Achieving Success in Critical Situations: Non-Technical Skills for Surgeons

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-no disclosures-
Good technical skills are not sufficient
Some complications are due to non-technical skills

This assumes we can reliably assess, improve, and link behaviors to patient outcomes
Aim: Demonstrate how surgeons are integrating lessons from other high reliability industries to improve operative performance.
Industry
Scotland

Surgery
USA/ Rwanda

Space Medicine
Mars
Non-technical skills are critical for **safety, longevity, and resilience** in High Reliability Organizations (HROs).
Operational level disasters

Piper Alpha (1987)
Handovers, formal policies, safety culture all lacking.

Columbia (2003)
Safety not prioritized, ‘holes’ in decision making.
Increasing focus on ‘sharp end’ behaviors in 1990’s
### NOTECHS Rating Form

<table>
<thead>
<tr>
<th>CAPT/F/O:</th>
<th>Sector:</th>
<th>Date:</th>
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<td>Sim:</td>
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#### Element Checklist

1. **Co-operation**
   - Team-building and maintaining
   - Consideration of others
   - Support of others
   - Conflict solving

2. **Leadership and managerial skills**
   - Use of authority and assertiveness
   - Providing and maintaining standards
   - Planning and co-ordination
   - Workload management

3. **Situation awareness**
   - Awareness of aircraft systems
   - Awareness of external environment
   - Awareness of time

4. **Decision making**
   - Problem definition and diagnosis
   - Option generation
   - Risk assessment and option selection
   - Outcome review

#### Fail

#### Pass

**Comments:**
## NOTSS (Non-Technical Skills for Surgeons) - skills taxonomy v1.2

<table>
<thead>
<tr>
<th>Category</th>
<th>Elements</th>
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</table>
| Situation Awareness          | • Gathering information  
                              • Understanding information  
                              • Projecting and anticipating future state |
| Decision Making              | • Considering options  
                              • Selecting and communicating option  
                              • Implementing and reviewing decisions |
| Communication and Teamwork   | • Exchanging information  
                              • Establishing a shared understanding  
                              • Co-ordinating team activities |
| Leadership                   | • Setting and maintaining standards  
                              • Supporting others  
                              • Coping with pressure |

Yule et al *Surgery* 2006;139:140-149

Yule et al *Medical Education* 2006;40:1098-1104
Can we improve patient outcomes through non-technical skills or team training?

**Association Between Implementation of a Medical Team Training Program and Surgical Mortality**

Nugget: Significant reduction in mortality rates in training sites (18% drop) compared with non-training sites (7% drop)

Neily et al, *JAMA* 2010;301:1693-1700
Simulation-based OR team training (2011-2017)

CRICO and 4 Harvard simulation programs worked together to build a multidisciplinary OR team training program
Close loop communication, assertiveness, checklist use
Directed vs. Non-Directed communication

Directed

targeted using name, role, eye contact or physical contact

Non-Directed

not targeted to a specific team member
Closed Loop Communication

Call Out
“John - please activate the MTP”

Check back
“Yes I am calling them now”
Directed call outs were 2x more likely to elicit a check back response, and 3x more likely to result in closed loop communication (p<.01)
Relative density plot of communication during simulated PEA arrest in a post-surgical patient

Davis et al., Surgery (2017)
Aim: Validation of the NOTSS taxonomy in USA and implementation of non-technical skills curriculum

Customize NOTSS Assessment Tool to US context

Validation in multiple OR settings

eNOTSS e-Learning Package

Scalable Electronic Platform for Psychometric Testing of NOTSS-ACS v2.0

Funded by NBME Stemmler Medical Education grant
NOTSS video series

Non-Technical Skills for Surgeons
NOTSS v2.0 Assessment Study

Video Series 1
Contains Episodes 1A-1F
50%

Video Series 2
Contains Episodes 2A-2E
100%

Video Series 3
Contains Episodes 3A-3G
57%

Video Series 4
Contains Episodes 4A-4E
20%

Video Series 5
Contains Episodes 5A-5G
National leadership and advocacy

ACS Committee on Non-Tech Skills
» Doug Smink & Ajit Sachdeva
» ACS-APDS Phase III curriculum
» NOTSS course at clinical congress

SCORE – National curriculum
» For surgical trainees
» 99% of surgery residencies 2 non-technical skills modules added in 2014
Contextual Challenges to Safe Surgery in a Resource-limited Setting

A Multicenter, Multiprofessional Qualitative Study

John W. Scott, MD, MPH,*†‡ Yihan Lin, MD,†§ Georges Ntakiyiruta, MD,¶ Zeta A. Mutabazi,¶
William Austin Davis, BA,* Megan A. Morris, PhD, MPH,* Douglas S. Smink, MD, MPH,*†||
Robert Riviello, MD, MPH,*†|| and Steven Yule, PhD, MA, MSc*†||

Objectives: Safe surgery should be available to all patients, no matter the setting. The purpose of this study was to explore the contextual-specific challenges to safe surgical care encountered by surgeons and surgical teams in many in low- and middle-income countries (LMICs), and to understand the ways in which surgical teams overcome them.

Background: Optimal surgical performance is highly complex and requires providers to integrate and communicate information regarding the patient, task, team, and environment to coordinate team-based care that is timely, effective, and safe. Resource limitations common to many LMICs present unique challenges to surgeons operating in these environments, but have never been formally described.

Examples of resilient strategies to anticipate, monitor, respond to, and learn from these challenges.

Conclusions: Resource variability rather than lack of resources underlies many contextual challenges to safe surgical care in a LMIC setting. Understanding these challenges and resilient strategies to overcome them is critical for both LMIC surgical providers and surgeons from HICs working in similar settings.

Keywords: global health, global surgery, nontechnical skills, resilience engineering, resource-limited settings

Industry
Scotland

Surgery
USA/ Rwanda

Space Medicine
Mars
Research Question:

How can we support astronauts to manage medical events on long duration exploration missions?
“Houston you have a problem”

**Specific aim 1:** Identify objective measures of non-technical skills that enhance crew management of in-flight medical emergencies

**Specific aim 2:** Develop a simulated spacecraft medical bay, and run a series of simulation scenarios to measure crew behavior during high acuity, low frequency medical emergencies
Expert Advisory Panel on managing medical events in Deep Space Exploration Missions

Houston, Nov 3-4 2016
Survivability of deep space medical conditions

[Diagram with various medical conditions listed on the left and their likelihood of survival ranging from very unlikely to very likely on the right axis.]
Astronauts’ non-technical skills for medical event management (preview)

1. Recognizing the problem
2. Communication w/ crew
3. Coordination w/ ground
4. Conflict resolution
5. Stress management
6. Calling for help
Future applications
Achieving success in surgery requires non-technical skills, and learning from other industries

1. Simulation
2. Observation
3. Coaching and debriefing
Future challenges

Context

Cost

Scale

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