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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Disclosures

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

Background: Combat Care
Combat Trauma

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

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%.

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.
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- Israeli Defense Forces study discussed their unpublished first intubation attempt failure rate as high as 40%.
- Battlefield cricothyrotomies have a 33% failure rate.


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.

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
- TMG6™ 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 videolaryngoscope blades projecting image to computer
Laerdal Difficult Airway Manikin

Central Hospital of Defence, Madrid

Spanish Military Satellite Network
SECOMSAT
DVB-S2 system with 512Kbps
(military non command and control systems)

NATO Forward Support Base in Herat, Afghanistan

Telecommunication Video and Audio

Peripheral video and audio
• professional video conference (Sony PCS-1P)
• audio G.722.1
• teleconference with 200Kbps H.264

Airway video
• ClearSea™ Videoconference
• Karl Storz CMAC videolaryngoscope
• Each teleconference with 200Kbps 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?