



Crew Resource Management

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Objectives

- Discuss the utility of crew resource management in improving safety and quality in the operating room
- Describe the resources required in providing crew resource management for operating room personnel
- Discuss current and future JC regulations regarding CRM



Disclosures

- I have no financial disclosures that are relevant to this presentation
- I am not Dave Gaba but we have worked together for 20 years



Lecture Disclosure

- This is mostly my perspective on history helping to develop and teach CRM
- CRM and simulation
- This is not a complete history of CRM
- It will be “Stanford-centric”
- I am NOT purposefully leaving out the important work of MANY others!



Final Disclosure

- I am not a pediatric anesthesiologist
- Pediatric Vets are those fresh from boot camp!



Birth of Crew Resource Management AVIATION

- First workshop: 1979
- Developed by aviation psychologists and pilots in response to accident and near miss analysis
 - Accidents occurred with “able” planes
 - “Behavioral” problems within the team
 - » Helmreich, Lauber, Foushee, Weiner

Developed Special Training on Decision Making & Teamwork Crew Resource Management (CRM)



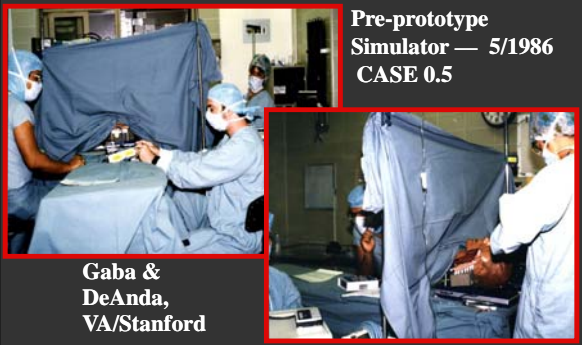
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Mid - 1980's VA / Stanford

- APSF funds simulator development
- Gaba's work on theory (patient safety, accident evolution)
- Early research on decision-making in anesthesiology using simulation



Re-invention of Mannequin-based Interactive Patient Simulation



Pre-prototype Simulator — 5/1986 CASE 0.5

Gaba & DeAnda, VA/Stanford



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CASE 1.2 circa 1988



1988 - 1989 CASE 1.3



Gaba & DeAnda, VA/Stanford

Which eventually led to:



1991 CASE 2.0

Gaba & Williams, VA/Stanford



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How Do Clinicians {e.g. anesthesiologists} Make Time-Critical Decisions?

- In a 1987 paper about "accident evolution" -- based on Perrow's *Normal Accidents* model, we made conjectures about anesthesiologists' cognition



Anesthetic Mishaps: Breaking the Chain of Accident Evolution

David M. Gaba, M.D.,* Mary Maxwell, M.D.,† Abe DeAnda, B.S.‡

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Models of Cognition in Healthcare *{circa 1987}*

- Decision-theory
- Abstract causal reasoning
- Pattern recognition of radiologists/pathologists

...All slow & static...

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Models of Cognition in Healthcare *{circa 1987}*

- This does NOT describe how people work in the OR since they are “complex dynamic worlds”

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Key Characteristics of Complex Dynamic Worlds

(Cook & Woods; Orasanu & Connolly)

- Ill-structured problems
- Complexity & uncertainty
 - Humans don't have an instruction manual
- Dynamism & time stress
- Complex action/feedback loops
- Intrinsic risk & high-stakes
- Shifting, ill-defined, competing goals
 - Multiple players (from different “tribes”)

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Human Performance & Safety in Anesthesia

- Publication of NASA TM on CRM (1984)
- NOVA program: *Why Planes Crash* (1987)
- APSF grant to create ACRM curricula
 - Analogous to aviation CRM
 - As in aviation, simulators used to train
 - Two successful pilot courses (1990)

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Crisis Resource Management

- Modeled after Crew Resource Management in aviation (Foushee, Helmreich, Lauber)
- Made sense to clinicians
 - Medical/technical skills not enough
 - Behavioral skills necessary and teachable
 - Simulation settings = teaching moment

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1989-1991

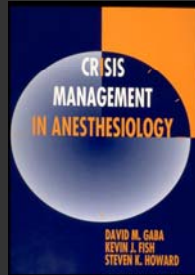
- Steve's anesthesia odyssey begins
- APSF grant to develop Anesthesia Crisis Resource Management course
 - ACRM “transferred” to Harvard in 1992
- Instructor Consortium
 - VA, Harvard, Toronto



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ACRM

- Syllabus published in 1994
- Early ACRM Instructor Courses -- US, Australia, New Zealand, UK
- Similar courses crop up around the world



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CRM/Teamwork Training in Multiple Dynamic Medical Domains

- CRM-based curricula for:
 - OR
 - ICU
 - Emergency Dept.
 - Cardiac arrest teams
 - Delivery room/NICU
 - Cath lab / radiology
 - Field responders
 - Military medicine
 - Ward emergencies
 - Heart Room

Team Management- A Prototypical Picture



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Key Principles of Dynamic Decision Making and Teamwork (CRM)

- Cognitive Components:
 - Know the Environment
 - Anticipate and Plan
 - Use All Available Information & Cross Check
 - Prevent / Manage Fixation Errors
 - Use Cognitive Aids



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Key Principles of Dynamic Decision Making and Teamwork (CRM)

- Team Management Components:
 - Leadership & followership
 - Communication & sharing mental model with rest of team
 - Distributing the workload
 - Calling for help early



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Why Use Simulation For Training CRM?

- Creates an interactive “immersive” activity that re-creates experiences of a real-world environment
 - » To amplify or replace actual experiences
 - » Hard to practice CRM “in the moment”
- Traditional didactic CRM is being done
 - » VA's Medical Team Training

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Deploy and Practice Teamwork Skills

- Experiential exercises force participants to “Walk the walk” not just “talk the talk”
- This takes practice

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Integrating Teamwork & Medical Work

- Team skills executed in context during medical decision & action, with
 - Time pressure
 - Uncertainty
 - Competing goals
 - Perceived risk

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Optimal CRM Training

- Engages participants with clinically & behaviorally challenging experiences
- Allows team to actually **deploy and practice skills, not just “talk”**
 - Integrating behaviors with clinical cognition, decision-making & action
 - Diverse challenges, including behavioral issues

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CRM Training Must Be For a Lifetime

- Career-long combination of modalities as individuals & teams, repeatedly cycling through:
 - Didactics & seminars
 - On-screen simulators & “virtual worlds”
 - Courses in dedicated simulation center
 - In-situ simulations & drills

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Other Industries With High Intrinsic Hazard Use Continuous & Intensive Training via Simulation

Spaceflight Commercial Aviation Military Aviation

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Other Industries With High Intrinsic Hazard Use Continuous & Intensive Training via Simulation

Maritime

Law Enforcement

Fire Fighting



Basic Resources for CRM?

- Learners (all levels & ALL “tribes”)
- Facilitators / teachers
- Space (conference room, in-situ, sim ctr)
- Time (all players in the same space)
- Simulator and an operator (?)
- Disposables (for realistic drills)



Education & Training

- Bringing teacher and learner together
 - Difficult in our system
 - » Education & training lacks priority
 - Humans are reactive not proactive
 - » Production pressure – throughput trumps all
 - Clinicians (teachers) generate \$\$
 - Warm bodies in locations providing patient care



Single-Discipline “Training Crews to Work in Teams”

- Address issues for “crews” from a single discipline (sims do have entire team -- “confederates” play other team members)
 - Logistically simpler
 - Can focus on unique technical, cognitive, and teamwork issues of each discipline
 - Can expose participants to a wide variety of clinical situations & interpersonal challenges
 - BUT.... not real teams



Multi-disciplinary “Combined Team Training”



- Train complete teams of staff who do or might actually work together (in OR, ICU, ED, Delivery Room, Cath Lab, etc.)
 - Trains actual teams to work as a team
 - Encourages cross-discipline understanding and cross-training
 - But... various barriers...



Significant Barriers to Combined-Team Training in OR

- Hard to provide credible surgical work
 - Surgical simulators are:
 - » Limited & available only for a few surgical procedures/fields
 - » Crude for “open” surgery
 - » These barriers are lowering
- Logistically complex (entire OR team)



Single Discipline & Combined Team Approaches Are Complementary

- Single-discipline training particularly suited for trainees
- Combined team training particularly suited for experienced clinicians and/or fixed teams
- Techniques are really complementary -- ideally both should be used



Advantages of In-situ Training

- Probes actual team in actual setting
- Can unmask systems issues in actual clinical care areas
- Conducive to short courses & unannounced mock drills
- Available to all, even without dedicated sim center



Disadvantages of In-situ Training

- Limitations to organize, schedule, and control
- Real clinical areas might be occupied or might be needed on short notice
- Distracting to real care; staff vulnerable to being pulled to duty
- Real clinical supplies are costly



Determining if “CRM Works” Will Be Difficult

- Can it present a meaningful, socially contextual experience? **YES**
- Can it engage learners “as-if” real? **USUALLY**
- Can it teach/assess the target issues? **OFTEN**
- Does it change performance or behavior of individuals or teams? **MAYBE**
- Does it change patient outcome? **HARD TO TELL**



Does CRM Training Improve Safety?

- **For mannequin-based & team simulation**
 - High face validity, survey, & anecdotal support, but we do not know “for sure”
 - Level 1A proof for many applications may be impossible due to logistics and cost
 - Real test requires long-term adoption of comprehensive, integrated model of career-long training, with evaluation over long time horizon



Does CRM Training Improve Safety?

- Aviation does not have Level 1A evidence of CRM’s effectiveness
- CRM is built into the fabric of the aviation industry
- Though mandatory, pilots wouldn’t fly without it



Cultural / Organizational Challenges to CRM’s Impact

- The (real) clinical world must reinforce what is taught in training
 - currently it often does not
- Culture trumps training (always!)
- Much more time spent in real world than in training sessions
- Incentives and disincentives of various kinds play out in the real world



CRM and the Joint Commission



- **Sentinal Event Recommendations**

- Perinatal team training
- Staff team training – ventilated patients
- Address worker fatigue



- **Integration into NPSG's**

- Teamwork and communication



The End