

CREATING A CULTURE OF SAFETY THROUGH SIMULATION

By: Nicole Freeling, SRNA

LEARNING OBJECTIVES

- At the end of this presentation the learner will be able to:
 - Demonstrate an appreciation of safe medication administration
 - Relate the importance of error reporting
 - Identify the types of medication errors that occur in anesthesia
 - Discuss the methods utilized in practice to aid in the prevention of medication errors
 - Discuss the implications of simulation training for medication preparation and administration

- <http://www.youtube.com/watch?v=BFd54Yzg-vo&feature=related>

WORLD HEALTH ORGANIZATION

“To err is human,
to cover up is unforgivable,
to fail to learn is inexcusable.”



MEDICATION SAFETY IN ANESTHESIA

- Institute of Medicine (IOM) estimates that each year 1.5 million patients are injured by medication errors, costing healthcare systems 3.5 billion dollars



TO ERR IS HUMAN

- A report by the IOM in 1999, “To Err Is Human” called to decrease healthcare errors by 50 percent within 5 years.
- This was not achieved:
 - As of 2007 medication administration was primarily given by traditional means.
 - The only change that has been implemented is bar coding on vials.
 - Started in 2004 and phased in over 5 years.

ACCURATE DRUG ADMINISTRATION

- No other aspect of anesthesia is more important.
- Little to no research has been published.
 - Reports dating back to as far as 1978 identify human error in drug administration.



WHY DO MED ERRORS IN ANESTHESIA CONTINUE TO OCCUR?

- Humans are prone to error
 - The medications we administer are usually potent and can have devastating effects on patient safety
- Distraction increases the risk of error
- Stress
- Lack of knowledge
- Underreporting
 - Fear of disciplinary action



WHAT COMPLICATES MEDICATION ERRORS?

- Errors are looked at differently depending on the outcome.
 - Suppose: A child darts out in front of your car and you hit him, but he get up and walks away
 - You may not change or question anything preceding the accident.
 - Suppose: A child darts out in front of your car and you hit and injure or kill the child.
 - You would question what went wrong, and how you could avoid ever having it happen again.

WHAT COMPLICATES MEDICATION ERRORS?

- The same thing happens in medicine:
 - An error that could have potentially occurred but was picked up prior to the incident.
 - May not be identified as a fault in the system.
 - An error that results in a patient with no adverse reaction.
 - May not facilitate active learning and change.
 - An error that results in a patient with an adverse response.
 - Necessitates change in behavior.

CULTURE OF SAFETY

- Data derived from reporting med errors or potential errors can be used to improve the medication process and reduce the risks of future system failures
 - Errors may not be reported because of inherent fear of retribution, punitive actions, and professional humiliation

BLAME FREE CULTURE

- In "Human Error" James Reason advocated a blame free culture as necessary for reducing error
 - Is this reasonable of attainable?



CULTURE OF DENIAL AND EFFORT

- Uses blame for carelessness, forgetfulness, or other character weakness when an error occurs
- Takes emphasis off the faulty system and puts blame on the individual – thus allowing for continued potential for error in the future



WHAT BLAME DOES TO A SAFETY CULTURE

- Blame has an emotional context
- Blame shifts energy and focus
- Blame creates bias
- Blame inhibits creativity
- Blame is expensive
- Blame can kill

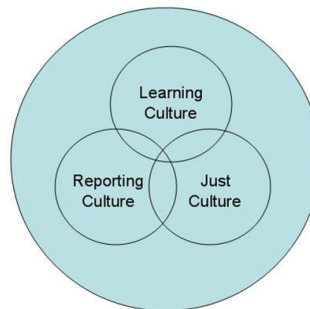


A JUST CULTURE

- One that promotes patient safety, blame would be reserved for egregious behaviors, such as leaving an anesthetized patient unattended, or working under the influence



Safety Culture



MODEL FOR A JUST CULTURE

- Researchers have looked towards the aviation model of safety
 - Accidents are a result of a faulty system design
 - Accidents and incidents are an opportunity to redesign the workplace and improve safety
 - Embraces a healthy reporting system



CULTURE OF SAFETY

- Human errors occur when a system relies on memory
 - Designing simplified systems with safety nets for error, mistakes can be minimized or avoided



CULTURE OF SAFETY

- The emphasis of a blame free culture will:
 - Promote error reporting
 - Identify faults in the system
 - Reduce the incidence of error
- Health care organizations must establish sound techniques for drug administration, teach them to their residents and provide role models in their use



“Knowledge and error flow from the same mental sources, only success can tell one from the other”

-Mach



ERROR DEFINED

- An Error is something done incorrectly through ignorance or inadvertence; it is a fact of the human condition (McDowell, Ferner & Ferner, 2009).
 - In other words, humans are fallible.



ERROR DEFINED

- Errors are unintentional acts that were either devised or executed improperly.
 - A nurse that has made a mistake has, in realizing her mistake, had all the punishment and discipline and suffering which are desirable.
 - Anything beyond that should be constructive in nature



MEDICATION ERROR

- An error in the prescription, dispensing or administration of a medication that results in the patient failing to receive the correct drug or proper dosage
 - Does not always result in injury



MISTAKE

- An error in formulating a plan – it is inadequate
 - “Mistakes occur when people undertake non-routine tasks that require conscious (supervisory) attention, i.e. they require problem solving, judgment, diagnosis, or theoretical knowledge, or are outside the previous experience of the person undertaking them” (McDowell, Ferner & Ferner, 2009).



MISTAKE

- This is often seen with the novice anesthetist. Even what may be considered routine to the mentor is foreign to the student anesthetist (SRNA) and therefore prone to error.
 - Lack of knowledge compounds this issue with the SRNA and can result in poor planning or a good plan applied to the wrong situation.

A SLIP

- An error in executing a plan can be defined as a slip where one or more step in the plan is executed incorrectly.
- Skill-based, occurring during the execution of smooth, automated and highly integrated tasks that do not require conscious control or problem solving

A LAPSE

- One or more step is inadvertently omitted
 - Memory failure
- Distraction and inattention play a role in this type of error, as well as lack of knowledge and experience for the novice.
 - Forgetting to relax the patient during a procedure that requires relaxation is a lapse that could be the result of lack of knowledge in the novice or distraction in the experienced.

LATENT ERRORS

- Errors waiting to happen are potential threats to patient safety.
 - They are the result of a system in place that has the potential to be unsafe. These types of errors need to be detected and analyzed but in the punitive culture we have in medicine, these along with actual errors are often not disclosed.

ERROR REPORTING

- Error reporting is considered necessary to promote changes in practice to achieve the desired goal of improved safety for patients.
 - In order for this to occur we need to look at the culture of safety in healthcare and how we can make the shift from a punitive environment to one that is proactive in prevention

CONTRIBUTING FACTORS

- Factors that have been identified in the research that have been present during medication errors in anesthesia
 - Inattention
 - Haste
 - Distraction
 - Inexperience
 - Stress
 - Fatigue



THEMES IN ANESTHESIA

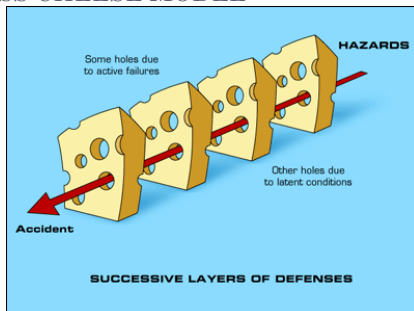
- Common themes to medication errors in anesthesia that have been identified in the research
 - Dosing errors
 - Drug substitution
 - Syringe swap
 - Ampule swap
 - Omission



SWISS CHEESE MODEL

- Reason's "Swiss Cheese Model"
 - The holes in a stack of imaginary slices happen to align so that one can see right through the pile
 - Describes the chain of error causation when a series of seemingly minor events combine by chance and result in an accident.
 - The prescriber, the person giving the drug, lack of communication, environment, formulation or presentation of the drug or the patient may all contribute to the medication error

SWISS CHEESE MODEL



PREVENTING ERRORS IN ANESTHESIA PRACTICE

- Looking back in the history of anesthesia, it is one of the few specialties that have a system in place that promotes a safety culture.
 - It is a work in progress.



ERROR PREVENTION IN ANESTHESIA

- Beginning in the 1970's, much public attention was brought to the safety of anesthetic practice due to the high mortality rate associated with it.
 - Researchers looked toward the aviation-inspired critical incident analysis technique for guidance to develop a plan of action.
 - In 1984 the groundwork for this action plan came to life and began the inception of what is known today as the Anesthesia Patient Safety Foundation.

ANESTHESIA PATIENT SAFETY FOUNDATION

- This foundation was formally launched in late 1985 as an independent, non-profit organization.
- Funded by the ASA and corporate sponsors it is a multidisciplinary collaboration with the ultimate goal of patient safety in anesthesia.
- The ASPF takes a non-punitive look at safety issues that occur in anesthesia, provides insightful research and evidence based suggestions for practice change.

ASPF SUGGESTED PRACTICE CHANGES

- Take control as an organization and set safety standards rather than waiting for a regulatory board to dictate them
 - Promotes ownership, commitment and proactive behaviors.
- Take the emphasis off blame
 - Individuals would be more willing to contribute
 - Results in an informed culture.



ASPF SUGGESTED PRACTICE CHANGES

- Near misses and accidents must be reported
- Creating an environment of trust to encourage team members to provide essential safety information.
- Remain flexible and adapt to change when deficiencies develop
 - An important step in the process.



ASPF SUGGESTED PRACTICE CHANGES

- Ultimately a safety culture is an evolving process that can always be improved upon.
- As long as we realize this and learn from our mistakes we can work towards improving patient safety.



ASPF CONSENSUS CONFERENCE

- In January 2010, the ASPF held a consensus conference addressing medication safety.
 - Their proposal was a new paradigm to reduce medication errors based on Standardization, Technology, Pharmacy/Prefilled/Premixed, and Culture (STPC).



ASPF CONSENSUS RECOMMENDATIONS

- The following is the consensus recommendations for improving medication safety in the operating room:
 - Standardization
 - Technology
 - Pharmacy/prefilled/premixed
 - Culture



STANDARDIZATION

- High alert drugs should be available in standardized concentrations/dilutents prepared by pharmacy in ready-to-use (bolus/infusion) form that is appropriate for both adult and pediatric patients.
- Infusions should only be delivered by an electronically-controlled smart device containing a drug library
- Ready-to-use syringes and infusions should have standardized fully compliant machine-readable labels



STANDARDIZATION

- Additional ideas:
 - Interdisciplinary and uniform curriculum for medication administration safety to be available to all training programs and facilities
 - No concentrated versions of any potentially lethal agents in the operating room
 - Required read-back in environment for extremely high alert drugs such as heparin

STANDARDIZATION

- Additional ideas (continued):
 - Standardized placement of drugs within all anesthesia workstations in an institution
 - Convenient required method to save all syringes and drug containers until case concluded
 - Standardized infusion libraries/protocols throughout an institution
 - Standardized route-specific connectors for tubing (IV, arterial, epidural, enteral)

TECHNOLOGY

- Every anesthetizing location should have a mechanism to identify medications before drawing up or administering them (bar code reader) and a mechanism to provide feedback, decision support, and documentation (automated information system)



TECHNOLOGY

- Additional ideas:
 - Technology training and device education for all users, possibly requiring formal certification
 - Improved and standardized user interfaces on infusion pumps
 - Mandatory safety checklists incorporated into all operating room systems

PHARMACY/PREFILLED/PREMIXED

- Routine provider-prepared medications should be discontinued whenever possible
- Clinical pharmacists should be a part of the perioperative/operating room team
- Standardized pre-prepared medication kits by case type should be used whenever possible

PHARMACY/PREFILLED/PREMIXED

- Additional ideas:
 - Interdisciplinary and uniform curriculum for medication administration safety for all anesthesia professionals and pharmacists
 - Enhanced training of operating room pharmacists specifically as perioperative consultants
 - Deployment of ubiquitous automated dispensing machines in the operating room suite (with communication to central pharmacy and its information management system)

CULTURE

- Establish a “just culture” for reporting errors (including near misses) and discussion of lessons learned
- Establish a culture of education, understanding, and accountability via a required curriculum and CME and dissemination of dramatic stories in the APSF Newsletter and educational videos
- Establish a culture of cooperation and recognition of the benefits of STPC within and between institutions, professional organizations, and accrediting agencies.

ADDITIONAL SAFETY MEASURES

- Label on any drug ampule or syringe should be carefully read before a drug is drawn up
- Syringes and ampoules should be labeled legibly with the correct information
- Syringes should be always labeled



ADDITIONAL SAFETY MEASURES

- Formal organization of drug drawers and workspace should be used with attention to:
 - Tidiness
 - Position of ampoules and syringes
 - Separation of similar or dangerous drugs
 - Removal of dangerous drugs from operating room theatres

ADDITIONAL SAFETY MEASURES

- Labels should be checked specifically with a second person or a device (bar code reader) before a drug is drawn up or administered
- Errors should be reported and reviewed
- Packaging and presentation of drugs contribute to error and should be avoided where possible

ADDITIONAL SAFETY MEASURES

- Drugs should be presented in pre-filled syringes whenever possible
- Color coding by class of drug according to an agreed national standard should be used
- Coding by syringe position or size should be used

LIMITATIONS

- It has been agreed that in order to achieve a safer environment individual anesthesia providers will have to surrender some of their “independence” and will need to adapt their personal preferences, styles and habits into more standardized practice patterns, utilizing more standardized medications and relying more on technology.

HOW DOES SIMULATION TRAINING TIE INTO THIS?

- **“Invasive procedures are difficult to learn because they require an understanding of complex three-dimensional anatomy and tactile skills... This inherent complexity inevitably leads to a high complication rate and steep learning curve”**
- **This quotation highlights the challenge of learning technical skills in clinical practice**

©Castanelli, 2006

WHAT IS SIMULATION TRAINING?

- Simulation is defined as any activity that reproduces a task environment with sufficient realism to serve a desired educational goal



WHAT IS SIMULATION TRAINING?

- It is an instructional strategy that focuses on providing trainees the opportunity to develop required competencies and to receive feed back
 - Achieved by practicing in an environment that simulates actual operational conditions
 - Outcome is to improve both technical and non-technical skills

WHAT IS SIMULATION TRAINING?

- Modalities include but are not limited to
 - Role playing scenarios
 - Task trainers
 - High-fidelity, robotic simulation systems



HIGH FIDELITY SIMULATION

- Robotic simulator
 - Ability to replicate human physiology in a realistic manner
 - Can interface with monitoring equipment and anesthesia machines
 - Learners can manage events, make errors in decision making and follow the event to the natural conclusion
 - The students learn from mistakes without harming a patient

SIMULATION AT NAZARETH

- At Nazareth we utilize a blended approach to simulation from low-fidelity, to task trainers, to high-fidelity simulation
 - Low fidelity
 - Medication set up, room set up, machine check, pre-operative interview process
 - Task trainers
 - Intubation manikins, spinal trainers
 - High fidelity SimMan
 - Routine intubation sequencing to critical event management

SIMULATION AT NAZARETH

- We utilize senior level students as mentors
 - Research has shown that this provides benefit to both senior level students and junior level
 - Junior level students reported decreased anxiety, an appreciation for additional role models and an increase in collegiality among students
 - Senior level students reported increased leadership skills and sense of competency

BARRIERS TO SIMULATION

- Barriers to simulation noted in the literature
 - Cost ranges from \$27,000 to \$245,000 for the initial systems
 - Cost of yearly up-keep and staff training
 - Time commitment for scheduling and instructors
 - Getting students to buy into the realism of the training

SIMULATION

- In order for simulation to be effective it must:
 - Offer educators a methodology that fosters critical skills not readily acquired through traditional approaches
 - Present learning opportunities not possible in the classroom or clinical arena
 - Should assist educators in addressing external realities that impinge on the formation of safe, competent nurse anesthesia graduates

SIMULATION TRAINING IN THE NOVICE NURSE ANESTHETIST

- Clinical anesthesia training presents unique challenges
 - Requires rapid assimilation of both cognitive and technical skills
 - This is necessary to competently respond to critical events
 - Current operating room-based training may result in significant gaps
 - Training may lack in critical incidents
 - It is difficult to assess performance

CRISIS RESOURCE MANAGEMENT IN THE NOVICE

- Critical events are the leading cause of adverse patient outcomes
 - Standardized curriculum in critical events properly prepares the novice
 - Critical events in the clinical area are infrequent and not suitable for active participation of students
 - Crisis situation is simulated without jeopardizing patient safety

HIGH FIDELITY SIMULATION IN THE NOVICE

- Safe and controlled environment
- Provides for direct observation to allow for competency evaluation
- Research has shown that high-fidelity simulation training leads to accelerated acquisition of event-specific skills
- Eliminated gaps in experience
- Provides an on-demand learning environment without compromising care
- The literature suggests that experiential training results in greater retention compared to didactic teaching

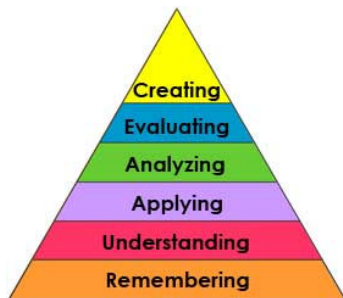
SIMULATION TRAINING AND COMMUNICATION

- The operating room staff has evolved into a complex, multidisciplinary team that requires a high degree of competency and interpersonal communication skills
 - Simulation can provide opportunity to develop these skills
 - Simulation fosters situation awareness, decision making and team communication

SIMULATION

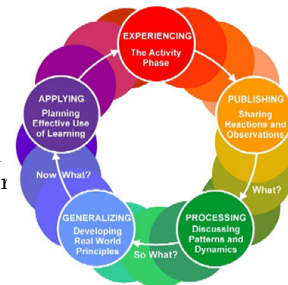
- Simulation enhances higher order skills
 - Cognitive skills are hierarchical
 - The student must attain lower level skill prior to attempting more complex behaviors
 - Bloom's taxonomy offers a useful classification of the intellectual processes essential to learning
 - Simulation scenarios can be designed to emphasize the higher order skills

BLOOM'S TAXONOMY



SIMULATION

- Experiential learning may be one of the most effective means to help students gain the most from their training
 - Knowledge can be produced through the transformation of experience



REFLECTION

- Often missed in the busy clinical areas, reflection is critical
 - Simulation offers an opportunity for students to reflect in a structured fashion
 - This assists the student to learn how to learn from their experiences
 - They gain awareness of their strengths and weaknesses



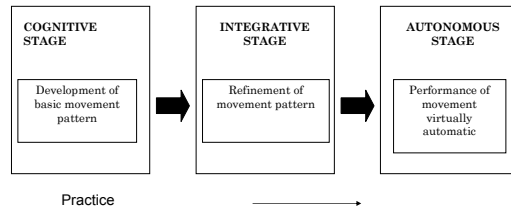
SIMULATION

- Simulation aids in the assessment of student performance
 - Sessions can be videotaped and reviewed
 - Promotes self-awareness
 - Helps validate clinical issues
 - Allows faculty to assist the student's active reflection of problem behaviors
 - Student and faculty can work together to formulate a remediation plan

SIMULATION AND ANESTHESIA SAFETY

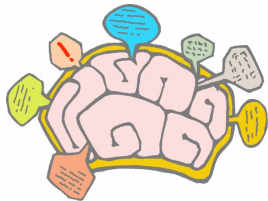
- Simulation promotes anesthesia safety
 - Tentative but growing evidence suggests that simulation training accelerates the speed and quality of student learning and may enhance our capacity to prevent human error
 - Fitts and Posner theory of motor skill acquisition states that there are three stages
 - Cognitive
 - Integrative
 - Autonomous

FITTS AND POSNER'S THREE STAGE MODEL



COGNITIVE

- Cognitive – the initial experience where the learner intellectualizes the task
 - Performance is erratic
 - Procedure is carried out in distinct steps



INTEGRATIVE

- Integrative – knowledge is translated into appropriate motor behavior
 - Learner still thinks about the steps, but with practice and feedback performance becomes more fluid



AUTONOMOUS

- Autonomous – learner performs task smoothly and continuously, no longer having to think about the steps involved
 - To maximize patient safety the cognitive and integrative stages should occur before a learner practices on a patient



SIMULATION AND ANESTHESIA SAFETY

- Being at the autonomous stage allows the learner to devote attention to other aspects of clinical performance
 - Gain new knowledge and clinical decision making
 - We can only attend to a finite amount of information or stimuli at any given time

SIMULATION AND ANESTHESIA SAFETY

- Deliberate practice
 - Ericsson described the concept of deliberate practice as being fundamental to procedural learning
 - Repetitive performance of intended cognitive or psychomotor skills in a focused domain, coupled with rigorous skills assessment that provides feedback that results in increasingly better skill performance in a controlled setting
 - Motivation and feedback are essential for continued improvement in performance



SIMULATION AND ANESTHESIA SAFETY

- Applying these factors into the basic training of the novice anesthetist can increase patient safety while accelerating the novice's learning curve
 - Basic skills such as medication set up and induction sequence should be automated by the time the novice enters the clinical environment



SIMULATION AND ANESTHESIA SAFETY

- This allows for more attention to be available for higher level skill acquisition
- The novice will be familiar with the operating room surroundings
- Familiar with medications, dosages and color coding of syringes



SIMULATION AND ANESTHESIA SAFETY

- A standardization of the medication set-up and placement on the workstation is stressed
- Safe medication handling and preparation is taught
- High-frequency simulation allows for the student to learn the effects of the potent anesthetics used daily in anesthesia



SUMMARY

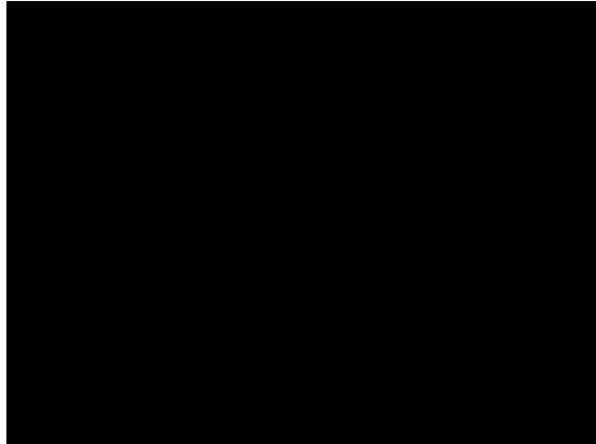
- Medication errors are still a prominent problem in healthcare and can be particularly devastating in the specialty of anesthesia
- We need to promote a “just culture” to enhance error reporting in order to effectively reduce medication errors



SUMMARY

- The APSF has recommended adding medication safety into the nurse anesthesia curriculum
- Simulation has been reported as a valuable tool to effectively reduce error in the novice anesthetist
- Focusing on standardized medication simulation can accelerate student learning





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