Team Training and CRM: To err is human BUT . . .

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Objectives

• Be familiar with the history and current call for team training with the crisis resource management model
• Know the theory behind and evidence for (simulation-based) training in these areas
• Appreciate the challenges with designing, implementing and evaluating these training programs and their participants
“To err is human”

- IOM Report in 1999 estimated that up to 98,000 deaths a year are 2/2 avoidable medical error
  - Up to 80% are human errors such as ineffective communication and teamwork
- JC in 2008 listed communication errors as root cause of 65% of sentinel events with 74% resulting in death
The Remediation

- Call from IOM, JC, AHRQ for interdisciplinary team training programs for critical care areas such as ED, ICU, OR
  - Using principles of crew resource management (CRM), simulation-based training (SBT)
- With goal of making healthcare a high-reliability organization (HRO)
Some Definitions

• Team
  – Two or more individuals with specialized knowledge and skills who perform specific roles and complete interdependent tasks to achieve a common goal or outcome (Baker et al 2006)

• Ad hoc team
  – Forms rapidly, has an abbreviated life span, usually has limited experience working together previously (Weaver et al 2014)
Some More Definitions

- **Multidisciplinary team**
  - Multiple disciplines work side by side responsible only for activities related to their own discipline (the silos)

- **Interdisciplinary team**
  - Multiple disciplines working as a collaborative group towards a common goal

- **Interprofessional education**
  - Practitioners learning together to promote collaborative practice
    
    (Alberto and Herth, 2009)
Some Definitions

• Team Training
  - A systematic methodology for optimizing the communication, coordination, and collaboration of health-care teams that combines specific content (knowledge, skills, attitudes associated with teamwork competencies) with opportunities for practice, formative feedback and tools to support transfer to the daily care environment (Weaver et al 2014)
  - Meant to be generalizable; is *not* team building
Some Definitions

• **Crew (-> Crisis) Resource Management**
  – One of the most popular adaptations of the shared mental model of team training
  – The use of teamwork and all available resources, equipment, and people, to promote safety and enhance efficiency (McConaughey et al 2008)
Some Definitions

• High Reliability Organization
  – Institutions where individuals, working together in high-acuity situations facing great potential for error and disastrous consequences, consistently deliver care and positive results with minimal errors (Sundar et al 2007)
How did we get here???
The Crash: Tenerife Airport 1977
The Cascade of Effects: 1980’s

- Cockpit -> Crew Resource Management in Aviation
  - Research showed most accidents from human error
    - Many s/t problems w/ communication and teamwork
  - NASA, military and airlines developed CRM training
The Cascade of Effects: 1990’s

• Cockpit -> Crew Resource Management in Aviation ->

• Anesthesia Crisis Resource Management ->
  – CRM principles first applied to healthcare in OR of University Hospital in Basel, Switzerland, in 1994.
  – Much early work in US by Gaba et al
The Cascade of Effects: Onwards

• Cockpit -> Crew Resource Management in Aviation ->
• Anesthesia Crisis Resource Management ->
• **Other areas in medicine** characterized by unplanned, uncommon, high stakes events managed by ad hoc interdisciplinary teams
CRM skills

• “The generic behavioral skills needed to safely and effectively manage medical crises such as resuscitation” (Plant et al, 2011)
• NOT medical knowledge
• NOT technical or procedural skills
• Sometimes called non-technical skills
• Which exact skills are included within this construct varies based on context
Gaba, Anesthesia in 2001

Decision Making and Cognition
- Know the environment
- Anticipate and plan
- Use all available information and cross check
- Prevent or manage fixation errors
- Use cognitive aids

Teamwork & Resource Management
- Exercise leadership and followership
- Call for help early
- Distribute the workload
- Mobilize all available resources for optimum management
How do we make this happen?

• Should adhere to sound educational theory and practice (Eppich et al, 2011)
  – e.g. Stages of curriculum development (Kern et al 2009)
    – Problem Identification and General Needs Assessment
    – Needs Assessment of Targeted Learners
    – Goals and Objectives
    – Educational Strategies
    – Implementation
    – Evaluation and Feedback
What to teach and assess?

- Knowledge
  - e.g. of individuals’ responsibilities
- Skills: CRM and other skills
- Attitudes
  - e.g. positive disposition to working in team
- Shared mental models: the knowledge and mechanisms that can be leveraged to describe, explain, and predict events
How to teach?

• Classroom-based instruction
  – Can be information-based (didactics) and demonstration-based (videos)
  – e.g. MedTEAMS
  – e.g. LifeWings, TeamSTEPPS
  (www.saferpatients.com, teamstepps.ahrq.gov)
How to teach?

• Simulation-based training
  – Is “practice-based”
  – High-fidelity sufficient but not necessary
  – e.g. ANTS program (www.abdn.ac.uk/iprc/ants)
How to teach?

• A mixed model matching type of learning with appropriate instructional strategies, incorporating principles of experiential learning and deliberate practice
  – Instruction in principles (Knowledge, Attitudes)
  – Practice (Skills) [usually via simulation]
  – Debriefing +/- video review, +/- assessment of performance (Feedback)
  – Recurrent training opportunities
What to evaluate?

• The individual
• The team
• The program
• The organization
Kirkpatrick Model of Evaluation of Training Programs

The Kirkpatrick Model

Level 1: REACTION
To what degree participants react favorably to the learning event

Level 2: LEARNING
To what degree participants acquire the intended knowledge, skills and attitudes based on their participation in the learning event

Level 3: BEHAVIOR
To what degree participants apply what they learned during training when they are back on the job

Level 4: RESULTS
To what degree targeted outcomes occur as a result of learning event(s) and subsequent reinforcement

From http://www.kirkpatrickpartners.com
Level 1: Satisfaction
Level 2: Self-efficacy

• Instrument measuring self-efficacy (an individual’s confidence in his ability to perform a specific task in a given domain) in CRM skills
  – Plant et al 2012
  – Question re. accuracy of physician self-assessment
  – Theoretical argument that self-efficacy affects development and access to knowledge and skills
  – 20 items such on 5 point Likert scale
  – Some correlation to performance
Level 2: Other

• Knowledge
• Attitudes
Level 3: Team Leader Performance

- Anaesthesia Non-Technical Skills (ANTS) instrument
  - Fletcher et al. 2002-2004

<table>
<thead>
<tr>
<th>Category</th>
<th>Elements</th>
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<tbody>
<tr>
<td>Task Management</td>
<td>• Planning and preparing&lt;br&gt;• Prioritising&lt;br&gt;• Providing and maintaining standards&lt;br&gt;• Identifying and utilising resources</td>
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<tr>
<td>Team Working</td>
<td>• Co-ordinating activities with team members&lt;br&gt;• Exchanging information&lt;br&gt;• Using authority and assertiveness&lt;br&gt;• Assessing capabilities&lt;br&gt;• Supporting others</td>
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<td>Situation Awareness</td>
<td>• Gathering information&lt;br&gt;• Recognising and understanding&lt;br&gt;• Anticipating</td>
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<tr>
<td>Decision Making</td>
<td>• Identifying options&lt;br&gt;• Balancing risks and selecting options&lt;br&gt;• Re-evaluating</td>
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Situation Awareness: Skills for developing and maintaining an overall awareness of the work setting based on observing all relevant aspects of the theatre environment (patient, team, time, displays, equipment); understanding what they mean, and thinking ahead about what could happen next. It has three skill elements: gathering information; recognising and understanding; anticipating.

Gathering information – actively and specifically collecting data about the situation by continuously observing the whole environment and monitoring all available data sources and cues and verifying data to confirm their reliability (i.e. that they are not artefactual).

**Behavioural markers for good practice**
- obtains and documents patient information pre-operatively
- conducts frequent scan of the environment
- collects information from team to identify problem
- watches surgical procedure, verifying status when required
- cross-checks information to increase reliability

**Behavioural markers for poor practice**
- reduces level of monitoring because of distractions
- responds to individual cues without confirmation
- does not alter physical layout of workspace to improve data visibility
- does not ask questions to orient self to situation during hand-over

Recognising and understanding – interpreting information collected from the environment (with respect to existing knowledge) to identify the match or mis-match between the situation and the expected state, and to update one’s current mental picture.

**Behavioural markers for good practice**
- increases frequency of monitoring in response to patient condition
- informs others of seriousness of situation
- describes pattern of cues and their meaning to other team members

**Behavioural markers for poor practice**
- does not respond to changes in patient state
- carries out inappropriate course of action
- silences alarms without investigation

Anticipating – asking ‘what if’ questions and thinking ahead about potential outcomes and consequences of actions, intervention, non-intervention, etc.; running projections of current situation to predict what might happen in the near future.

**Behavioural markers for good practice**
- keeps ahead of the situation by giving fluids/drugs
- reviews the effects of an intervention
- sets and communicates intervention thresholds
- takes action to avoid or mitigate potential problems

**Behavioural markers for poor practice**
- does not consider potential problems associated with case
- fails to increase level of monitoring in keeping with patient condition
- is caught unaware by surgical actions
- does not foresee undesirable drug interactions
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<th>*Rating</th>
<th>Observation on Performance</th>
<th>Category rating and debriefing notes</th>
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**ANTS System Rating Options**

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<tr>
<th>Rating Label</th>
<th>Description</th>
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<td>4 – Good</td>
<td>Performance was of a consistently high standard, enhancing patient safety; it could be used as a positive example for others</td>
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<tr>
<td>3 – Acceptable</td>
<td>Performance was of a satisfactory standard but could be improved</td>
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<td>2 – Marginal</td>
<td>Performance indicated cause for concern, considerable improvement is needed</td>
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<td>1 – Poor</td>
<td>Performance endangered or potentially endangered patient safety, serious remediation is required</td>
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<td>N – Not observed</td>
<td>Skill could not be observed in this situation</td>
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Level 3: Team Leader Performance

• Anaesthetists’ Non-Technical Skills (ANTS) system
  – Multiple “spin-offs”
    • **NOTSS**: Surgeons' non-technical skills (situation awareness, decision making, communication, teamwork, leadership) in the OR
    • **SPLINTS**: Scrub practitioners' non-technical skills (situation awareness, communication, teamwork, task management) in the OR
Level 3: Team Leader Performance

- Ottawa Global Rating Scale (Ottawa GRS)

**LEADERSHIP SKILLS**
- Stays calm and in control during crisis
- Prompt and firm decision-making
- Maintains global perspective ("Big picture")

**SITUATIONAL AWARENESS**
- Avoids fixation error
- Reassesses and re-evaluates situation constantly
- Anticipates likely events

**COMMUNICATION SKILLS**
- Communicates clearly and concisely
- Uses directed verbal/non-verbal communication
- Listens to team input

**PROBLEM SOLVING**
- Organized and efficient problem solving approach (ABC’s)
- Quick in implementation (Concurrent management)
- Considers alternatives during crisis

**RESOURCE UTILIZATION**
- Calls for help appropriately
- Utilizes resources at hand appropriately
- Prioritizes tasks appropriately

**OVERALL**
# OVERALL PERFORMANCE

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<tr>
<td></td>
<td>Novice; all CM skills require significant improvement</td>
<td>Advanced novice; many CM skills require moderate improvement</td>
<td>Competent; most CM skills require minor improvement</td>
<td>Clearly superior; few, if any CM skills that only require minor improvement</td>
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## I. LEADERSHIP SKILLS

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<td>Loses calm and control for most of crisis; unable to make firm decisions; cannot maintain global perspective</td>
<td>Loses calm/control frequently during crisis; delays in making firm decisions (or with cueing); rarely maintains global perspective</td>
<td>Stays calm and in control for most of crisis; makes firm decisions with little delay; usually maintains global perspective</td>
<td>Remains calm and in control for entire crisis; makes prompt and firm decisions without delay; always maintains global perspective</td>
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## II. PROBLEM SOLVING SKILLS

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<td></td>
<td>Cannot implement ABC's assessment without direct cues; uses sequential management despite cues; fails to consider any alternative in crisis</td>
<td>Incomplete or slow ABC assessment; mostly uses sequential management approach unless cued; gives little consideration to alternatives</td>
<td>Satisfactory ABC assessment; without cues; mostly uses concurrent management approach with only minimal cueing; considers some alternatives in crisis</td>
<td>Thorough yet quick ABC without cues; always uses concurrent management approach; considers most likely alternatives in crisis</td>
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## III. SITUATIONAL AWARENESS SKILLS

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<td>Becomes fixated easily despite repeated cues; fails to re-assess and re-evaluate situation despite repeated cues; fails to anticipate likely events</td>
<td>Avoids fixation error only with cueing; rarely reassesses and re-evaluates situation without cues; rarely anticipates likely events</td>
<td>Usually avoids fixation error with minimal cueing; reassesses re-evaluates situation frequently with minimal cues; usually anticipates likely events</td>
<td>Avoids any fixation error without cues; constantly reassesses and re-evaluates situation without cues; constantly anticipates likely events</td>
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## IV. RESOURCE UTILIZATION SKILLS

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<td></td>
<td>Unable to use resources &amp; staff effectively; does not prioritize tasks or ask for help when required despite cues</td>
<td>Able to use resources with minimal effectiveness; only prioritizes tasks or asks for help when required with cues</td>
<td>Able to use resources with moderate effectiveness; able to prioritize tasks and/or ask for help with minimal cues</td>
<td>Clearly able to utilize resources to maximal effectiveness; sets clear task priority and asks for help early with no cues</td>
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## V. COMMUNICATION SKILLS

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<td></td>
<td>Does not communicate with staff; does not acknowledge staff communication, never uses directed verbal/non-verbal communication</td>
<td>Communicates occasionally with staff, but unclear and vague; occasionally listens to but rarely interacts with staff; rarely uses directed verbal/non-verbal communication</td>
<td>Communicates with staff clearly and concisely most of time; listens to staff feedback; usually uses directed verbal/non-verbal communication</td>
<td>Communicates clearly and concisely at all times, encourages input and listens to staff feedback; consistently uses directed verbal/non-verbal communication</td>
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Level 3: Other

• Safety culture or climate survey
Level 4

• Clinical processes
  – e.g. Compliance w antibiotic prophylaxis, incidence of case delays

• Patient outcomes
  – e.g. Incidence of surgical infection, mortality
Where are we now?

- Huge growth in development, implementation, evaluation of team training programs

Figure 1: PubMed publication trends from 2000 through October 2013 for team-training and related concepts.

Weaver et al 2014
Where are we now?

• Focus on much more than crisis resource management skills, for example:
  – Cross-training: in other members’ roles and responsibilities to help create shared mental model
  – Error management training: how to identify potential errors, capture them in the initial phase of error, and diminish their consequences
  – Metacognition training: increasing awareness and understanding of one’s own through processes

(Weaver et al 2014)
Does it work?

- Number of (outdated) review articles
- One in BMJ Quality and Safety from this year
Does it work?

• “Moderate to high-quality evidence” that both classroom-based and simulation-based training interventions improve teamwork processes and patient outcomes
  – 13 studies between 2011-2012 showed improvement in behaviors (Level 3)
  – 10 in clinical care processes or patient care outcomes (Level 4)
Does it work?

• Larger effect sizes were reported for bundled team-training interventions that included:
  – Readiness assessment and preparation
  – Interdisciplinary learning activities
  – Performance support tools (e.g. checklists) to promote transfer of behaviors to daily practice
  – Ongoing measurement and feedback
Where exactly does simulation fit in?

The Joint Commission Journal on Quality and Patient Safety

Teamwork and Communication

Didactic and Simulation Nontechnical Skills Team Training to Improve Perinatal Patient Outcomes in a Community Hospital

William Riley, Ph.D.; Stanley Davis, M.D.; Kristi Miller, R.N., M.S.; Helen Hansen, Ph.D., R.N.; Francois Sainfort, Ph.D.; Robert Sweet, M.D.

- Small cluster randomized clinical trial in 3 community hospitals over 2 years:
  1. Control
  2. TeamSTEPPS didactic training program alone
  3. TeamSTEPPS + in situ simulation
Where exactly does simulation fit in?

• 37% improvement in perinatal morbidity at didactic + simulation site
  – No change in control or didactic alone

• BUT, didactic group participated in one “abbreviated” session vs. didactic + simulation group participated in 11 simulation sessions over 2 year period
The Challenges

• Can be costly (Personnel, equipment, time for instructors and participants)

• May require culture change
  – Medicine is a hierarchy
  – Interprofessional experiences are new to many

• Is domain-specific

• Requires ongoing efforts to limit decay
  – ? Optimal refresher interval for teamwork competencies
Sources

Sources


