Difficult Airway Algorithm and Rescue Cricothyrotomy. The DAARC and Serious Video Game.

STA San Diego 01/14/2017

Jessica Feinleib, MD, PhD, CHSE
Department of Anesthesiology
Yale School of Medicine
Veterans Administration CT Healthcare System
Disclosures

The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting the views of the Veterans Health Administration.

Medical Advisory Board
Revolutionary Medical Devices, Inc.
Virtuous interlocking cycles of systems based approaches to improve airway protection.
Difficult Airway Management
Low Frequency-High Stakes Events

- Difficult airway patients present and difficult airway emergencies require interventions that we use infrequently.
- Type 1: Medical comorbidities and trauma can create emergent anticipated difficult airways (Angioedema, c-spine instability).
- Type 2: 1-3% of all routine airways are unanticipated difficult airway of those there is a subset of failed airways.

Physicians preparation
- Manage emergency difficult airway situations
- Unexpectedly in Emergency Departments, ICUS, OR and medical Floors.
- Multiple tools and techniques
- Surgical airways
Is it time for airway management education to be mandatory?

P. A. Baker¹,²,* J. Feinleib³,⁴ and E. P. O’Sullivan⁵

¹University of Auckland, Auckland, New Zealand,
²Auckland City Hospital, Auckland, New Zealand,
³Veterans Administration Connecticut Healthcare System, West Haven, CT, USA,
⁴Yale School of Medicine, New Haven, CT, USA, and
⁵St. James’s Hospital, Dublin, Ireland

*Correspondence author. E-mail p.baker@auckland.ac.nz
Airway Education

Voluntary Attendance Based
Competency Level
Patient Contact Unassessed Random Content

Mandatory Performance Based
Mastery Level
Simulation Assessed Deliberate Practice

Patient Outcomes Assessed

Voluntary Attendance Based
Competency Level
Patient Contact Unassessed Random Content
Patient Outcomes Unassessed

Continuing Airway Education

Trainee Airway Education Progress
Is it time for airway management education to be mandatory?

P. A. Baker¹,²,*, J. Feinleib³,⁴ and E. P. O’Sullivan⁵

¹University of Auckland, Auckland, New Zealand
²Auckland City Hospital, Auckland, New Zealand
³Veterans Administration Complex Care, West Haven, CT, USA
⁴Yale School of Medicine, New Haven, CT, USA
⁵St. James’s Hospital, Dublin, Ireland

*Correspondence: Paul Baker, Department of Anaesthesia, University of Auckland, PO Box 92019, Auckland, New Zealand. Email: paul.baker@auckland.ac.nz

Editorial
Department of Veterans Affairs  
Veterans Health Administration  
Washington, DC 20420

VHA DIRECTIVE 2012-032  
October 26, 2012

OUT OF OPERATING ROOM AIRWAY MANAGEMENT

1. PURPOSE: This Veterans Health Administration (VHA) Directive addresses the appropriate competencies of providers who perform urgent and emergent airway management outside of VHA facility operating rooms; it addresses required techniques to confirm successful endotracheal tube placement and required documentation when a patient has been determined to have a difficult-to-intubate airway. AUTHORITY: Title 38 United States Code 7301(b).
The Eagle simulator for training anaesthesia students at the Chelsea and Westminster Hospital, London. Etching with lithograph by Virgina Powell, 2000. (Credit: Wellcome Library [1].)
Learn to Play, 
Play to Learn
Serious Video Games for Health: How Behavioral Science Guided the Development of a Serious Video Game

Debbie Thompson, Tom Baranowski, Richard Buday, Janice Baranowski, Victoria Thompson, Russell Jago, and Melissa Juliano Griffith
Gaming to Change Clinical Behavior

In 2005 Stokes [6] defined serious games as “games that are designed to entertain players as they educate, train, or change behaviour.”

![Diagram showing the computer game spectrum.](image)

**Figure 1:** The computer game spectrum.
Game-based mass casualty burn training.

Kurenov SN, Cance WW, Noel B, Mozingo DW

Department of Surgery, University of Florida, FL, USA. sergei.kurnov@surgery.ufl.edu

Studies in Health Technology and Informatics [2009, 142:142-144]

Type: Journal Article, Research Support, Non-U.S. Gov't

Serious gaming technology in major incident triage training: A pragmatic controlled trial

James F. Knight, Simon Carley, Bryan Tregunna, Steve Jarvis, Richard Smithies, Sara de Freitas, Ian Dunwell, Kevin Mackway-Jones

DOI: http://dx.doi.org/10.1016/j.resuscitation.2010.03.042
## Simulation vs Gaming

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Traditional Simulation</th>
<th>Gaming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>Development and Ongoing Time Expense</td>
<td>Development Fixed</td>
</tr>
<tr>
<td>Distribution &amp; Self Paced Learning</td>
<td>Fixed locations Fixed times</td>
<td>To all computer terminals At the learners convenience</td>
</tr>
<tr>
<td>Standardization Of material delivery and</td>
<td>Requires Train the Trainer Difficult to validate</td>
<td>Assurance that the training program is the same for all learners</td>
</tr>
<tr>
<td>Metrics (Use and learner behavior)</td>
<td>Additional resources Difficult to standardize</td>
<td>Data collection can be programmed with statistical package</td>
</tr>
</tbody>
</table>
What Behavior Needs Changing and to what?

- Front of neck access
- Situational Awareness
- Fixation error
- Team training
- Standard cognitive model by use of clear cognitive aid.
Cricothyrotomy
Front of Neck Access (FONA)

Anesthesiologists have used scalpels in case reports. Fear of excessive bleeding unfounded. Rare event so human studies not available for evidence. Cannula technique not reliable in case reports and observational studies. With training scalpel open technique is timely and can reduce mortality.
Difficult Airway Algorithm and Rescue Cricothyrotomy (DAARC)

- To reduce patient morbidity and mortality associated with difficult and failed airways
- VA developed Difficult Airway Algorithm and Rescue Cricothyrotomy (DAARC)
  - An interdisciplinary educational program (EM, ANE, ICU)
  - ~146 hospital, 8.9 million patient national VA system
  - Wide geographic area
  - Mastery-based education
  - Standardized deliberate practice for formative phase
  - Standardized simulation assessed deliberate practice summative phase.
  - Cost
Design Plan from the Outset

- Education Plan with CME credit
- Composite program video didactics, formative and summative serious games, and a hands on simulation workshop
- Uniform Difficult Airway Algorithm and standardized Cognitive aid selection to create common language and remove communication barriers.
- Cognitive aid selection that is acceptable to stakeholders is a critical aspect of the plan.
- Selection of evidence-based and most direct techniques for surgical airway. Reviewed many and then made modifications that were then trialed in 100s of hands on simulation.
VA Educational Serious Games Innovations

- Critical performance gap EES turned to serious, game-based learning products
  - Game thinking to immerse learners
  - Motivate action
  - Solve problems
  - Promote learning with formative and summative feedback

- Interactive immersive digital gaming technology
  - Game-based learning recreates real-world contexts, events and tasks
  - Focuses on specific learning goals, objectives and competency-based training
  - For anywhere or anytime medical health care training
  - Validated in-game assessments
  - Decreased financial burden of VHA-wide mandatory training
DAARC Hybrid Blended Learning System

- Difficult Airway Identification and Vortex cognitive aid “videocast”
- Cricothyrotomy procedure training video
- Four scenario-based video simulation demonstrations with accompanying audio discussions
- Four formative serious game scenarios
- Eight summative serious game scenarios
- Local facility manikin didactic & psychomotor skills simulations (TBD)
DAARC Virtual Game

- DAARC virtual game incorporates a formative and summative Games
- Progressive learning opportunities built into four layered serious games
  - With the completion of each Formative Game an additional clinical technique is added to learners repertoire
  - The use of the cognitive aid is introduced and use of it is necessary to pass though the levels
  - Physiology and education incorporated in formative phase
  - The use of new standard monitoring incorporated in formative phase
  - Learner may opt to repeat Formative Games
- After completing Formative Game the learner may choose to go forward to Summative Games or review instructional videos, simulation scenario videos or podcasts
- Training culminates with four engaging summative games that are scored to ensure transfer of training
- If the learner does not pass the four Summative Games they are given a second opportunity with four new Summative Games (or Formative)
Vortex Approach Airway Cognitive Aid

- Conceived in 2008 by Dr. Nicholas Chrimes, an Australian anaesthetist
- Universal and consistent approach taught to all staff involved in airway management
- Supported by a “high stakes cognitive tool”
- Single tool applicable to any airway crisis
- Readily utilized in a stressful situation by all team members
- Vortex is a flexible cognitive aid, rather than progression through a linear algorithm
The Vortex Cognitive Aid

For Each NSA Technique Consider:
1. Manipulations:
   - Head & Neck
   - Larynx
   - Device
2. Adjuncts
3. Size/Type
4. Suction/O₂ Flow
5. Muscle Tone

MAXIMUM THREE TRIES AT EACH NON-SURGICAL AIRWAY TECHNIQUE
AT LEAST ONE TRY SHOULD BE HAD BY MOST EXPERIENCED AVAILABLE CLINICIAN

© Copyright Nicholas Chirmoe & Peter Fritz, 2013
DAARCC

Difficult Airway Algorithm & Rescue Cricothyrotomy

Stage 1
- Environment
- Physiology

Stage 2
Game Logic

Stage 3
Gameplay Art

Stage 4
Integration

Alpha
Sep 16

Beta
TBD

Gold
TBD

Attempt Logic:
- Bag Valve Mask
- ETT
- LMA
- Cric
Lift chin to ceiling
Put chin to chest
Smile for me, are these all your teeth?
Open mouth wide and stick out your tongue.
Can I examine your neck?
Done with Assessment

DAARC: Patient Initial Assessment
Alpha Test DAARC Game
Videos of the Game
Difficulties

- SME Time
- Need for multiple face to face meetings
- Physiology generator
- Testing and validation of educational tool
The Future…

- Validation of education tool
  - “Training Effectiveness”

- Virtual Reality (VR)
  - Goggles and gloves with haptic feedback

- Augmented Reality (AR)
  - Goggles that overlay items in the real environment. This could provide in situ simulation. The best of both worlds.

- The VA Employee Education System

They are considering a VR version of DAARC
Virtuous interlocking cycles of systems approach.

Thank You!

Airway Registries

Airway Protocols and Policies

Airway Management Education
QUESTIONS?

Jessica Feinleib MD/PhD/CHSE

jessica@feinleib.md

Jessica.feinleib@va.gov