

Virtual Simulation Training Using the Storz C-HUB to Support Distance Airway Training For the Spanish Medical Corps and NATO Partners

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- I nor my family members have no conflicting interest or financial disclosures related to this presentation



Background: Combat Care

Combat Trauma

Fatalities designation

- Killed in Action (KIA)
- Died of Wounds (DOW)
- Non-survivable (NS)
- Potentially survivable (PS)

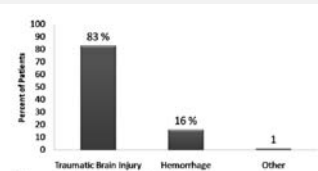


Figure 3. Mechanism of death in NS cases.

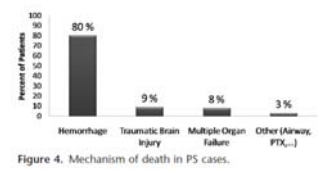


Figure 4. Mechanism of death in PS cases.

Eastridge BJ, Hardin M, Cantrell J, Oetjen-Gerdes L, Zubko T, Mallak C, Wade CE, Simmons J, Mace J, Mabry R. Died of wounds on the battlefield: causation and implications for improving combat casualty care. *The Journal of Trauma and Acute Care Surgery* 2011;71(1):S4-8

Airway management and preventable death

- Vietnam era Wound Data and Munitions Effectiveness Team database revealed:
 - preventable death for airway obstruction was 6%.
- Operation Iraqi Freedom and Operation Enduring Freedom study reported:
 - rates of preventable battlefield deaths for airway obstruction was 10% to 15%.

Bellamy RF. The causes of death in conventional land warfare: implications for combat casualty care research. *Mil Med* 1984; 149(2): 55-62.
 Kelly JF, Ritenour AE, McLaughlin DF, et al. Injury severity and causes of death from Operation Iraqi Freedom and Operation Enduring Freedom: 2003-2004 versus 2006. *J Trauma* 2008; 64(2 Suppl): S21-6.

Civilian and combat fatalities

- Civilian studies
 - 85% of major trauma patients suffered from an obstructed airway contributing to their death.
- Military database
 - Difficult to analyze
 - KIA data not frequently closely evaluated
 - potential improved neurological outcomes of soldiers suffering from traumatic brain injury (TBI) who have early definitive airway control.

Adnet F, Lapostolle F, Ricard-Hibon A, Carli P, Goldstein P. Intubating trauma patients before reaching hospital -- revisited. *Crit Care* 2001 Dec; 5(6): 290-1.
 Helm M, Hossfeld B, Schafer S, Holtz J, Lampl L. Factors influencing emergency intubation in the pre-hospital setting-a multicentre study in the German Helicopter Emergency Medical Service. *Br J Anaesth* 2006; 96(1): 67-71.

Military Combat Medic

- Trained at the level of basic emergency medical technicians.
- Limited equipment.
- U.S. combat deployments usually 6-12 months
- Exposed to enemy fire and works in austere environments.
- Combat injuries severe due to explosives and high velocity munitions.

Combat Medic Record

- REACH database reviewed patients arriving at a combat support hospital and identified that 92% of intubations were placed correctly.
- Israeli Defense Forces study discussed their unpublished first intubation attempt failure rate at as high as 40%.
- Battlefield cricothyrotomies have a 33% failure rate.

Adams BD, Cuniowski PA, Muck A, De Lorenzo RA. Registry of emergency airways arriving at combat hospitals. *J Trauma* 2008; 64(6): 1548-54.
Ben Abraham R, Yaalom R, Kluger Y, Stein M, Weinbroum A, Paret G. Problematic intubation in soldiers: Are there predisposing factors? *Mil Med* 2000; 165(2): 111-3.
Mabry RL. An analysis of battlefield cricothyrotomy in Iraq and Afghanistan. *J Spec Oper Med* 2012 Spring; 12(1): 17-23

Education and airway management

- Difficult to learn via traditional training modalities.
- Videolaryngoscopy and training regimens
 - resulted in improved learning curves.
 - requires instructors who are proficient with its use.
 - may not be accessible to individuals, such as deployed military medics.

Low D, Healy D, Rasburn N. The use of the BERC DCI® Video Laryngoscope for teaching novices direct laryngoscopy and tracheal intubation. *Anaesthesia* 2008; 63(2): 195-201.
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Maharaj CH, Costello JF, Higgins BD, Harte BH, Laffey JG. Learning and performance of tracheal intubation by novice personnel: a comparison of the Airtraq and Macintosh laryngoscope. *Anaesthesia* 2006; 61(7): 671-7.
Mukcaster JT, Mills J, Hung OR, et al. Laryngoscopic intubation: learning and performance. *Anesthesiology* 2003; 98(1): 23-7.

A Telementoring Solution

- *Telemedicine Service of the Central Hospital of Defence (Madrid, Spain) and Center for Advanced Technology & Telemedicine (CATT) (Omaha, NE)*
- Develop virtual airway training for far forward military personnel using videolaryngoscopy.

Spanish Military Telemedicine System (SMTS)

- Videoconference Camera
- TV monitors
- Personal Computer
- TM64™ telecommunication and ClearSea™ Videoconference software
- X-Ray picture scanner
- Vital Signs monitor
- Electrocardiography recorder
- Router + Switch
- High resolution external exploration cameras
- Ultrasound explorer machine
- DVD recorder
- Email consultation inbox
- LAN access-IP serial converter (reception of Telemonitoring signals)



Karl Storz C-HUB

- Portable module.
- Standard USB connection
- Plug and Play compatibility
- Interfaces with Karl Storz CMAC video-laryngoscope blades projecting image to computer



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Telecommunication Video and Audio

Peripheral video and audio

- professional video conference (Sony PCS-1P)
- audio G.722.1
- teleconference with 200Kbs H.264

Airway video

- ClearSea™ Videoconference
- Karl Storz CMAC videolaryngoscope
- Each teleconference with 200Kbs H.264

Telestration



Initial Results

- 100% of the subjects indicated clear audio and video
- 89% subjects rated the teaching value of this video conference training for intubation near 7 points (Likert scale)
 - Average score = 8.78; SD=1.592; min=4; max=10; n=18)
- 17 out of 18 subjects (94%) considered VTC Training useful to support training during deployments and the same percentage indicated they would like to have video laryngoscope device at their deployed location.

Confidence score in intubating patient on 1st attempt.

- Prior to training
 - 50% of subjects was under 4.
 - Average score = 3.83; SD=2.093; min=1; max=7; n=18.
- After training,
 - 89% subjects score near 7.
 - Average score = 7.44; SD=1.149; min=5; max=9; n=18.

- 83% subjects performed the direct intubation successfully on the first attempt.
- 17% subjects on the second.
- 100% subjects performed the indirect intubation successfully on the first attempt.

Conclusion

- Creating identical laboratories connected by a telecommunication platform.
 - Allows an intubation trainer at a medical center to train personnel at deployed military locations.
 - This virtual concept can have many training applications.

Questions?

