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Making Safe Enteral Tubing Connections

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Objectives

1. Discuss how tubing misconnections occur

2. Identify safety concerns associated with tubing connections

3. Identify best practices for safe enteral feeding at the patient bedside

“It may seem a strange principle to enunciate as the very first requirement in a hospital that it should do the sick no harm.”

What do we know about errors in healthcare?

*To Err Is Human: Building a Safer Health System*

“98,000 hospitalized Americans die each year as a result of errors in their care”

The Healthcare System

- **System:** a set of interacting elements to achieve a common aim.
- These elements may be both human and non-human
- Errors are due to a convergence of multiple contributing factors
- Prevention requires a systems approach

*(IOM, 2000)*
Systems Failure in Action

- Imperfect Human Performance
- Education does not recognize cognitive models
- Device is distributed
- Under-reported events
- Company X - Marketing designs
- No other device available
- Organization does not anticipate danger of common connectors

Swiss Cheese Model
Reason, 1990

Systems View of Nursing

- Organizational
- Technical
- Human Factors

Dangerous Situation

Return to Normal

Near Miss

Adequate defenses

Developing Errors

ERROR (Inadequate Defenses)
Connecting Tubing – a high risk activity

- Infusion and monitoring systems in healthcare are physiologically not compatible – many cause death if accidentally connected to another

- Infusion systems rely upon a single, universal connector- the luer tip/small bore connector

- Routine tasks such as connecting tubing are at risk for “automatic mode errors”
Multiple Alerts from Safety Organizations

- FDA - most recent 2005
- ECRI – 1986 and 2006 reissued

US Efforts

- AAMI standard passed in 1996 with specific guidelines for feeding tubes – not luer lock compatible
- Standard renewed by AAMI in 2005 - “in force”
- AAMI committee working on revision now
- ANA resolution
- California Legislation for 2011
Tubing and catheter misconnection errors are an important and under-reported problem in health care organizations. In addition, these errors are often caught and corrected before any injury to the patient occurs. Given the reality of and potential for life threatening consequences, increased awareness and analysis of these errors—including averted errors—can lead to dramatic improvement in patient safety.

European Efforts

- International Organization for Standardization
  Paris April 2006 - sent back to AAMI

- European standards committee technical task force February 2006
International Examples

1 “The patient became unwell and unresponsive after (oral) dipyridamole had been given via a central intravenous (PICC) line. Observations were unattainable and suction was given. The medical team was fast bleeped as the patient was obviously deteriorating. The patient died whilst doctors were present.” Outcome: death

2 “Patient given enteral feed down Hickman line in error. Patient had severe back pain, reduced oxygen concentration in blood, increased pulse as fat embolus entered subclavian vein leading to the heart and lungs.” Outcome: severe harm

3 “Post lung transplant patient complaining of sudden onset of flushing and heavy sensation in chest. Found that oral cyclosporin was given IV via central line.” Outcome: moderate harm

A Review by USP of More than 300 Cases:

- Intravenous infusions connected to epidural lines, and epidural solutions (intended for epidural administration) connected to peripheral or central IV catheters.

- Bladder irrigation solutions using primary intravenous tubing connected as secondary infusions to peripheral or central IV catheters.

- Infusions intended for IV administration connected to an indwelling bladder (foley) catheter.
A Review by USP of More than 300 Cases:

- Infusions intended for IV administration connected to nasogastric (NG) tubes.
- Intravenous solutions administered with blood administration sets, and blood products transfused with primary intravenous tubing.
- Primary intravenous solutions administered through various other functionally dissimilar catheters, such as external dialysis catheters, a ventriculostomy drain, an amnio-infusion catheter, and the distal port of a pulmonary artery catheter.

Literature Search

First documented misconnection 1972 (Wallace)
What is Human Factors Science?

- Cognitive Psychology and Engineering
  - The way we think and problem solve
- Ergonomics
  - How we work with tools and the environment
- Informatics
  - Information
- Systems Analysis
  - How we interact in organizations and with others

Human Factors: Error Modes

- Automatic Mode
  - Slips
  - Lapses
- Non Automatic Mode
  - Mistakes
Human Factors: Automatic Mode Errors

Stages of cognition:
1) Planning - gather information
2) Storage – process information
3) Execution – make a decision

Automatic Mode Errors

- Occur in the execution stage
- Are failures of actions going as intended
- Occur in common and familiar functions in familiar surroundings and are effortless and rapid
- Thinking is under “attentional control” – we only pay attention when there is a change
- Are errors that are unintentional and may not be recognized at the time

Reason 1990
Human Factors Issue

- In “automatic mode” errors are made without the participant’s knowledge
- Slips
  - Locking the keys in the car
  - Dialing the wrong number
  - Putting the milk in the cabinet and cereal in the refrigerator

Examples of Slips in Healthcare

- Free flow intravenous tubing
- Needle-less systems
- Double checks
Inattentive Blindness

“Look but fail to see"

The more familiar the color, shape and type, the more likely we are to “similarity match”

Distractions

Medication errors; experience of the United States Pharmacopeia (USP) MEDMARX reporting system.

Santell JP, Hicks RW, McMeekin J, Cousins DD

From 154,816 medication error reports:

Performance deficit and procedure/protocol not followed were consistently identified as causes of error. Distractions and workload cited as contributing factors.
United States Pharmacopeia (h1066i)
Physical Environments That Promote Safe Medication Use

- This proposed new general information chapter describes optimal physical environment guidelines that promote accurate medication use and improve the performance of persons involved in the medication use process (e.g., procurement, prescribing, transcribing, order entry, preparation, dispensing, and administration of medications) in any practice setting. This chapter focuses on one aspect of the medication use system: the characteristics of the physical environment.

Is Color Coding a Valid Safety Practice in Healthcare?

- Must be significantly different from the rest of the display.
- Non stereotypical meanings:
  - red = stop
  - red = hot
  - yellow = caution
  - blue = cold
- Most people can only easily discriminate between 5 and 6 colors
- Color is not perceptible under low-light conditions
- Redundant coding - a traffic light uses color and location
Institute for Safe Medication Practices

- Purple is not an official standard for either enteral feeding equipment or PICC lines

An epileptic patient who was supposed to receive oral KEPPRA (levetiracetam) liquid via a PEG tube instead received it IV via a PICC (peripherally inserted central catheter) line........... It’s possible that the experienced nurse who incorrectly gave the drug IV was confused by a purple color system available for enteral feeding equipment. The color is identical to the purple coloring used for the patient’s PowerPICC line.

Event Summary

Inadvertent Tubing Misconnection

Feeding in syringe, intended for enteral administration, was connected to PICC line
Significant Issues Identified

- Automatic mode error
- Distractions / interruptions
- Physical environment
- Physical design of connectors

Physical Environment

- Families present at patient bedsides
- Minimal stimulation (dark, quiet, swaddled infants)
- Radio frequency phones provided to each nurse for ease of communication
The Nurse

- Significant experience
- Unit preceptor
- The “go-to” team member
- Emotionally distraught
Be A.L.E.R.T.

A Practical Approach to Safe Enteral Feeding at the Bedside

Collaborative initiative between Nestlé Nutrition and A.S.P.E.N. promoting safe enteral feedings

Be A.L.E.R.T. Acronym includes 5 easy steps to assist the nurse in administering enteral feedings more safely at the bedside

Designed to minimize the risk of adverse events that can be associated with serious harm
Be A.L.E.R.T.

- **A** - Aseptic Technique
- **L** - Label Enteral Equipment
- **E** - Elevate HOB > or = 30 degrees
- **R** - Right Patient, Right Formula, Right Tube
- **T** - Trace All Lines and Tubing Back to Patient
Be A.L.E.R.T.

- Where can I get the Be A.L.E.R.T. poster?
  - Pdf on A.S.P.E.N. website
    www.nutritioncare.org
  - Contact Nestle Healthcare Nutrition District Manager
  - The Nestle call center for posters
    1-800-422-ASK2

Thank you!