Engineering Continuous Quality Improvement (CQI) in Radiation Oncology: A Journey Towards Reliability, Validity, and Safety Mindfulness

FASRT

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Disclosures

• UNC Health Care System: financial support, UNC Institute of Healthcare Quality Improvement
My Real Disclosure

• I am a medical dosimetrist.
Learning Objectives

• Finding a Common Language: The external world
• To discuss systems based thinking
  • Normal Accident Theory
  • Swiss cheese model
• To understand patient safety culture
• To learn how to foster and sustain a patient safety culture
• UNC Good Catches and A3s
Finding a Common Language: The external to the internal—the unknown becomes the known
Common Language: Interdisciplinary Academics

- Gleevec: Biologists (knowing nothing about cancer) determined that if certain cell pathways were blocked, the cell would die.
  - Cancer can be cured with a miracle pill.
Common Language: Interdisciplinary Academics

• CT scanners: The idea came from evolutionary mathematical principles that looked at changing 2D to 3D images.
  • The Beatles revolutionize radiation therapy practice.
Common Language: Revolutionary Research

• Viagra: The primary study was for heart disease – There was one side effect to taking the pill....
Common Language: From Florists to Precision Radiation Therapy Treatments

• Turning flower arrangements into immobilization devices
Old Knowledge and Old Language: Traditional Systems Based Radiation Therapy Thinking
Culture of Medicine

- Quality & safety are a **personal responsibility**

"The single greatest impediment to error prevention is...that we punish people for making mistakes." – Lucian Leape, MD

Leape JAMA 1994
• Errors are unacceptable
  • Expected to function without error
  • Errors are seen as someone’s fault
  • Not reported/covered up (fear of litigation, reaction of colleagues)
• Error prevention ➔ “Blame Culture”
  • Work/train/study harder will lead to less errors.
  • Blame culture is used to encourage proper performance.
  • Lessons learned are private and do not consider a systems perspective (work-arounds)
Errors will occur

• Errors are part of the human condition ➔ *how we learn*

• Proximal error is often ‘human’, but the root causes are often related to poor system and organizational design.

• Error-free performance is unattainable

• We are not so much actors of our errors, but rather errors are indicative of system flaws rather than character flaws.
New Language: Normal Accident Theory
Figure 2-3 Simple treatment flows, circa 1955

Oncology is Complex & Complicated

- Multidisciplinary
- Many hand offs/transitions of care
- Intensive treatments

We Work in Systems not as Autonomous Individuals

We need to embrace systems based thinking

System interaction

Adapted from Charles Perrow, Normal Accidents
System coupling

- **Loose coupling**
  - Cannot effectively detect and/or respond to failures
  - Failures interact in a predictable manner
- **Tight coupling**
  - Can effectively detect and respond to mitigate failures
  - Failures interact in an unpredictable manner

Adapted from Charles Perrow, Normal Accidents

- Nuclear plant
- DNA
- Aircraft design
- Space mission
- Mining
- Most universities
- Car manufacturing
- Post office
- Power grid
- Air transportation
- Rail transportation
- Dams
- Most manufacturing
- Most military missions
Adapted from Charles Perrow, Normal Accidents

- System interaction
  - Linear
    - Failures interact in a predictable manner
  - Complex
    - Failures interact in an unpredictable manner

- Failure to effectively detect and respond to failures
  - Loose coupling
  - Tight coupling

Failures interact in a predictable manner
Most universities

Failures interact in an unpredictable manner
Post office

Adapted from Charles Perrow, Normal Accidents
System coupling

Tight coupling

Cannot effectively detect and/or respond to failures

Loose coupling

Can effectively detect and respond to mitigate failures

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Post office

System interaction

Most universities

Linear

Failures interact in a predictable manner

Complex

Failures interact in an unpredictable manner
System coupling

Tight coupling:
- Cannot effectively detect and/or respond to failures

Loose coupling:
- Can effectively detect and respond to mitigate failures

Adapted from Charles Perrow, Normal Accidents

System interaction:
- Linear
- Complex

Failures interact in a predictable manner
- Dams
- Rail transportation
- Air transportation
- Car manufacturing
- Post office

Failures interact in an unpredictable manner
- Power grid
- Aircraft design
- Space mission
- DNA
- Mining
- Most military missions
- Most manufacturing
- Most universities
- Most universities
Understanding how your systems behave

Drive QA strategies

Safety Mindfulness

Increasing probability that failures will propagate through system leading to an accident

Increasing probability of unexpected failure interactions

Adapted from Charles Perrow, *Normal Accidents*
New Language: Swiss Cheese Model
Reason’s Swiss Cheese Model

- People
- Actions
- Harm

We tend to focus here
We need to focus here. We tend to focus here.

Latent failures predispose us to make errors!

Reason’s Swiss Cheese Model

Administrative
Latent failures: e.g. policies, supervision

Workplace
Latent failures: e.g. lighting, noise, workflows

People
Safety mindfulness

Actions
Harm
Latent failures predispose us to make errors!

Administrative
- Latent failures: e.g. policies, supervision

Workplace
- Latent failures: e.g. lighting, noise, workflows

People
- Safety mindfulness

Actions

We need to focus here
We tend to focus here

Human Factors Engineering Hierarchy of Effectiveness

Lean Safety Culture

Physician leadership

Harm
New Language: Understanding Patient Safety Culture
Patient Safety Culture

• “... the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization’s health and safety management.”

• “DNA” of a safety culture
  • Acknowledging the high-risk nature of processes
  • Having a blame-free environment where workers are able to report errors/near errors without fear of punishment
  • Encouraging collaboration across ranks and disciplines to improve safety
  • Organizational/leadership commitment of resources to address safety concerns.
Event Reporting Systems

• Program through which all workers can confidentially report Errors and Near-errors in their daily work/processes in the interest of improving quality and safety

• Aviation Safety Reporting System (1960’s)
Event Reporting Systems

- Anesthesia Quality Institute
Event Reporting Systems

• Radiation Oncology Incident Learning System
What knowledge have we created?

- Common language of patient safety
- Cultural Change to include patient safety
- Higher ethical values for our profession
- With a common language integrated with a cultural shift, we are developing what political scientists call ‘the optic’ to better see situations and what can happen.
- The optic—the ability of a photographer to have ‘you see’ what he/she wants you to see. The ability of a politician to understand what you want to see, and to become that.
- In radiation therapy we have been missing the language and culture to develop our optic.
New language: Foster and Sustain New Knowledge into an Emerging Patient Safety Culture
Our Approach/Paradigm

- **Lean** = to remove waste via work on process while focusing on developing employees
  - Streamline processes
  - Remove ambiguity
  - Improve communication

- Focus on upstream/latent failures
  - *It’s the process not the person*

- Empower frontline staff
  - *Emphasize no blame*

Errors are inevitable
- *Errors are evidence of system flaws not character flaws*
Integrated Model

Clinic

Integrating facilitators of quality/safety into routine workflow; e.g., peer review, checklists, standardization, Lean assessments

Supports/celebrates quality/safety initiatives

Nurtures Culture of Safety

Empowers others to improve processes

Departmental Leadership, QA Committee (proactive)

Continuous monitoring of process measurements
Continuous Quality Improvement

Define Standard Work

Modify processes
e.g. A3’s, +Kaizens, Involve All stakeholders

Identify targets for improvement

Consistent use

Reliable Outcomes

Monitor process performance

Good catches Statistics

‘Blame’ workers

No workers
New Knowledge: Hierarchy of Effectiveness (in preventing error)

Forcing function & constraints

Automation/computerization

Simplification/standardization

Reminders, checklists, double checks

Rules & policies

Training & education

Adopted from Joseph Cafazzo. Miami Safety Meeting June 2010
Hierarchy of Effectiveness (in preventing error)

Forcing function & constraints

Automation/computerization

Simplification/standardization

Reminders, checklists, double checks

Rules & policies

Training & education

Technology
Focused
More Effective

People
Focused

Easy, Cheap

Less
Effective

Most Often
Used

Adopted from Joseph Cafazzo. Miami Safety Meeting June 2010
Hierarchy of Effectiveness (in preventing error)

- Forcing function & constraints
- Automation/computerization
- Simplification/standardization
- Reminders, checklists, double checks
- Rules & policies
- Training & education

Technology
Focused
More Effective

The “right thing” happens naturally

Make it easier for people to do the “right thing”

People
Focused
Easy, Cheap

Less Effective
Most Often Used

Hope people remember to do the “right thing”

Adopted from Joseph Cafazzo. Miami Safety Meeting June 2010
Need for work-arounds
Surprises
Confidence in system
Happiness
Quality, Efficiency, Safety

People are not cars

System Reliability/Robustness
The Language of Lean
What is Lean?

“Lean”: coined to describe the TPS as a new production system that was not company specific or nationalistic.

A systematic approach to identifying and eliminating waste (non-value added activities) through continuous improvement.
Principles of Lean Thinking

• VALUE - what customers are willing to pay for
• VALUE STREAM - the steps that deliver value
• FLOW - organizing the Value Stream to be continuous
• PULL - responding to downstream customer demand
• PERFECTION - continuous improvement (culture)

~Lean Thinking, Womack and Jones, 1996.
Problem Solving
• ‘Go-see’ for yourself
• Decisions by consensus
• Kaizen – become a leader in waste reduction
• Plan-Do-Study-Act (PDSA) via “A3 thinking”

People & Partners
• Grow people in light of philosophy
• Develop teamwork and networks

Process
• One piece flow & Pull system
• Heijunka (leveling workload)
• Jidoka (build-in quality)
• Standardized work
• Visual management

Philosophy

Toyota’s 4P Model for Improvement

Liker, 2004
Japanese workers use their brains and hands …… providing 1.5 million suggestions a year, and 95 percent of them are put to practical use. There is an almost tangible concern for improvement in the air at Toyota.
Pull once: Slow the line to address the problem

Pull twice: Stop the line if problem can’t be solved immediately

“Football Field Hash Marks”: working to takt time
UNC Good Catch and A3 Program
“UNC Good Catch & A3 Program” - creating infrastructure for continuous quality improvement through two major program components:

• GoodCatch
  • an event learning system
  • Web-based system, easy to use
  • All members in our dept. participate
  • Submit errors that reach the patient AND near-errors

• A3 Approach to Problem-Solving
  • a 1 page tool for problem-solving
  • Work on improvement projects that benefit their team, others in their area and outside of their area
What is a Good Catch?

A condition, defect, event, situation, or miscommunication that could have or did result in harm, delay, rework, waste, or an error.
Total Monthly Good Catches
Weekly Quality Safety Committee

Strong commitment of leadership (esp. physician) to a culture that encourages quality & safety is essential!

Physicians, nurses, residents, students, therapists, dosimetrist, physicists, industrial engineers, research specialists, administrators, managers
<table>
<thead>
<tr>
<th>REASON FOR ACTION</th>
<th>GAP ANALYSIS</th>
<th>COMPLETION PLAN</th>
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<tbody>
<tr>
<td>CURRENT STATE</td>
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<tr>
<td>TARGET STATE</td>
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<td>SOLUTION APPROACH</td>
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<td>INSIGHTS</td>
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A3 Improvement Projects at UNC-CH since 2012

Rad Onc Department Areas
(as of April 2016)

Number of A3s Implemented

A3 Project Statistics:
# Completed: 56
# Approved and In Progress: 5
# Upcoming: 3
Program Sustainability

• Celebrate improvement activities

• Provide psychologically safe environment, rewards & recognition, feedback

• Allocate time for improvement activities

• Lead by example

• Measure success (quarterly program health report)
Monthly Dept. QA meeting 2/25/16
Celebrating people and their ideas leads to greater participation and higher reliability

- “It’s the system not the person”
- Part of how we manage
- Part of our education programs

>1000 Good Catches
UNC Radiation Oncology AHRQ scores
Engaging Everyone in Quality and Safety

**Involve everyone from the beginning**

**Discover common purpose**
- Improve patient outcomes
- Reduce hassles and wasted time

**Make everyone’s involvement visible**

**Make everyone partners, not customers**

**Use “Engaging” Improvement Methods**
- Standardize what is standardizable
- Generate light, not heat, with data
- Make the right thing easy to try & do

**Identify and activate champions**

Adopted from IHI: *Engaging Physicians in a Shared Quality Agenda*
UNC Quality and Safety Education

• **Department of Radiation Oncology**
  • Division of Healthcare Engineering
  • All new employees go through 2 hour quality safety course
  • Sign a safety contract

• **UNC School of Medicine Institute Healthcare Quality Improvement**
  • Physician engagement in Quality and Safety Course
  • All residents and fellows
  • Physician leadership development and mentorship
  • Quality & Safety ➔ promotion/career advancement

• **UNC 3rd and 4th year medical students**
  • 3rd year: all medical students participate in quality and safety workshop during internal medicine rotation (1 hour class room, 1 hour group discussion)
  • 4th year elective
Conclusions

• External to the Internal
• Errors are inevitable
• Errors are indications of system flaws not people flaws
• Focus on the system/process ⇒ “No blame culture”
• Physician leadership is essential ⇒ Changing safety culture is difficult
• Empower the front-line staff ⇒ cultivate problem “seeing” and solving skills
• All of This will be the new normal: it should be taught and put into our medical dosimetry academic curriculum
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