. The adult hookworm cannot be passed between humans as it needs the soil to molt into the infective fiarliform larva stage.

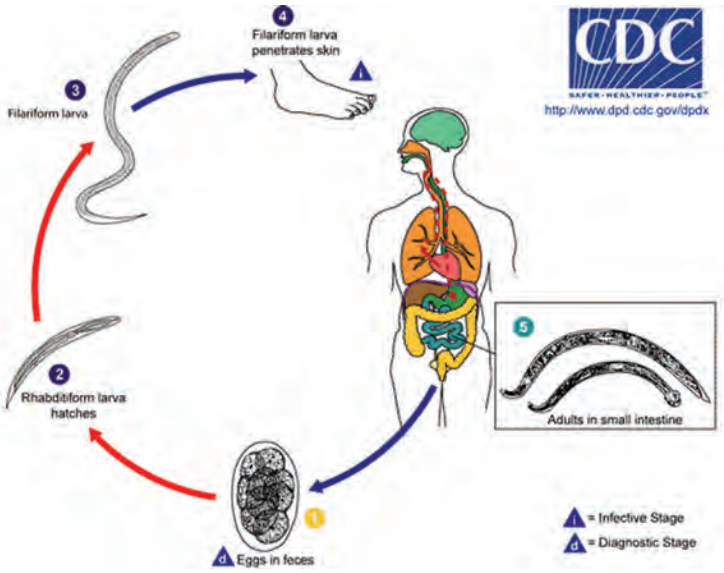

Figure 1 - Life Cycle of the Hookworm

Cutaneous larva migrans on the other hand, is a unique infection acquired by the larva entering the skin. The parasite remains confined to the epidermis for it lacks the collagenase needed to disrupt the basement membrane and penetrate the skin completely. It subsequently begins to migrate across the basement membrane leaving the chacteristic serpiginous, slightly elevated palpable tracts.

Necator americanus and ancylostoma duodenale are the predominate types of hookworm that are responsible for systemic hookworm disease in humans and they are contrasted in the table below.

Hookworm intestinal parasitization is potentially fatal in infants through severe iron deficiency anemia, otherwise known as andylostomiasis or "miner's anemia." Hookworms in large numbers produce anemia due to the amount of blood consumed by the nematode. If not fatal in infancy, a continuous infection can result in stunted

Necator Americanus	Ancylostoma Duodenale
Consumes 0.3ml of blood/day	Consumes 0.5ml of blood/day
Takes 6-8 weeks for eggs to show up in stool	Takes up to 38 weeks for eggs to show up in stool
Lifespan is up to 5 years	Lifespan is up to 1 year

growth and slowed mental development in children due to the constant protein deficiency and anemia. Other notable symptoms associated with the parasitic nematode are difficulty breathing during the fiarliform migration phase, cough, low-grade fever, loss of appetite, nausea, vomiting, abdominal cramping, pallor, and fatigue. While a hookworm infection is rarely fatal to adults and small children, it does however create an environment of decreased health status making them more vulnerable to other infections.

Diagnosis, Prevention & Treatment

Definitive diagnosis of systemic infection is difficult at best in a field setting. Nonetheless when one combines a high index of suspicion developed through pre-deployment studies and knowledge of the local area, the diagnosis can be easily added to the differential when the vague symptoms noted above and the characteristic cutaneous findings are observed. In a perfect world, the 18D or other healthcare provider would carry his "air-droppable" microscope in order to definitively identify the parasitic nematode ovum in the patient's stool.

Prevention is paramount and is tied to the standard of living. Local populations in northern Africa have to allow their animals to free-graze in order to gather the necessary food for survival. The problem with letting animals free-graze in compounds is the presence of feces everywhere due to the lack of fecal containment areas. Poor sanitation in the villages and limited sources of well water lead to the use of rivers for almost all water needs, which makes the situation much more complex. One must always remember when in Africa that you are never really "up-stream." Education as well is a reflection of socio-economic development. Even in the most remote regions of Northern Africa children have access to schools and learn about water-borne and other infections. The problem is that they still have to walk home to their village barefoot to live with the roaming herds of goats and cows that sustain their families.

In a study published in the *Journal of Parasitology*, the efficacy of 600mg albendazole repeated every four months and 600mg of mebendazole repeated every six months in western Kenyan school children of ages 4 to 19 years was evaluated. Drug efficacy was evaluated using a Kato-Katz examination on stool samples before and after treatment. The study concluded that 600mg albendazole had a greater impact on hookworm treatment as reflected by a clearence rate of 92% for albendazole as opposed to mebendazole's 55%. The Kato-Katz examination also illustrated the treatment of two other geo-helminthes. *Ascaris lumbricoides* and *Trichuris trichiura*, for which the results were similar. The study also evaluated and concluded that a six-month treatment plan with albendazole was more successful than mebendazole.[2]

Dr. Semmelweis from the University, School of Medicine, in Budapest Hungary, studied mebendazole's effects when used during pregnancy between 1980 and 1996. A total of 22,843 women were treated using a daily dose of 100mg of mebendazole during their pregnancy, and less than 0.07% of the women had infants born with abnormalities. More importantly it was noted that all of the mothers that were successfully treated using mebendazole demonstrated an increase in their gestational period and subsequently an increase in birth weight, their infants.[3]

In addition to the solid safety profile for both benzimiadaoles noted above, the World Health Organization (WHO) concluded that de-worming with albendazol or mebendazole is accompanied by enhanced nutritional status, increase in weight and improved iron carrying capabilities in children less than 24 months.[4]

Recommended Treatment Dosages for Systemic Hookworm Infestation

1. Primary: Adults and children > 2yrs of age: albendazole 400mg oral — once
Children <2 yrs old: albendazole 200mg oral once with repeat dose in three weeks if stool is not cleared of ova.

2. Secondary: Adults and children > 2 yrs of age: mebendazole 500mg oral — once
Children <2 yrs old : Not established

On-going: Correcting the iron deficiency through the handing out of multi-vitamins.

Treatment for Cutaneous Larva Migrans

1. **Primary**: Adults and children >2yrs of age: albendazole 400mg oral — once
   Children <2 yrs old: albendazole 200mg oral once with repeat dose in three weeks if visible track and pruritis persists.
2. **Secondary**: Adults and children > 60kg: ivermectin 12mg oral dose — once
   Children <60kg: ivermectin 150ug/kg oral dose — once for children

3. **Tertiary**: Topical application of 10 to 15% solution of thiabendazole in the area involved.

Conclusion

Approximately 25% of the world's population is infected by the hookworm.[5] Factors that affect hookworm paratization rates in communities include poor sanitation practices, cramped living conditions, living in close proximity to livestock, unhygienic practices, and socio-economic factors. As healthcare providers in austere environments, Special Operations medical providers must remember that with the current operational tempo, visiting a village/community might only happen once every six to 12 months. Definitive diagnosis of hookworm disease can be challenging but the presence of cutaneous larva migrans is a cutaneous finding that should not be missed. Treating the local populations, especially the children, is a significant way to gain trust. MED CAPS may get only one opportunity to treat local populations with a "One Shot — One Kill" effort, or as Doc Schissel more appropriately put it, give and forget-type medicine. While mebendazole is an acceptable therapy for the hookworm disease, albendazole clears the paratization with a higher clearance rate, which is what's needed for our limited give and forget-type of medicine.

If you are DEPLOYED and have concerns about a puzzling skin condition, you can email your clinical photos and a concise morphologic description of the lesion to our Operational Teledermatology site at derm.consult@us.army.mil or directly to Daniel.Schissel@us.army.mil. The lesion you describe just may make its way to the next edition of **Picture This…**

Thanks for all you do.

SSG Matthew Lambdin graduated from the Special Forces Medical Course in 2005. He enlisted in the U.S. Special Forces in 2002 under the 18X-ray program after graduating from Arizona State University with a Bachelor of Science degree. He has been to Africa numerous times conducting MEDCAPs and other civic actions. He is currently with the 10th SFG (A).

LTC (P) Daniel Schissel originated "Picture This" for the Med Quiz. He is a 1993 graduate of the Uniformed Service University of the Health Sciences and completed his internship with the family practice department at Fort Bragg in 1994. He then served as the 2/10th Special Forces Group (Airborne) Surgeon and followed on as the 10th SFG(A) Group Surgeon. He completed his residency training in dermatology at the Brooke Army Medical Center in 1999. LTC (P) Schissel is presently stationed in Heidelberg, Germany as a staff physician and the European Regional Medical Command Dermatology Consultant. He has been selected as the U.S. Army OTSG Dermatology Consultant. LTC (P) Schissel has authored the dermatology section of the new SOF manual, serves on the USSOCOM Medical Curriculum and Examinations Board, and is the U.S. Army Aviation Dermatology Consultant.

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Diagnosis This...

Kharod, Chetan, MD, MPH

Your unit is staging out of a forward base in Afghanistan. The base is undergoing significant growth and many civilian contractors work there. While you and two team members perform physical training one day, you see some commotion in a ditch by the side of a road where a contractor apparently fell down. As you approach the scene, you see a man whose arm is supported by a flexible SAM Splint® (Picture 1) **Note:** SAM (Structural Aluminum Malleable). He explains that as he was climbing out of a vehicle, stumbled, and fell forward. He tried to catch himself but landed on his partially outstretched hand as he straightened his arm. He has a past medical history of hypertension and hypercholesterolemia and takes medications to treat those conditions. He says that his hand feels cold and that he is starting to get a "pins and needles" sensation in his fingers.

Based on your field experience and on information presented in your SOF medical handbook, what is the likely diagnosis? What are some of the associated injuries this man could have? What is the treatment? What are some possible complications he may experience?

THE "411" ON ELBOW DISLOCATIONS

The elbow is the most commonly dislocated joint in pediatrics and the second most commonly dislocated joint in adults (#1 is the shoulder). Structurally, the elbow is a very stable hinge joint formed by the articulation of the intracondylar groove of the humerus and the olecranon fossa of the ulna. The inherent stability of this joint suggests that any disruption of the joint would require considerable force and be accompanied by substantial soft tissue injury and often by associated fractures.

Elbow dislocations are generally characterized as either *posterior* (more common) or *anterior*. Posterior dislocations are fairly easy to spot on physical exam (shortened forearm, elbow flexed, olecranon sticking out prominently), but can be more challenging to diagnose if there is significant soft tissue swelling. Anterior dislocations are less common and the arm is usually held in extension with tenting of the skin of the forearm near the antecubital fossa.

POSSIBLE ASSOCIATED INJURIES

In all trauma patients, it is better to assume nothing and to look for other injuries: Look for other trauma from the fall. As permitted by the tactical situation, perform a step-wise assessment: Primary survey (ABCDE) and secondary survey (head-to-toe). Find out why the person fell (seizure, syncope, GSW?).

The most serious associated arm injury is brachial artery injury (possible with any type of elbow dislocation, especially open dislocation). Circulatory status can be dynamic and must be monitored closely; delayed complications occur commonly so close follow-up is key.

Specific injuries associated with elbow dislocation include damage to the median and ulnar nerves. These injuries can result from the nerves being torn, stretched, trapped between the dislocated bones, or squeezed by developing hematoma/soft tissue swelling. In the field, it can be challenging to tell these apart so close observation and noting the neurovascular status before and after the reduction is essential. If the exam shows the condition is worsening, the patient may need surgical intervention.

TREATMENT

The bottom line of treating dislocations is to reduce the dislocation and put it back in place as early as possible. This usually minimizes associated injury and helps minimize long-term complications.

Conscious patients with elbow reductions are very uncomfortable. Adequate procedural pain control will not only help the patient but will also facilitate dislocation reduction. In the right setting, intravenous (IV) analgesia (morphine sulfate or fentanyl sulfate) is an effective starting point, though some sedation will likely be required prior to reduction. Another field-expedient alternative is injection of the joint with local anesthetic, which avoids both the placement of IVs in the field and the potential for altered mental/respiratory status with opioid analgesia.

After pain control and sedation, for posterior dislocations, apply longitudinal traction and anterior translation of the forearm (lateral support/alignment may also be needed). For anterior dislocations, in-line traction is followed by backward pressure on the proximal forearm. In both cases, successful reduction is usually signaled by a "clunk."

After reduction, gently check the elbow's range of motion. Obtain post-reduction radiographs as dictated by the setting. Apply a long arm, posterior in both types of injury. Ice and analgesics with splint and sling are effective aftercare with frequent re-assessment of neurovascular status.

PITFALLS

Inadequate post-reduction attention to neurovascular status: There is usually a fair amount of swelling occurs after the injury. Since the space available in the arm is somewhat limited, the swelling can result in compression of nerves and blood vessels. This is compounded by too-tight splints: what was "just right" a few hours ago, becomes "too tight" after swelling has increased. Check early and check often: distal pulses, capillary refill, and motor/sensory function.

Missed fractures: When possible, pre and post-reduction films are essential to verifying bony integrity. A joint that does not range smoothly may have an occult fracture or soft-tissue entrapment.

Inadequate analgesia/sedation: While it is not always possible to sedate the patient completely, inadequate pain control is a common pitfall in all levels of medical practice. SOF Medics have successfully utilized fentanyl lozenges in recent years. Adequate analgesia facilitates reduction of the dislocation and recovery. Good pain control is part of good medicine

Thank you for all that you do…Good luck out there and Godspeed!

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Major Chetan U. Kharod, MD, is a 1996 graduate of the Uniformed Services University of the Health Sciences (USUHS). He completed his internship at Malcolm Grow USAF Medical Center in 1997 and served as a squadron medical element flight surgeon with the 964 AACS (ACC). He subsequently completed Emergency Medicine residency training at SAUSHEC (BAMC/WHMC) and was a CCAT team leader in Operation ENDURING FREEDOM (OEF). He is board-certified in emergency medicine, and earned an MPH completing the International Emergency Medicine Fellowship at the Johns Hopkins University. He has traveled and deployed to over 30 countries in various military and medical capacities. Maj Kharod is an Assistant Professor in the Department of Military and Emergency Medicine at USUHS and is a special consultant to the Center for Disaster and Humanitarian Assistance Medicine. He is currently deployed to TF MED, Bagram Airfield, OEF, as Flight Commander, Emergency Medicine at the Craig Joint Theater Hospital.

Meet Your JSOM Staff

EXECUTIVE EDITOR

Warner Dahlgren Farr, MD
warner.farr@socom.mil

Colonel "Rocky" Farr was the distinguished honor graduate of his Special Forces 18D class in 1968 and completed 40 years of active service last April. He served as a recon team member with the 5th SFG(A) in SOG-Studies and Observations Group. He attended the DLI (German) and joined Detachment A, Berlin Brigade, an early special mission unit. He became the SF instructor at the ROTC Detachment, Northeast LA University and completed his BS. As a SFC, he taught in the 18D course and was selected for MSG. COL Farr was accepted to the Uniformed Services University of the Health Sciences and while a medical student, he was the medical platoon leader for the 11th SFG(A). He received his MD in l983 and has completed residencies in aerospace medicine, and anatomic and clinical pathology. He commanded Company F (ABN), 3rd BN, Academy BDE, Academy of Health Sciences as Course Director of the Special Operations Medical Sergeant's Course; and advisor to the 12th SFG(A). He was Chief, Department of Pathology, Blanchfield Army Community Hospital, and Flight Surgeon, 50th Medical Company (Air Ambulance), 101st ABN Division (Air Assault). COL Farr was the Division Surgeon of the 10th Mountain Division (Light Infantry) until becoming Deputy Commander of the U.S. Army Aeromedical Center. He attended the Air War College before becoming the Deputy Chief of Staff, Surgeon, U.S. Army Special Operations Command; Command Surgeon, U.S. Army Special Forces Command; and Command Surgeon, U.S. Army Civil Affairs and Psychological Operations Command. He became the Command Surgeon of the U.S. Special Operations Command in Tampa, FL in July 2006. He has numerous operational tours to include Bosnia, Kosovo, Kuwait, Vietnam, Cambodia, and Afghanistan.

MANAGING EDITOR

Michelle DuGuay Landers, RN
duguaym@socom.mil

Lt Col Landers joined the Army Reserve in 1987 and served as a nurse in a Combat Support Hospital unit for three years before switching services in 1990 to become an Air Force C-130 Flight Nurse. She is currently an IMA reservist attached to the SOCOM/SG office where she has been in charge of management, production, publication, and distribution of the JSOM since its inception in Dec 2000. Lt Col Landers has a Bachelors in Nursing and a Masters in Business Administration/Management. Her 22 year nursing career includes being a flight nurse in both the military and private sector, 15 years of clinical experience in emergency and critical care nursing as well as being an EMT and a legal nurse consultant. She also served as the military liaison to her Disaster Medical Assistance Team (DMAT). Prior to the SG office, Lt Col Landers' experience at USSOCOM includes an assignment in the Center for Force Structure, Resources, Requirements, and Strategic Assessments.

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Special Forces Aidman's Pledge

As a Special Forces Aidman of the United States Army, I pledge my honor and my conscience to the service of my country and the art of medicine. I recognize the responsibility which may be placed upon me for the health, and even lives, of others. I confess the limitation of my skill and knowledge in the caring for the sick and injured. I promise to follow the maxim "Primum non- nocere" ("First, thou shalt do no harm"), and to seek the assistance of more competent medical authority whenever it is available. These confidences which come to me in my attendance on the sick, I will treat as secret. I recognize my responsibility to impart to others who seek the service of medicine such knowledge of its art and practice as I possess, and I resolve to continue to improve my capability to this purpose. As an American Soldier, I have determined ultimately to place above all considerations of self the mission of my team and the cause of my nation.

Pararescue Creed

I was that which others did not want to be. I went where others feared to go, and did what others failed to do. I asked nothing from those who gave nothing, And reluctantly accepted the thought of eternal lonliess ... should I fail. I have seen the face of terror; felt the stinging cold of fear, and enjoyed the sweet taste of a moment's love. I have cried, pained and hoped...but most of all, I have lived times others would say best forgotten. Always I will be able to say, that I was proud of what I was: a PJ It is my duty as a Pararescueman to save a life and to aid the injured. I will perform my assigned duties quickly and efficiently, placing these duties before personal desires and comforts.

These things I do,
"That Others May Live."

A Navy Poem

I'm the one called "Doc"... I shall not walk in your footsteps, but I will walk by your side. I shall not walk in your image, I've earned my own title of pride. We've answered the call together, on sea and foreign land. When the cry for help was given, I've been there right at hand. Whether I am on the ocean or in the jungle wearing greens, Giving aid to my fellow man, be it Sailors or Marines. So the next time you see a Corpsman and you think of calling him "squid," think of the job he's doing as those before him did. And if you ever have to go out there and your life is on the block, Look at the one right next to you...

I'm the one called "Doc".

~ Harry D. Penny, Jr. USN

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