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

STA San Diego 01/14/2017

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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.

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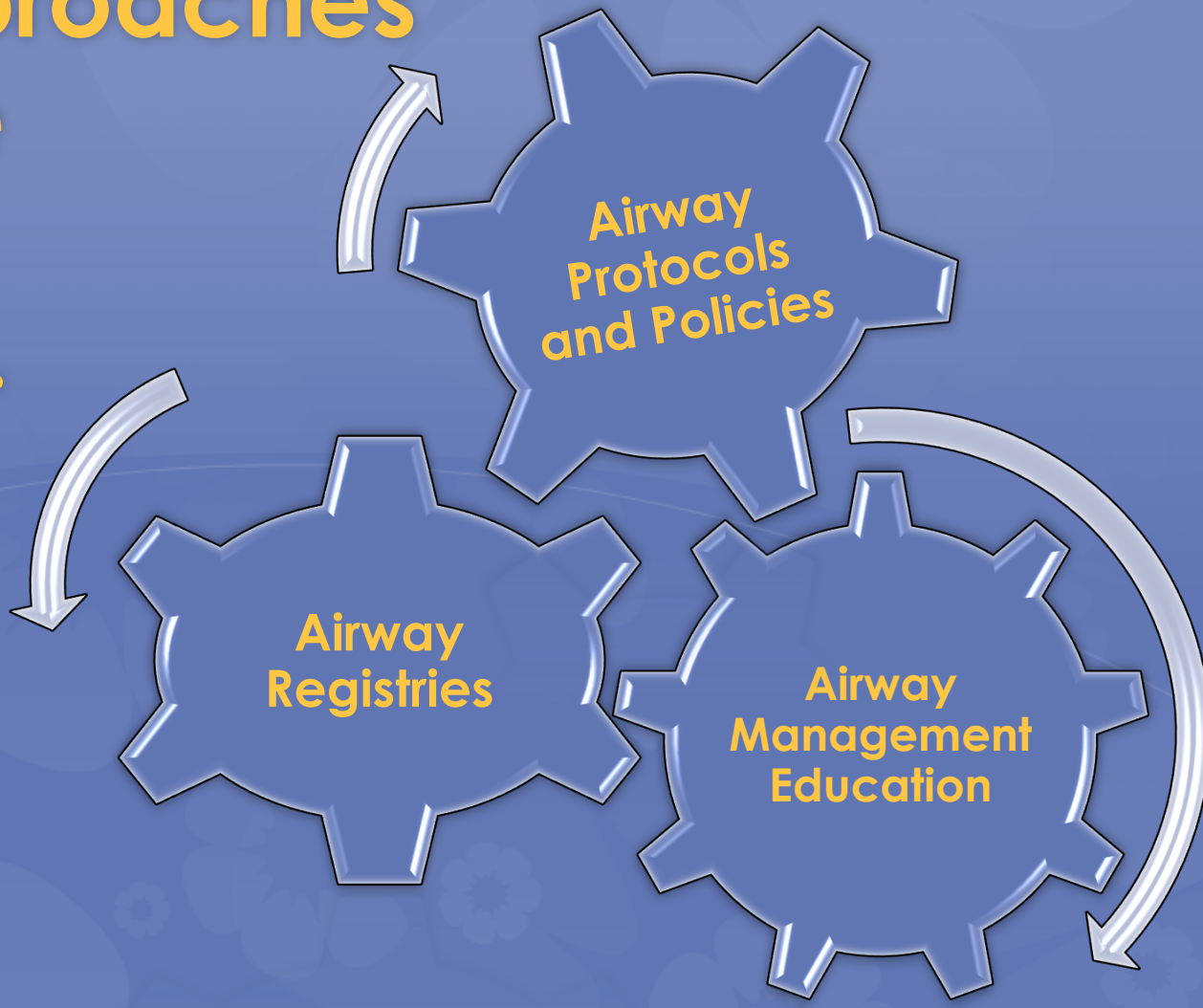
Virtuous interlocking cycles of systems based approaches to improve airway protection.



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

BJA

British Journal of Anaesthesia, 2016, 1–4

doi: 10.1093/bja/aew129
Editorial

EDITORIAL

Is it time for airway management education to be mandatory?

P. A. Baker[1,2,*], J. Feinleib[3,4] and E. P. O'Sullivan[5]

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[4]Yale School of Medicine, New Haven, CT, USA, and
[5]St. James's Hospital, Dublin, Ireland

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Airway Education

Voluntary

Attendance Based

Competency Level

Patient Contact Unassessed Random Content

Mandatory

Performance Based

Mastery Level

Simulation Assessed Deliberate Practice

?

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

Trainee Airway Education Progress

Continuing Airway Education

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YES!!!

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[4]Yale School of Medi
[5]St. James's
*C

YES!!!

YES!!!

Out of OR Airway Management (OORAM)

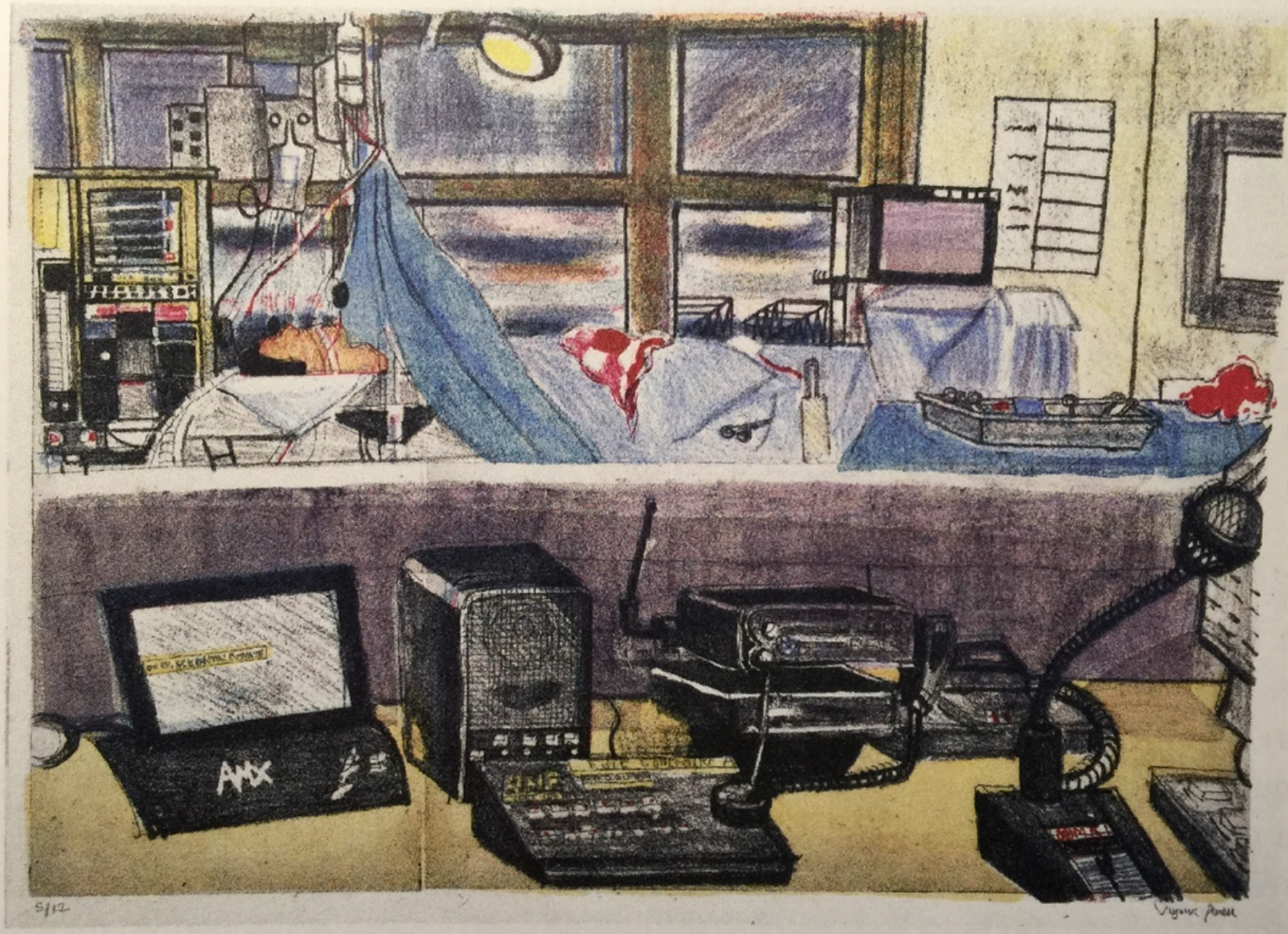
Department of Veterans Affairs
Veterans Health Administration
Washington, DC 20420

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

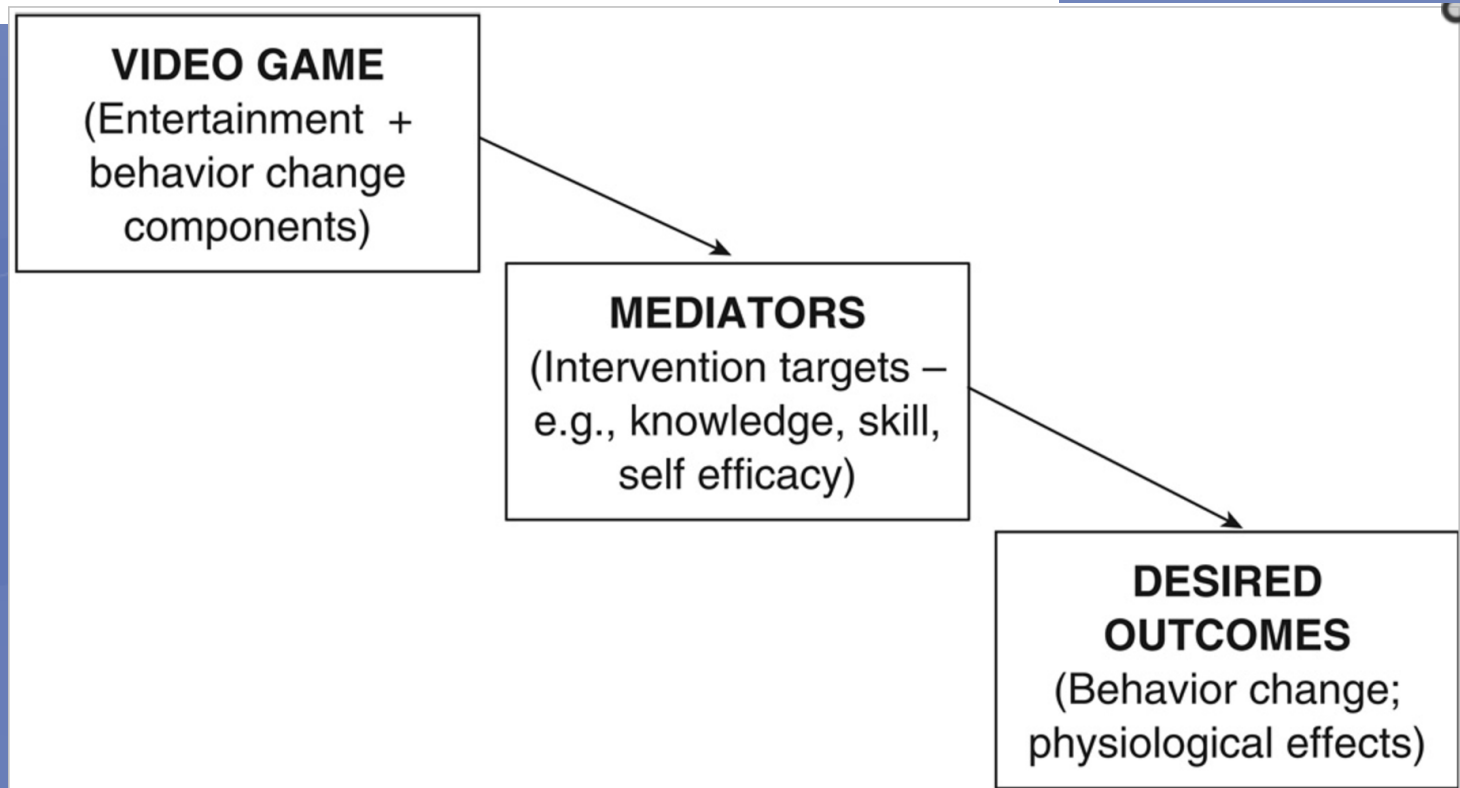
Gaming to change Health Behavior

Simul Gaming. Author manuscript; available in PMC 2011 Jun 1.
Published in final edited form as:
Simul Gaming. 2010 Aug 1; 41(4): 587–606.
doi: 10.1177/1046878108328087

PMCID: PMC2919172
NIHMSID: NIHMS135870

Serious Video Games for Health How Behavioral Science Guided the Development of a Serious Video Game

Debbe 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."

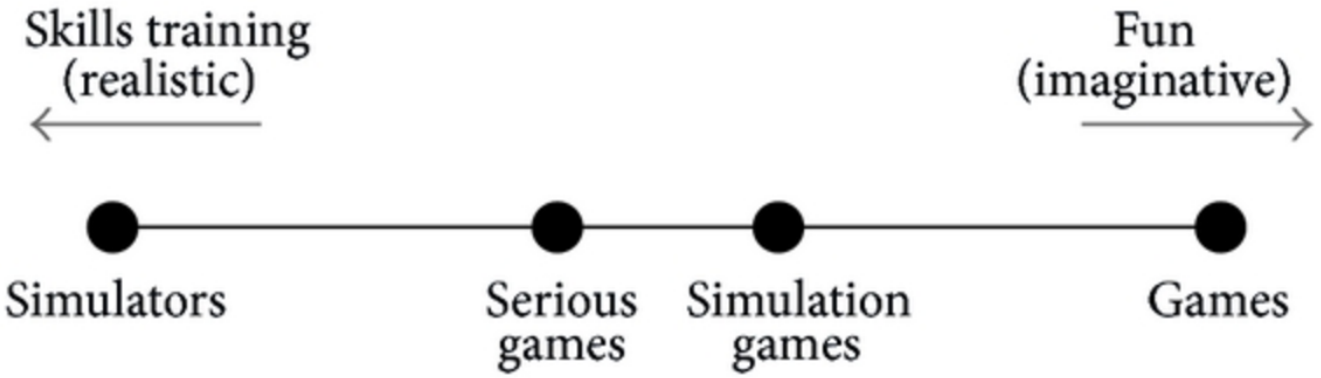


Figure 1: The computer game spectrum.

Game-based mass casualty burn training.

(PMID:19377134)

Abstract | Citations | BioEntities | Related Articles | External Links

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

Altmetric 8

DOI: http://dx.doi.org/10.1016/j.resuscitation.2010.03.042

Simulation vs Gaming

Criteria	Traditional Simulation	Gaming
Cost	Development and Ongoing Time Expense	Development Fixed
Distribution & Self Paced Learning	Fixed locations Fixed times	To all computer terminals At the learners convenience
Standardization Of material delivery and	Requires Train the Trainer Difficult to validate	Assurance that the training program is the same for all learners
Metrics (Use and learner behavior)	Additional resources Difficult to standardize	Data collection can be programed with statistical package

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)

British Journal of Anaesthesia 117 (S1): i17–i19 (2016)
doi:10.1093/bja/aew219

The great airway debate: is the scalpel mightier than the cannula?

P. A. Baker[1,2,*], E. P. O'Sullivan[3], M. S. Kristensen[4] and D. Lockey[5,6]

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 stake holders is a critical aspect of plan.
- Selection of evidence based and most direct techniques for surgical airway. Reviewed many and then made modification 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)

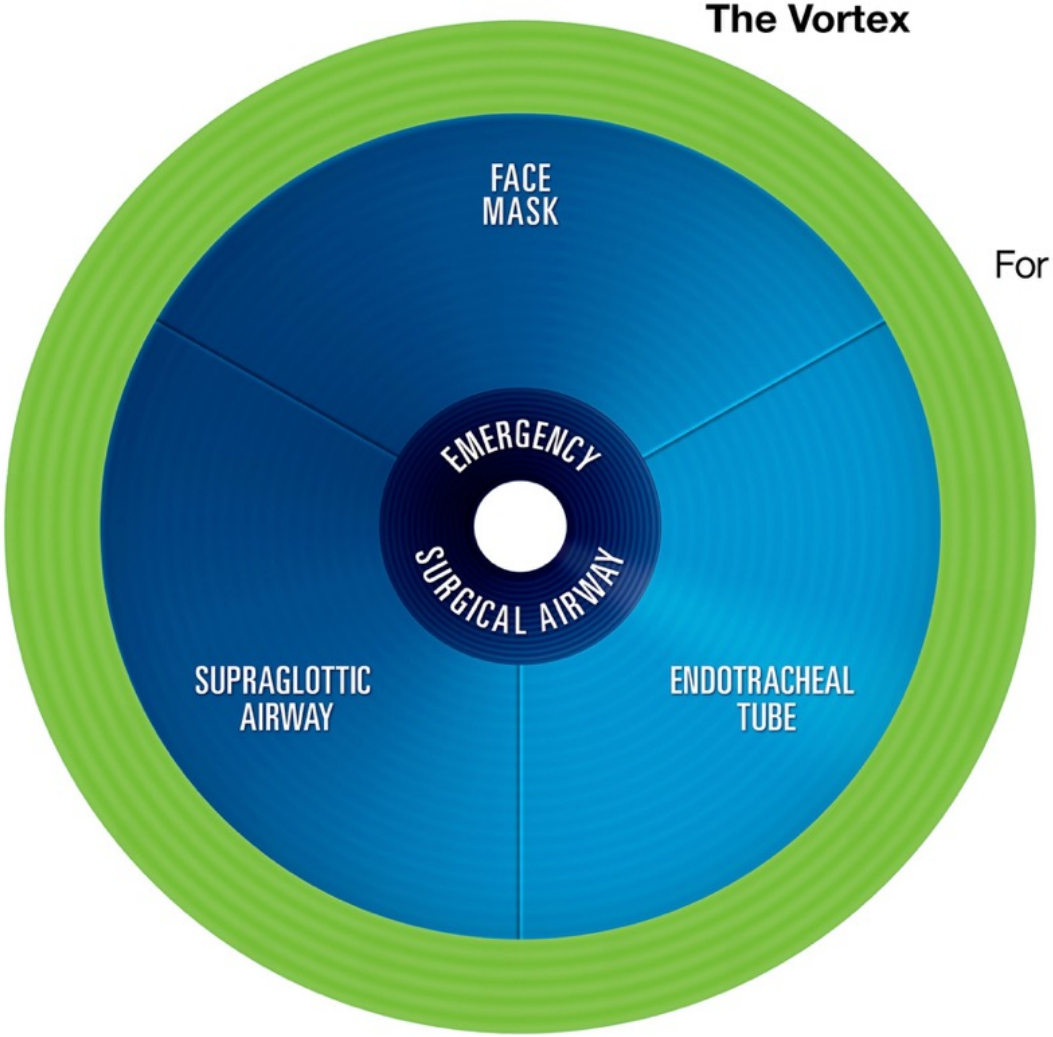
DAARC Virtual Game

- 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/O_2 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

vortexapproach.org

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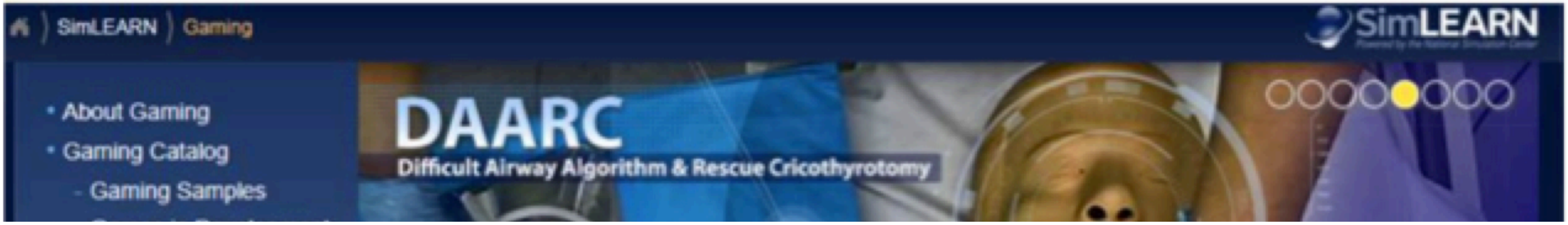
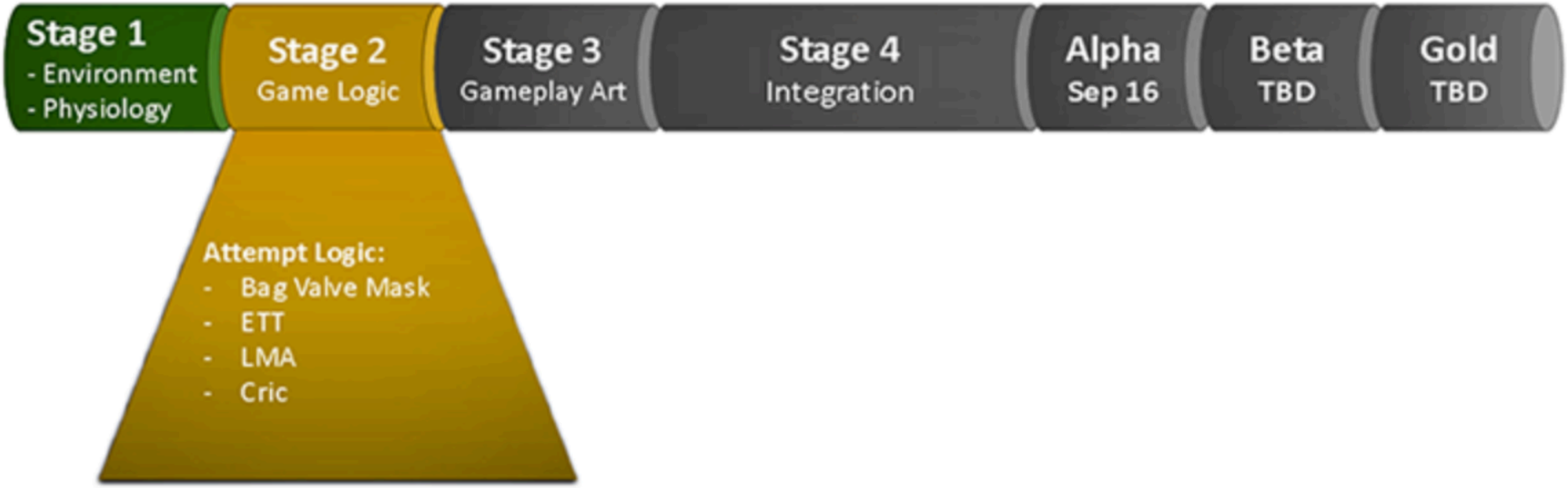
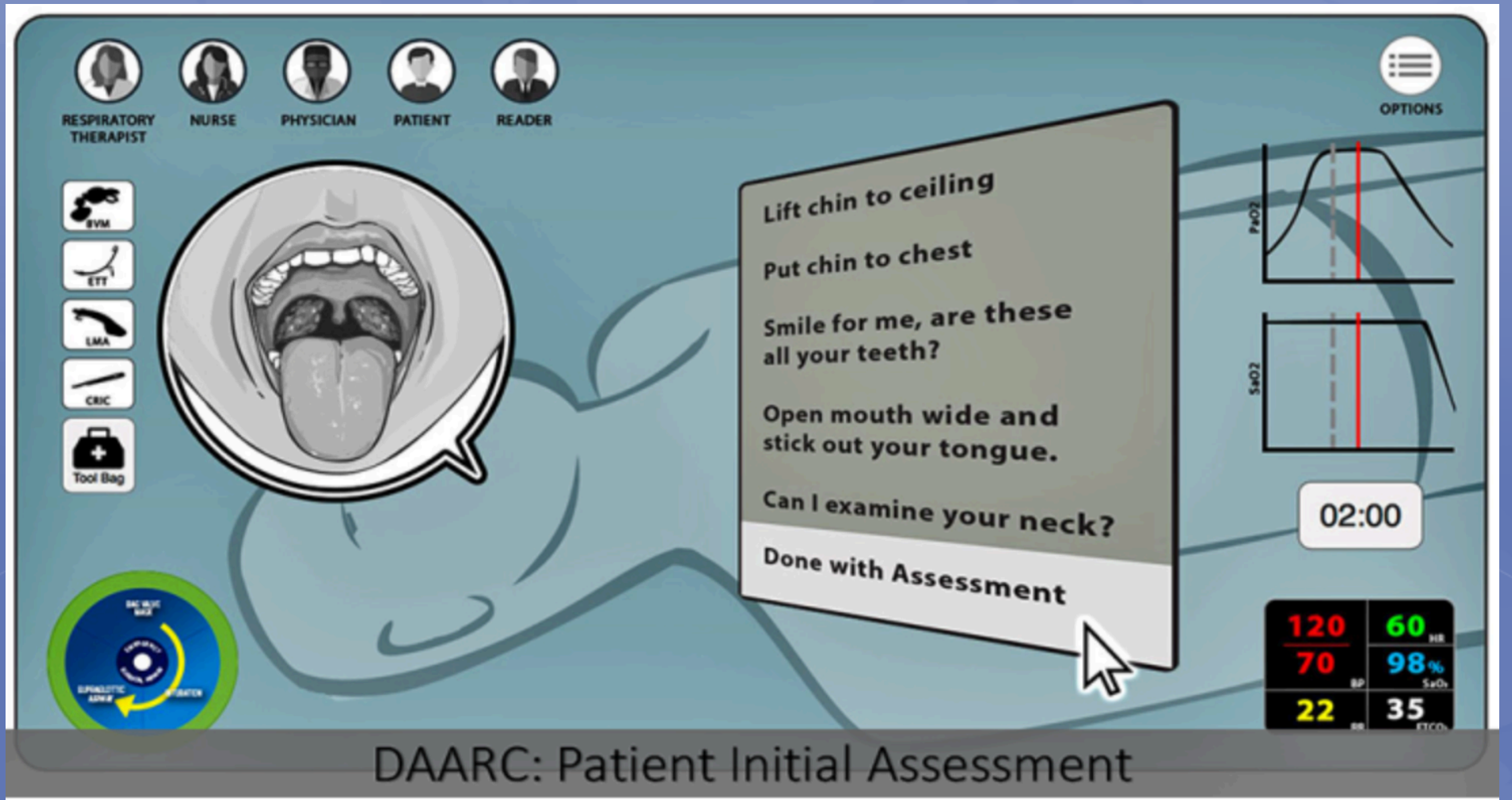
D A A R C
Difficult Airway Algorithm & Rescue Cricothyrotomy



DAARC

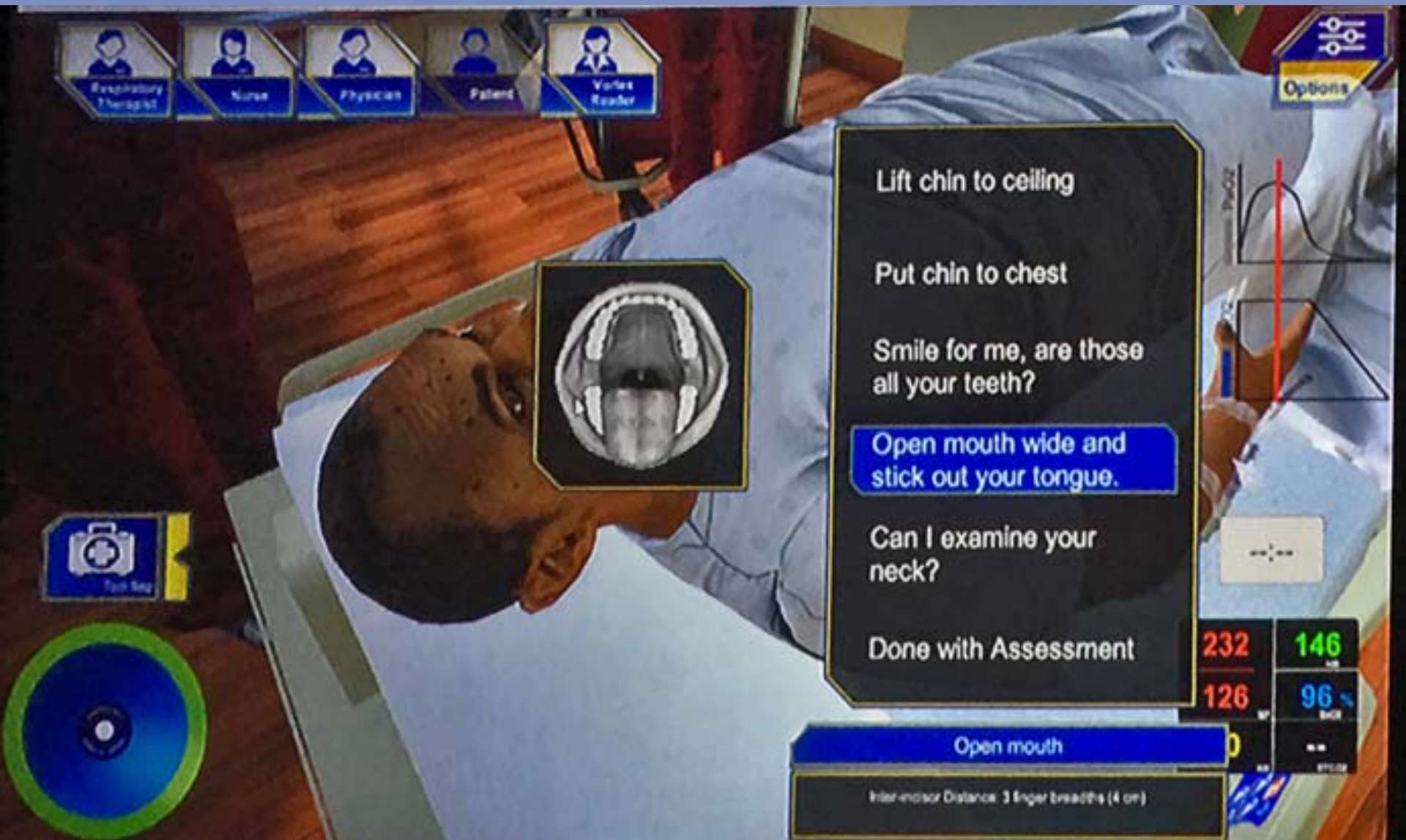


DAARC Game Interface



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 provided 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

Thank You!

QUESTIONS?

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