**Joint Theater Trauma System: Strategic Overview**

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<table>
<thead>
<tr>
<th>1. REPORT DATE</th>
<th>2. REPORT TYPE</th>
<th>3. DATES COVERED</th>
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<td>JAN 2011</td>
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<td>00-00-2011 to 00-00-2011</td>
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<tbody>
<tr>
<td>Defense Health Information Management System (DHIMS), Joint Theater Trauma System, 5113 Leesburg Pike Skyline 4 Suite 701, Falls Church, VA, 22041</td>
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<table>
<thead>
<tr>
<th>8. PERFORMING ORGANIZATION REPORT NUMBER</th>
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<tr>
<td>Approved for public release; distribution unlimited</td>
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<th>13. SUPPLEMENTARY NOTES</th>
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<td>presented at the 2011 Military Health System Conference, January 24-27, National Harbor, Maryland</td>
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</tr>
<tr>
<td>b. ABSTRACT</td>
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<tr>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>19a. NAME OF RESPONSIBLE PERSON</th>
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</table>

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JTTS Vision

That every soldier, marine, sailor, or airman injured on the battlefield or in the theater of operations has the optimal chance for survival and maximal potential for functional recovery.
JTTS Mission

• Improve organization and delivery of trauma care
• Improve communication among clinicians in the evacuation chain to ensure continuity of care and access to data
• Populate the JTTR to evaluate care provided, document outcomes, and facilitate conduct of formal research
JTTS Mission

- Evaluate and recommend new equipment or medical supplies for use in theater to improve efficiency, reduce cost, improve outcomes
- Facilitate Morbidity and Mortality conferences to promote real-time, data-driven clinical process improvements and improved outcomes
- Develop and implement clinical practice guidelines; monitor compliance with them
Data

- Data drives doctrine and policy
- Data improves clinical patient care
- Data creates new knowledge
Joint Theater Trauma Registry (JTTR)

- Largest combat Injury database in existence
- All services injury data derived from level IIb, III, IV and V medical charts
  - Scoring of Injuries
  - Diagnosis and Procedures
  - Outcomes
- 23,450 US military injury patients
JTTS Components

**Components Across the Continuum of Care**

**Performance Improvement**
- Patient Safety
- Feedback Mechanism for Providers Throughout Continuum of Care
- Loop Closure

**Leadership & Communication**
- Trauma Director / Coordinators / Registrars
- Intra-Theater
- Inter-Theater
- Recognized Lead Agent and Consulting Assets

**Integrated Pre-Hospital, Levels 3-5**
- Integrated approach for MTFs and Divisional Medical Units
- Coordinated Divisional Evacuation Standard Operating Procedures
- Adopt Clinical Practice Guidelines
- Communicate
- Train

**Education & Advocacy**
- Linkage with Service Medical Education and Training Centers
- Joint Combat Trauma Management Course (JCTMC)
- Trauma Outcomes and Performance Improvement Course - Military (TOPIC-M)

**Prevention**
- Linkage with Materiel Developers
- Service Centers for Health Promotion and Preventive Medicine

**Information Systems**
- Joint Theater Trauma Registry (JTTR)
- Data for PI and Analysis
- Data from Theater Medical Data Store (TMDS)
- Modules to Support Related Functional Disciplines
- DoD Trauma Registry - Longitudinal Trauma Registry
- Provide Data and Information Needs for MTFs / Services / DoD

**Supports Research**
- Provide Raw Data IAW Established MOAs and Protocols
- Provided statistical information through approved protocols

**R4 - “Right Patient, Right Place, Right Time, Right Care”**
Leadership Visibility
Medical Decision Making
Data drives doctrine and policy
Battle Injuries by Body Region

Source: JTTR September 2001 – September 2010
OEF
Dominant Mechanism of Injury

Dec 09 – Nov 10

N=7254
Cause of Injury
November 2010

*Includes both battle and non-battle injury*
Injury Severity Score

ISS Score Break-down: Dec 09 – Nov 10

Number of Patients

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1 - 15</td>
<td>75.3%</td>
</tr>
<tr>
<td>16 - 30</td>
<td>19.2%</td>
</tr>
<tr>
<td>31 - 45</td>
<td>3.5%</td>
</tr>
<tr>
<td>46 - 75</td>
<td>1.1%</td>
</tr>
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</table>

Right Patient, Right Care, Right Place, Right Time
### Admissions, Severity of Injury

**Admission Number**

<table>
<thead>
<tr>
<th></th>
<th>Bastion</th>
<th>Bagram</th>
<th>Kandahar</th>
<th>Dwyer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Qtr 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd Qtr 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd Qtr 10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4th Qtr (Oct &amp; Nov data only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percent w/ ISS &gt; 15 for current Qtr</td>
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</table>

**Percent ISS > 15**

- Bastion: 80%
- Bagram: 75%
- Kandahar: 40%
- Dwyer: 5%
OEF Mode of Arrival
Dec 09 – Nov 10

Mode of Arrival

- Civ. Ambulance (31)
- CASEVAC (33)
- Non-MEDEVAC Ground (117)
- Non-MEDEVAC Air (102)
- MEDEVAC Ground (133)
OEF
Monthly Admissions

Monthly Level III Admissions – 1 Year

OEF Dec 09 – Nov 10 (n = 7476)
Monthly Trauma Admissions by Facility

Admissions: 3-Month Snap Shot

- **Sep-10 (n=716)**
- **Oct-10 (n=684)**
- **Nov-10 (n=588)**

<table>
<thead>
<tr>
<th>Facility</th>
<th>Sep-10</th>
<th>Oct-10</th>
<th>Nov-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagram</td>
<td>250</td>
<td>146</td>
<td>131</td>
</tr>
<tr>
<td>Kandahar</td>
<td>225</td>
<td>131</td>
<td>146</td>
</tr>
<tr>
<td>Bastion</td>
<td>225</td>
<td>131</td>
<td>146</td>
</tr>
<tr>
<td>Dwyer</td>
<td>86</td>
<td>86</td>
<td>100</td>
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</tbody>
</table>
OEF
US Military, Coalition, All Others

Total Admissions (n=7476)

- 44.6% (3332) US Military
- 39.8% (2972) All Others
- 15.7% (1172) Coalition

Rolling 12 months: Dec 09 – Nov 10
OEF Admissions

OEF Trauma Admissions

<table>
<thead>
<tr>
<th>Month</th>
<th>US Military</th>
<th>Coalition</th>
<th>All Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sep 10</td>
<td>316</td>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>Oct 10</td>
<td>345</td>
<td>80</td>
<td>70</td>
</tr>
<tr>
<td>Nov 10</td>
<td>250</td>
<td>50</td>
<td>100</td>
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</tbody>
</table>

3 – Month Snap Shot
OEF Total Trauma Admissions
Battle vs. Non-Battle Injury

OEF Battle vs. Non-Battle Injury – 1 Year

Non-Battle (19%)  Battle (81%)

Dec-09  Jan-10  Feb-10  Mar-10  Apr-10  May-10  Jun-10  Jul-10  Aug-10  Sep-10  Oct-10  Nov-10

77  81  95  118  126  93  120  117  111  87  83  110

258  309  351  464  385  572  725  743  722  627  589  478

Right Patient, Right Care, Right Place, Right Time
OEF Admission Category Break-Down

OEF Admission Categories (n=7467)

- Enemy (N=231)
- Contractor (N=218)
- Host Nation (N=1481)
- ANA/ANP (N=1042)
- Coalition (N=1172)
- US Military (N=3332)
OEF
US Military Injured

US Military Service Admission Breakout

Air Force: 75
Army: 1701
Marine: 1472
Navy: 84

1-Years Data: OEF Dec 09 – Nov 10
OEF Pediatric Admissions

Pediatric Admissions (<15 years)

6.2% of overall trauma admissions

1 Year’s Data: Rolling 12 Months

Number of Admissions

Dec-09: 28
Jan-10: 2
Feb-10: 30
Mar-10: 25
Apr-10: 25
May-10: 35
Jun-10: 45
Jul-10: 73
Aug-10: 56
Sep-10: 61
Oct-10: 41
Nov-10: 74

OEF 6.2%
(n=466)
OEF Theater Hypothermia

Admission Temperature < 96 F or < 35.5 C
1-Year’s Data: Dec 09 – Nov 10
4.2% of total admissions

Right Patient, Right Care, Right Place, Right Time

OEF
OEF Hypothermia Cases by Facility

Temperature < 96 F or < 35.5 C on Admission to Role III

1-Year’s Data: Dec 09 – Nov 10

- Bagram
- Bastion
- Dwyer
- Kandahar
OEF Hypothermia Cases by Facility

Temperature < 96 F or < 35.5 C on Admission to Role III
OEF Hypothermia Breakdown

Admission Temperature < 96 F or < 35.5 C

- 6.6% of all Others admissions
- 1.5% of all US admissions
- 0.9% of all Coalition admissions

<table>
<thead>
<tr>
<th>Month</th>
<th>US Military</th>
<th>Coalition</th>
<th>All Others</th>
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<tbody>
<tr>
<td>Jun-10</td>
<td>6</td>
<td>3</td>
<td>13</td>
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<tr>
<td>Jul-10</td>
<td>8</td>
<td>7</td>
<td>17</td>
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<td>Aug-10</td>
<td>1</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Sep-10</td>
<td>6</td>
<td>5</td>
<td>13</td>
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<tr>
<td>Oct-10</td>
<td>13</td>
<td>8</td>
<td>20</td>
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<tr>
<td>Nov-11</td>
<td>9</td>
<td>1</td>
<td>17</td>
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</table>

Right Patient, Right Care, Right Place, Right Time.
OEF Shock on Admission (BD > 5)

1-Year’s Data: Dec 09 – Nov 10

12.6% of total OEF admissions
OEF Shock on Admission

Base Deficit ≥ 5

# Level III Admissions

US Mil | Coalition | All Others

Jun-10 | Jul-10 | Aug-10 | Sep-10 | Oct-10 | Nov-11

2.0% | 0% | 10.5%

Right Patient, Right Care, Right Place, Right Time
OEF Total
Massive Transfusions

Massive Transfusions
Defined as > 10 units PRBCs in 24 hours

1 Year’s Data: Rolling 12 Months

(N=388)

- US Mil
- Coalition
- Others
OEF Total
Casualties Requiring Blood

(1819/7467 = 24%)

- US Mil 32% (N=582)
- Coalition 13% (N=240)
- Others 55% (N=998)

Right Patient, Right Care, Right Place, Right Time
OEF Level III
Massive Transfusion Survival

- Survival rates:
  - 1st Qtr 10: 77%
  - 2nd Qtr 10: 78%
  - 3rd Qtr 10: 79%
  - 4th Qtr 10 (Oct & Nov data only): 80%

- # Massive Transfusions:
  - 1st Qtr 10: 80
  - 2nd Qtr 10: 80
  - 3rd Qtr 10: 120
  - 4th Qtr 10 (Oct & Nov data only): 80

Right Patient, Right Care, Right Place, Right Time
OEF Massive Transfusion Survival
Long Term US Military Only

% Survival

# Massive Transfusions

1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr (Oct & Nov data only)

Right Patient, Right Care, Right Place, Right Time
OEF Massive Transfusion Survival
Theater Coalition Only

# Massive Transfusions

1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr (Oct & Nov data only)

% Survival

50% 60% 70% 80% 90% 100%
Massive Transfusion Component Therapy

Nov 2010 MT Patients (N= 37)

- Mean # units transfused
- Mean RBC Age

Total Units FWB: 6 (3 patients)
Doses of Factor VII: 2 (Level III Only)

Platelets: 1 unit = 6 pk plts

Right Patient, Right Care, Right Place, Right Time
# Massive Transfusion Component Therapy by Site

**Nov 2010**

<table>
<thead>
<tr>
<th>Component</th>
<th>Bagram (5 pts)</th>
<th>Kandahar (8 pts)</th>
<th>Bastian (19 pts)</th>
<th>Dwyer (5 pts)</th>
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<tbody>
<tr>
<td>PRBC</td>
<td>161</td>
<td>73</td>
<td>76</td>
<td>268</td>
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<tr>
<td>FFP</td>
<td>253</td>
<td>154</td>
<td>268</td>
<td>161</td>
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<tr>
<td>Platelets</td>
<td>62</td>
<td>51</td>
<td>20</td>
<td>8</td>
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<td>Cryo</td>
<td>20</td>
<td>27</td>
<td>27</td>
<td>20</td>
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<tr>
<td>RBC Age</td>
<td>23.028</td>
<td>26.6</td>
<td>26.9</td>
<td>28.5</td>
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</table>

**Site**
- Bagram: 5 pts
- Kandahar: 8 pts
- Bastian: 19 pts
- Dwyer: 5 pts
Red Cell Age in Massive Transfusion

![Graph showing the average red cell age over time for different locations (Bagram, Kandahar, Bastion, Dwyer). The x-axis represents the months from Dec-09 to Nov-10, and the y-axis represents the average red cell age in days. Different colors represent each location, with Bagram in blue, Kandahar in red, Bastion in green, and Dwyer in purple. The graph illustrates fluctuations in red cell age across different months and locations.](image-url)
Trend Line of Red Cell Age in Massive Transfusion
OEF In-Theater Survival

Total Level III Admissions Dec 09 – Nov 10

N= 7476

- Lived 92.4%
- Died 7.4%
OEF US Military
In Theater Survival

Level III Discharge Status

<table>
<thead>
<tr>
<th>Month</th>
<th>Alive</th>
<th>Dead</th>
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<tbody>
<tr>
<td>Sep</td>
<td>96.3%</td>
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</tr>
<tr>
<td>Oct</td>
<td>94%</td>
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<tr>
<td>Nov</td>
<td>93.8%</td>
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3 – Month Snap Shot

OEF 2010

Right Patient, Right Care, Right Place, Right Time
OEF Coalition Military In Theater Survival

Level III Discharge Status

<table>
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<tr>
<th>Month</th>
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<th>Dead</th>
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<tr>
<td>Sep</td>
<td>89%</td>
<td>11%</td>
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<tr>
<td>Oct</td>
<td>90.2%</td>
<td>9.8%</td>
</tr>
<tr>
<td>Nov</td>
<td>94.3%</td>
<td>5.7%</td>
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Right Patient, Right Care, Right Place, Right Time
OEF “All Others”
In Theater Survival

Level III Discharge Status

<table>
<thead>
<tr>
<th>Month</th>
<th>Alive</th>
<th>Dead</th>
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<tbody>
<tr>
<td>Sep</td>
<td>92.6%</td>
<td>7.4%</td>
</tr>
<tr>
<td>Oct</td>
<td>86.5%</td>
<td>13.5%</td>
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<tr>
<td>Nov</td>
<td>88%</td>
<td>12%</td>
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3 – Month Snap Shot

Right Patient, Right Care, Right Place, Right Time
Medical Performance Improvement

Data improves clinical patient care
Performance Improvement

• Trauma System Process Improvement
  – Pre-hospital Care and Triage
  – Timeliness of Care and Procedures
  – Review of Care
  – Appropriateness and Legibility of Documentation
  – Compliance / Development of Guidelines, Protocols and Pathways
  – Prevention

DATA COLLECTION!!!
Scheduled Communications

- Weekly f/u conf call with Level II+, III, IV and V
  - TMDS (Theater Medical Data Store) to list patients from Theater or beyond Theater
  - VTC/TC from Nursing Conf room 0700 Thursdays
  - M&M conference, share lessons learned
- Weekly Trauma Nurse Coordinators call
  - TC including all theater and LRMC/CONUS
- Monthly System-wide VTC for system issues
  - Includes VA, JPMRC, GPMRC, AMC, CENTAF Forward
  - 59MDW begins hosting Feb 07
- JTTS Directors conference call quarterly
- JTTR Tri-service working group
Access Trauma CPGs

CENTCOM CPG

31 CPG

3 Pending (Pain & Sedation, Multiple Ampitation, Renal Replacement)


• Migration MHS

• Guidelines / Info
  – TMDS
    • CENTCOM CPG
Impact CPG
Massive Transfusion Component Therapy
CPG “Authority”

- SME Panel
  - Military
    - Surgeons General Trauma / General Surgery Consultant
    - Medical Commands
  - Civilian
    - ACS Committee on Trauma
- CENTCOM JTTS Director
- JTS Director and Deputy Director
- CENTCOM SG
Research

Data creates new knowledge
Research Access to JTTR

- Complete a data application and data use agreement
- Internal Review Board (IRB) document must be completed
- Staff will provide input to requestor to refine final output
- Final data reviewed for any public affairs or OPSEC issues
- Currently >200 peer reviewed manuscripts utilizing JTTR data
Contemporary JTTS Issues

JTTS Afghanistan Trauma Conference
28-29 October 2010
JTTS Afghanistan Trauma Conference

• Concept: Evaluate emerging trends in trauma within the Afghanistan AO and develop effective mitigation strategies
• Hosted by KAF Role III
• 50 participants
  – Representation Role III, Role II, RCs
  – US military, coalition military
  – Representation American College of Surgeons
  • Trauma system evaluation
JTTS Trauma Conference Lessons Learned

• Medevac documentation
• Enroute critical care sustainment
• Optimizing resuscitation
  – Thromboelastography / ROTEM
• Injury patterns
  – Spine fracture management
  – Multiple amputations
    • Massive transfusion ~100%
    • Wound management / increased infection
DRAFT MEDEVAC Report Template

<table>
<thead>
<tr>
<th>JTTR ROLE II/ROLE III MEDEVAC REPORT</th>
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<tbody>
<tr>
<td>MISSION #</td>
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<tr>
<td>-----------</td>
</tr>
<tr>
<td>CIRCULATION</td>
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<tr>
<td>BLOOD</td>
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<tr>
<td>PULSES:</td>
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<tr>
<td>FEMORAL</td>
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<tr>
<td>RADIAL</td>
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<tr>
<td>CPR/ACLS</td>
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<tr>
<td>TOURNIQUET (If Y/time placed)</td>
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<tr>
<td>HEMOSTATIC DRESSING</td>
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<tr>
<td>IV ACCESS</td>
</tr>
<tr>
<td>VASOACTIVE MENDS</td>
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<tr>
<td>OTHER</td>
</tr>
<tr>
<td>BREATHING/AIRWAY</td>
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<tr>
<td>OBSTRUCTED</td>
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<tr>
<td>NEEDLE DECOMPRESSION</td>
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<tr>
<td>ORAL AIRWAY</td>
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<tr>
<td>NASAL AIRWAY</td>
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<tr>
<td>LMA (KING LT/COMBI)</td>
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<td>EMERGENCY CRICH</td>
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<td>INTUBATION</td>
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<td>VENTILATOR</td>
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JTTR Draft Form September 2010: MEDEVAC DOCUMENTATION: FOR QUESTIONS REGARDING THIS FORM CALL DSN: 318-431-4430: RECEIVING FACILITY: Please scan/email document to: jitrsmedevac@afghan.swa.army.mil
Management Casualties with Bilateral Lower Extremity Injuries

- Bastion or Dwyer (N = 43)
  - bilateral transfemoral (8, 19%)
  - transfemoral-transtibial (18, 42%)
  - bilateral transtibial (17, 39%)
- Median SBP [90/65], HR [131] and T [35.2] were consistent with hemorrhagic shock
- Acidosis [pH 7.14] and BD [11.5] and were normalized during initial operation (3.12 ± 1.91 hrs)
- Three (7%) presented in cardiac arrest and 5 (12%) required a resuscitative thoracotomy with aortic cross clamping.
JTTS Trauma Conference
Lessons Learned

- Clinical Practice Guideline (CPG)
  - Pain management
    - (Ready for CENTCOM SG)
  - Multiple amputation management
    - (Ready for SME vetting)
JTTS Trauma Conference
Lessons Learned

• New therapies
  – Tranexamic acid (used by UK @ Bastion)
  • Consensus not enough good data to support ubiquitous use
  • Limited use in patients with hyperfibrinolysis?
  – Renal replacement therapy
  – Junctional hemorrhage control
JTTS Trauma Conference
Lessons Learned

• Provider
  – Pre-deployment training
• Develop / standardize common elements
  – Emergency War Surgery / Joint Forces Combat Trauma Management Course
  – Clinical practice guidelines
  – Familiarization training with theater electronic health record
  – Theater / deployment site specific MROE
JTTS Trauma Conference
Lessons Learned

• Provider
  – Optimal resourcing
    • US services grossly overtaxed @ current force structure
    • Modularity based upon casualty volume
  – Resiliency / compassion fatigue

2/2/2012
Right Patient, Right Care, Right Place, Right Time