Medical Errors Management and Early Warning for the Medical Physicist

David Hintenlang, University of Florida

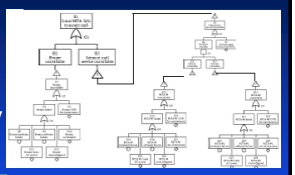
Types of "Errors"

- Human errors vs.
- Medical errors vs.
- Medical events

To err is human, to forgive is divine...

Approaches of other industries:

- Nuclear Power
- Aviation
- Cruise Ship Industry



Commercial Aviation Safety

- High profile accidents
- Long period of experience and study
- Evolutionary changes in culture
- Enviable safety record

Concepts applicable to Health Care and Medical Physics

- Review and analysis of incidents
- Emphasis on team coordination
- Procedural tools
- Identification of Error Chains

Review and Analysis of Incidents

- Learning from experience
- Regulatory reporting requirements
- Centralized repository
- Incentivized no-fault reporting
- Analysis
- Dissemination

Required Reporting of Major Incidents

Aviation	Radiology/Radiation Therapy
Federal Aviation Administration	*Medical Events: State/NRC*
National Transportation Safety Board	*Sentinel Events: Joint Commission*

Centralized Reporting of Incidents

Aviation	Radiology/Radiation Therapy
Federal Aviation Administration	
National Transportation Safety Board	
National Aeronautics and Space Administration	

Voluntary No-Fault Reporting

Aviation	Radiology/Radiation Therapy
NASA – Aviation Safety Reporting System	

Incentivized No-Fault Reporting

- ASRS – Aviation Safety Reporting System
- Voluntary reporting
- Maintains confidentiality
- Analyzes data
- Disseminates to Community

Elements of Safety Reporting System

- Voluntary Submission
- Submitters identity is confidential
- Incentive – Immunity from enforcement actions
- Encompasses all stakeholders
- Basis for human factors research
  - (source of 2/3 incidents)

- Not limited to regulatory violations
- Includes incidents / near misses
- Observations of unsafe practice

Parallels in Medical Physics?

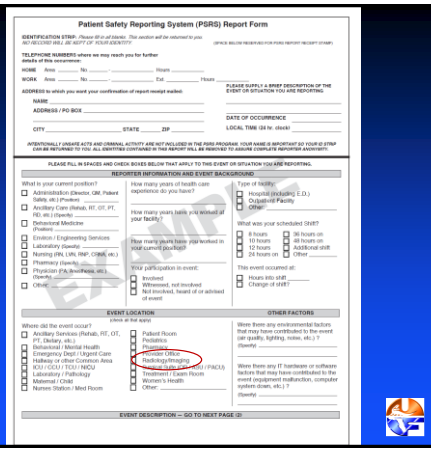
- Need recognized and discussed at various meetings
- AAPM recognizes the need
  - Working with ASTRO and others towards addressing the need

AAPM Response to NY Times Article (March 2011)

- In summary, AAPM believes that patient safety in the use of medical radiation will be increased through:……..; a consistent and accessible national event reporting/recording system; and …….

In Development ?

- Patient Dose Index Registry
- NASA has a version of ASRS available to health care professionals - PSRS


Patient Safety Reporting System (PSRS) Report Form

IDENTIFICATION STRIP: Please fill in all blanks. This section will be returned to you. NOT RECORDED AND WILL BE KEPT OF YOUR IDENTITY.

TELEPHONE NUMBERS where we may reach you for further details of this occurrence:

HOME Area ____ No. ____ - ____ Hours ____

WORK Area ____ No. ____ - ____ Ext. ____ Hours ____

ADDRESS to which you want your confirmation of report receipt mailed:

NAME

ADDRESS / PO BOX

CITY STATE ZIP

PLEASE SUPPLY A BRIEF DESCRIPTION OF THE EVENT OR SITUATION YOU ARE REPORTING.

DATE OF OCCURRENCE

LOCAL TIME (24 hr. clock)

INTENTIONALLY UNSAFE ACTS AND CRIMINAL ACTIVITY ARE NOT INCLUDED IN THE PSRS PROGRAM. YOUR NAME IS IMPORTANT SO YOUR ID STRIP CAN BE RETURNED TO YOU. ALL IDENTITIES CONTAINED IN THIS REPORT WILL BE REMOVED TO ASSURE COMPLETE REPORTER ANONYMITY.

PLEASE FILL IN SPACES AND CHECK BOXES BELOW THAT APPLY TO THIS EVENT OR SITUATION YOU ARE REPORTING.

REPORTER INFORMATION AND EVENT BACKGROUND

What is your current position?
- ☐ Administration (Director, QM, Patient Safety, etc.) (Position) _____
- ☐ Ancillary Care (Rehab, RT, OT, PT, RD, etc.) (Specify) _____
- ☐ Behavioral Medicine (Position) _____
- ☐ Environ / Engineering Services
- ☐ Laboratory (Specify) _____
- ☐ Nursing (RN, LPN, RNP, CRNA, etc.)
- ☐ Pharmacy (Specify) _____
- ☐ Physician (PA, Resid/Fellow, etc.) (Specify) _____
- ☐ Other _____

How many years of health care experience do you have? _____

How many years have you worked at your facility? _____

How many years have you worked in your current position? _____

Your participation in event:
- ☐ Involved
- ☐ Witnessed, not involved
- ☐ Not involved, heard of or advised of event

Type of facility:
- ☐ Hospital (including E.D.)
- ☐ Outpatient Facility
- ☐ Other _____

What was your scheduled Shift?
- ☐ 8 hours
- ☐ 10 hours
- ☐ 12 hours
- ☐ 24 hours on
- ☐ 36 hours on
- ☐ 48 hours on
- ☐ Additional shift
- ☐ Other _____

This event occurred at:
- ☐ Hours into shift
- ☐ Change of shift?

EVENT LOCATION (check all that apply)

Where did the event occur?
- ☐ Ancillary Services (Rehab, RT, OT, PT, Dietary, etc.)
- ☐ Behavioral / Mental Health
- ☐ Emergency Dept / Urgent Care
- ☐ Hallway or other Common Area
- ☐ ICU / CCU / TCU / NICU
- ☐ Laboratory / Pathology
- ☐ Maternal / Child
- ☐ Nurses Station / Med Room
- ☐ Patient Room
- ☐ Pediatrics
- ☐ Pharmacy
- ☐ Provider Office
- ☐ Radiology/Imaging
- ☐ Surgical Suite (OR / PACU)
- ☐ Treatment / Exam Room
- ☐ Women's Health
- ☐ Other: _____

OTHER FACTORS

Were there any environmental factors that may have contributed to the event (air quality, lighting, noise, etc.) ? (Specify) _____

Were there any IT hardware or software factors that may have contributed to the event (equipment malfunction, computer system down, etc.) ? (Specify) _____

EVENT DESCRIPTION – GO TO NEXT PAGE ⇨

EXAMPLE

University of Florida

Centralized Reporting System provides

- Honest indicators of industry performance
- Evaluation of trends and management
- Opportunity to learn from “our” mistakes – without making them

University of Florida

Emphasis on Team Coordination

- Maximize team & system
- Reduces individual importance
- Safety is not a solely individual responsibility

University of Florida

Team Effort

- Human Factors
- Reduces the consequences of “rogue” personalities

CRM – Crew Resource Management

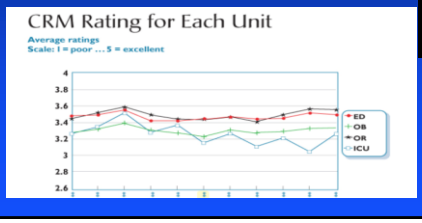
- Utilized to minimize human error
- Optimizes use of available resources, equipment, procedures & people
- Emphasis
  - Not on technical knowledge and skill
  - Cognitive and interpersonal skills
- Interpersonal communication
- Leadership
- Decision making

CRM Strategies & Tools

- Flatten hierarchical order
  - Enhanced feedback by junior team members to senior members
  - First names used during normal procedures
  - Alternating roles
  - Common Knowledge
- Responsibility: shifts from individual to corporate organization

CRM for Healthcare

- Recognized benefits are being adapted to healthcare
- Books and Pamphlets
- Commercial Training Courses



Procedural Tools & Discipline

- Training
- Checklists
- Sterile Console (Cockpit)

Training

- Organizational responsibility
  - CRM and oversight of individual
- Recurrent training
  - Licensure
  - MOC
  - "Applications" or service engineers
- Restricted duties enforced by organization for those lacking
- Other members of health care team?

Checklists

- Ensure proper order and execution of complex procedures
- Types
  - Memory aid
  - Read and Do
  - Challenge and Response
- AAPM Working Group on Checklists

ROBERT BOISSONEAULT ONCOLOGY INSTITUTE
HDR TREATMENT REVIEW/PHYSICS SERVICE

Charts of patients receiving high dose rate brachytherapy (HDR) are reviewed by physics after each treatment fraction to ensure that the treatment was carried out in accordance with the written directive and that all facets of the HDR quality management program were followed.

Patient Name: _____ No. _____

FRACTION NUMBER	1	2	3	4	5	6	7	8	9	10
Date of treatment fraction										
Patient Name verified by two methods										
Patient I.D. Face Photo in Chart										
Prescription client , complete and signed by physicists (on Flow Sheet and Rx page)										
Isodose Rx point corresponds with written directive										
Source activity at implant date (Computer and HDR unit printout) agrees with decayed activity from calibration data.										
Step size on isodose plan agrees with treatment step size										
Number of catheters planned = Number of catheters treated										
Calculated dwell times at each position (plan) match treatment dwell times (tx printout)										
Total treatment time calculated (plan) matches total treatment time delivered (tx printout)										
Reference Distance is appropriate for implant type. Standard length 995 for Lung: 1500 for Gyn; 1321 for Lingotip										
Length of indexer to dwell position 1 agrees (plan vs. tx printout)										
Isodose plan signed by the physicists										
Treatment printout signed by the physicists										
Double check form in chart agrees with total treatment time to within ±10%										
Negative patient survey documented after treatment complete										
Confirm presence of bail out container, long forceps										
Reviewed By										
Date										

✔ = acceptable N/A = not applicable Note = note sent to appropriate person

Remarks:

To be useful:

- Readily available
- Thoughtfully reviewed
  - Requires more than a rote check or click of a mouse

Sterile Cockpit Rule

- Refrain from non-essential talk during critical operations
- Designed to eliminate unnecessary distractions
- Many control consoles are burdened with distractions (i.e. phones)

Lessons Learned from Review

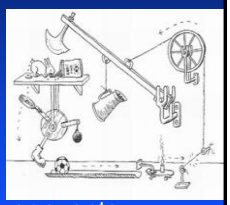
- Accidents/Errors rarely are the result of a single unrecoverable event.
- Evolve through a series of events – Error Chain
- Typically there is ample opportunity to
  - Recognize a developing error chain
  - Break a link of the error chain

- Accidents/Events only infrequently are the result of a single cause

- Most have multiple root causes, or are the result of a combination of events.

Error Chain

- Series of *independent* events that contribute to a dangerous condition.
- Clearly there are many combinations best characterized after the fact.



Recognition of these patterns or events.

Eastern Flight 401, 1972

- New York to Miami flight, uneventfully approaching Miami
- Landing gear extended on approach
- Landing checklist : Captain notices nose gear down light not illuminated
- Gear lever position verified
- Instructed to go-around, raised gear, circled and climb to 2000 ft

- Flight Engineer troubleshooting light
- Autopilot engaged at 2000 ft so Captain can investigate
- First officer further disassembled bulb fixture
- Flight Engineer verifies gear down
- Autopilot disengaged (inadvertant override)
- descended at 200 fpm to 900 ft., Called by ATC
- Radio altimeter alarms
- Aircraft impacts Everglades with total break-up

CRM Failure?

- 3 man crew fixation on minor problem
- Plane was flyable – yet no one was flying it!

Opportunities to break the Error Chain?

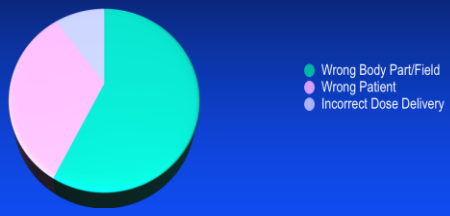
- Designate one individual to work on problem, someone to fly the plane
- Ignore once gear verified down
- ATC notification of altitude loss
- Less cockpit activity would not have disengaged autopilot
- Maintain situational awareness

ASRS Report

- GA Aircraft gear did not retract on take-off
- Pilots cycled gear handle
- Checked circuit breakers, electrical busses, etc.
- Initially one pilot was flying, one working on problem
- Soon both were working on the problem
- Senior pilot recalled parallel to Flt 401 and recognized no one was actually flying.
- Error Chain broken and an uneventful landing was made

Medical Events

FI 2008-2011



Wrong Patient Case

- Patient identified (correctly) and escorted to vault by Therapist 1
- Patient initiated discussion of next patient with Therapist 1
- Therapist 1 inadvertantly selects patient record of next patient at workstation
- Therapist 1 takes a phone call
- Therapist 2 continues
- 3 of 4 fiducials closely aligned
- Therapist 2 treats without checking patient data in room, or on console.

CRM Failure?

- Distractions
- Changes in normal procedure
- Lack of situational awareness

Opportunities to break the Error Chain?

- Designate one individual to deliver the treatment
- Minimize distractions (sterile console)
- Therapist 2 had a prime opportunity to verify patient ID
  - Re-initiate and complete the checklist
- Maintain situational awareness
- Alert! – normal procedure disturbed!

University of Florida

Another Wrong Patient Case

- Therapist sets up for scheduled Pt
- Scheduled Pt goes to restroom
- Pt 2 shows up 1.5 hr early
- Therapist calls for Pt 1, Pt 2 responds
  - Patient photos look similar
  - English not native language of either
  - Both have prostate treatment markings
- Pt 2 Treated

University of Florida

Opportunities to break the Error Chain?

- Two forms of positive patient ID
- Use open ended questioning
- Similar patients – Flag for caution

University of Florida

Yet another Wrong Patient Case

- Power outage locked-out MLC
- Physicist rebooted and tested with a “random” patient file
- Physicist did not close file
- Therapists continued treatment after timeout without verifying patient name on record

University of Florida

Error Chain

- Initiated by unusual event
- Physicist – close file
- Timeout – should restart procedure along with checks

Common Themes resulting in Events

- Most often result when an unexpected procedural change occurs.
- Assumptions regarding the situation are made but not verified (fly the plane)

- Facilities have good procedures but may not follow them
  - Staff attempting to maintain schedule
  - Considered to be redundant
- Checklists – required completion
- Organizational culture emphasizing procedure

Some Error Chain Initiators

- Any Unusual Event
  - change of normal procedure
  - distraction
  - interrupted procedures
- Time pressures

Breaking the Error Chain

- Disciplined approach
- Awareness & objectivity
- Heightened awareness can break the chain
- Prioritize courses of action & consequences

Summary
Learning from Past Misteaks

- Need a centralized reporting mechanism for events and “close-calls”
- Analysis of those events
- Dissemination
- Cultural Awareness

Acknowledgements

- Don Steiner and Tom Tomczak, Bureau of Radiation Control, Florida Department of Health
- Robert Boissenault Oncology Institute

Resource

- NASA – Patient safety Reporting System: www.psrs.arc.nasa.gov