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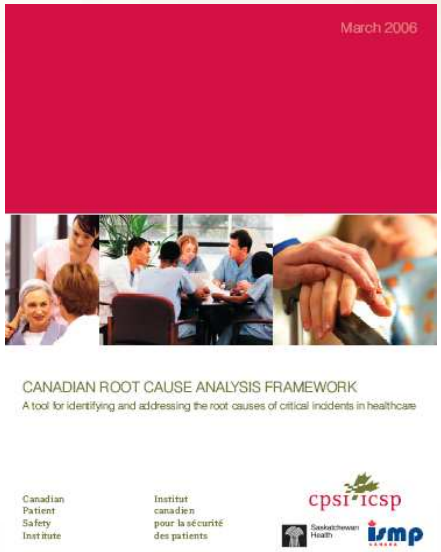
Canadian Root Cause Analysis Framework

A Tool for Identifying and Addressing the Root Causes of Critical Incidents in Health Care



Saskatchewan Health

ismp CANADA

Why there is a need for RCA

- Errors occur at all levels of healthcare.
- All staff, even the most experienced and dedicated professionals can be involved in preventable adverse events.
- Accidents result from a sequence of events and tend to fall in recurrent patterns regardless of the personnel involved.

Looking Past the Easy Answer

"We don't believe that people come to work to do a bad job or make an error, but given the right set of circumstances any of us can make a mistake. We must force ourselves to look past the easy answer that it was someone's fault – to answer the tougher question as to why the error occurred. It is seldom a single reason."

(Dr. J. Bagian,Veterans Affairs, 2005)

Root Cause Analysis

Definition

An analytic tool that can be used to perform a comprehensive, system-based review of critical incidents.

It includes the identification of the root and contributory factors, identification of risk reduction strategies, and development of action plans along with measurement strategies to evaluate the effectiveness of the plans.

Hoffman, C., Beard P., Greenall, J. U, D. & White, J. (2006). *Canadian Root Cause Analysis Framework*. Edmonton, AB: Canadian Patient Safety Institute.

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Context

Canadian Adverse Events Study

Findings:

- 3,745 charts reviewed
- ~7.5% of hospital admissions involve adverse event; 37% of adverse events preventable
- 34% of events were related to surgical procedures; 24% drug or fluid related

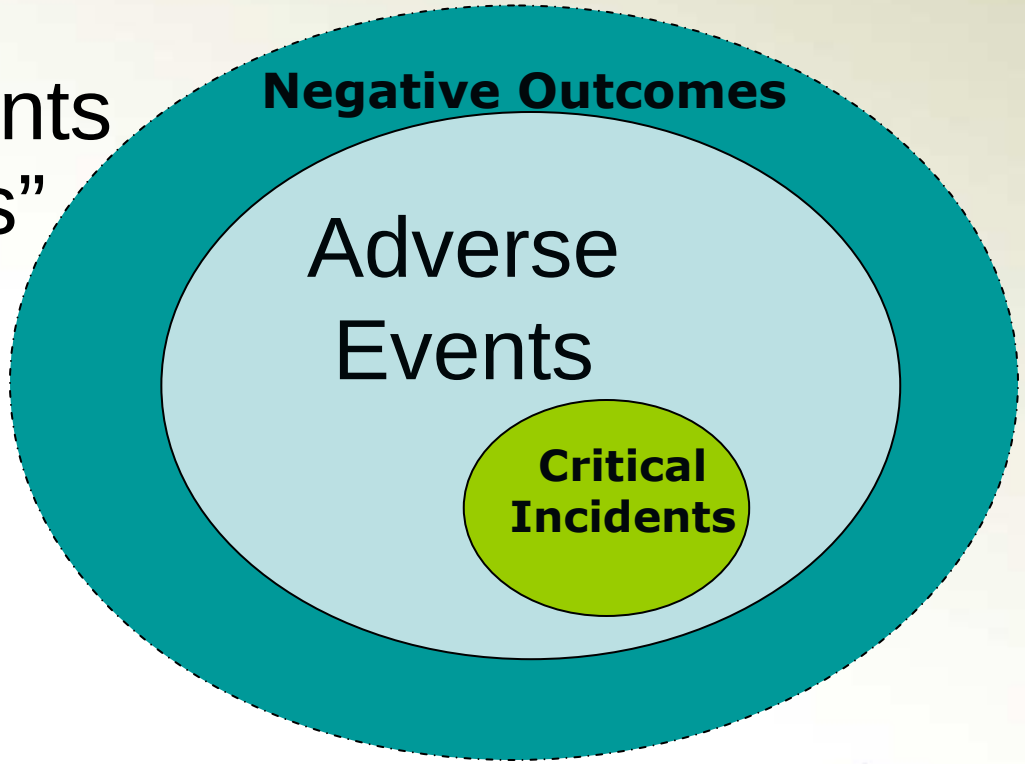
Extrapolation:

- Of ~ 2.5 million hospital admissions in Canada in 2000
  - 185,000 experienced 1 or more adverse events
  - 70,000 of the 185,000 were estimated to be preventable
  - 9,000 - 24,000 deaths were potentially preventable

Baker GR, Norton P et al. CMAJ, May 25, 2004.

Adverse Events vs. Critical Incidents

- Not all negative patient outcomes are "adverse events"
- Not all adverse events are critical incidents"



RCA focuses on the most serious preventable adverse events.

Professional Accountability and the Systems Approach

"Non-punitive" does not mean "blame-free"

A "system" approach includes the need for individual practitioners to be accountable for their actions

Shared Accountability - Just Culture

"…it is about creating a reporting environment where staff can raise their hand when they have seen a risk or made a mistake…..where risks are openly discussed between managers and staff."

"…while we as humans are fallible, we do generally have control of our behavioural choices."

"…good system design and good behavioural choices of staff together produce good results.

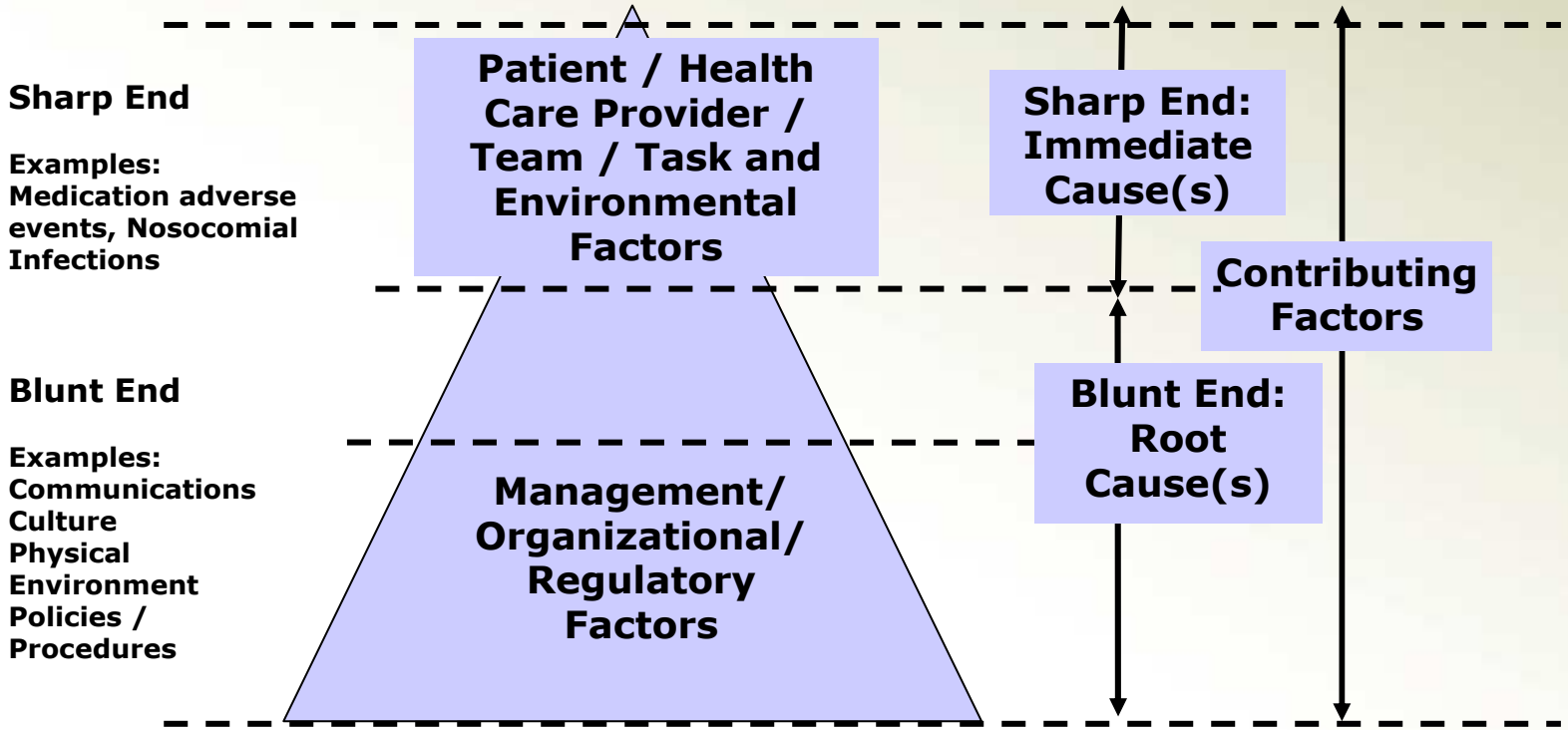
It has to be both."

David Marx, 2005

(quoted in *ISMP Medication Safety Alert! Sept 7, 2006)*

A Mindset for RCA

“Sharp End” / “Blunt End”



Adapted from the NHS Report – Doing Less Harm, 2001

Human Factors Engineering

A branch of engineering that specializes in understanding how humans interact with the world around them.

Draws upon research in biomechanics, kinesiology, physiology, and psychology, to define the parameters and constraints that influence human performance.

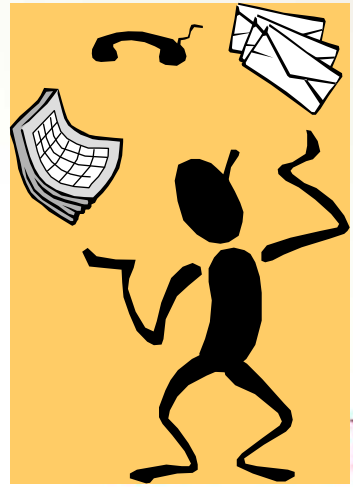
A guiding principle for root cause analysis and failure mode and effects analysis.

Everyday Human Factors Problems

www.baddesigns.com

Some Human Factors Themes….

- Working Memory, Workload, Task Demands
- Task Flow, Information flow
- Repetition, Fatigue, Sleep Deprivation, Inattentional Blindness
- Teamwork
- High Noise-to-Signal Ratio (information overload)
- Work Area Design & Environmental Factors (lighting, noise, distractions)



Inherent Human Limitations

- Limited memory capacity – 5-7 pieces of information in short term memory

- Factors affecting memory
  - Stress
  - Fatigue and other physiological factors

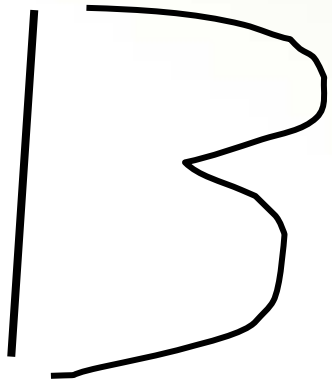
Miller GA (1956). The magical number seven, plus or minus two: some limits on our capacity for processing information. *Psychological Review,* 63(2): 81-97. Retrieved from http://psychclassics.yorku.ca/Miller/

Some Human Factors Themes….

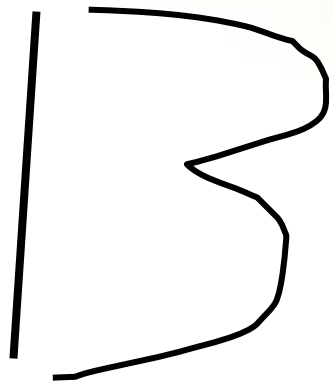
Confirmation Bias / Cognitive Tunnel Vision

Leads one to “see” information that confirms our expectations, rather than information that contradicts our expectations.

HINT: “Alphabet”



Hint: “NUMBER”



Human Factors Engineering Healthcare Applications

- Teamwork
- Medical devices
- Computer software design
- Labelling and packaging
- Medication distribution systems
- Work environment design
- Workflow design

Hospital Wide Culture

- Interesting
- Not the best unit of analysis – masks variability between work units

J. Bryan Sexton, PhD, *Mayo School of Continuing Medical Education: Human Factors in Health Care*. St. Paul, MN October 17-19, 2007

Familiarity with others is a critical component of effective teamwork:

- 74% of all commercial aviation accidents happen on the first day of a crew flying together
- Familiarity trumps fatigue
- Highlights the importance of predictable patterns of behavior

J. Bryan Sexton, PhD, *Mayo School of Continuing Medical Education: Human Factors in Health Care*. St. Paul, MN October 17-19, 2007

SAQ Background

The SAQ collects input from “front-line” personnel to determine the strengths and weaknesses of work settings.

- Used in medical, aviation, maritime, rail & military settings

- Administered in over 1300 hospitals (USA, United Kingdom, Switzerland, Germany, Norway, Sweden, Spain, Portugal, Italy, Turkey and New Zealand)
  - SAQ is a reliable tool and formally validated:
    - Sexton J.B., Thomas E, Pronovost P: Context of care and the patient care team: The Safety Attitudes Questionnaire. *National Academies of Science Report on Engineering in Healthcare.* Washington, DC: The National Academies Press, 2005.
    - Sexton J.B., Helmreich RL, Neilands TB, Rowan K, Vella K, Boyden J, Roberts PR, Thomas EJ. The Safety Attitudes Questionnaire: Psychometric properties, benchmarking data, and emerging research. *BMC Health Services Research*. 2006; Apr 3;6(1):44.
    - Sexton J.B., Makary MA, Tersigni AR, Pryor D, Hendrich A, Thomas EJ, Holzmueller CG, Knight AP, Wu Y, and Pronovost PJ. Teamwork in the Operating Room: Frontline Perspectives among Hospitals and Operating Room Personnel. *Anesthesiology*. 2006; in press.
    - Sexton J.B., Holzmueller CG, Pronovost PJ, Thomas EJ, McFerran S, Nunes J, Thompson DA, Knight AP, Penning DH, Fox HE. Variation in Caregiver Perceptions of Teamwork Climate in Labor and Delivery Units. *J Perinat*.2006; in press.
    - Pronovost PJ and Sexton J.B., Assessing safety culture: guidelines and recommendations. *Qual Saf Health Care.* 2005; 14:231-233

SAQ items are grouped into 6 factors:

Factor: Definition	Example items
Job satisfaction: positivity about the work experience	-I like my job -This hospital is a good place to work
Teamwork climate: perceived quality of collaboration between personnel	-Disagreements in this clinical area are appropriately resolved (i.e., what is best for the patient) -Our doctors and nurses work together as a well coordinated team
Safety climate: perceptions of a strong and proactive organizational commitment to safety	-I would feel safe being treated in this clinical area -Medical errors are handled appropriately in this clinical area
Perceptions of management: approval of managerial action	-Hospital management supports my daily efforts in this clinical area -Hospital management does not knowingly compromise the safety of patients
Stress recognition: acknowledgement of how performance is influenced by stressors	-I am less effective at work when fatigued -When my workload becomes excessive, my performance is impaired
Working conditions: perceived quality of the work environment and logistical support (staffing, training, etc.)	-Trainees in my discipline are adequately supervised -This hospital deals constructively with problem personnel

SAQ Culture Findings:
Teamwork Climate linkages to Clinical and Operational Outcomes

- Wrong Site Surgeries
- Delays
- Bloodstream Infections
- PE/DVT per 1000 surgical discharges
- RN Turnover
- Absenteeism
- Unit Size (#FTEs)
- Spirituality
- Burnout
- Reliance on float RNs hurts teamwork
- Structured communications improve teamwork

Culture Nuggets

- Size of unit matters: units with fewer than 40 caregivers often have a stronger consensus, better culture, and better implementation of innovations than units with over 80 caregivers

- Improvement is harder in teaching hospitals than faith based or community hospitals

- Losing a particularly ineffective or unpopular manager is a shock to many units – transition is associated with a drop in safety climate which is the opposite of the expected improvement after what is often a long awaited departure

Culture Nuggets

- Changes in geographic location, unit merging, and changes in managers each negatively impact teamwork and safety climate
- Introducing new technology to a unit is often associated with lower teamwork and safety climate scores
  - E.g., CPOE, Negative pressure rms, Automated Rx Dispenser
  - This association appears to fade after 1 year
- What is going on in the low safety climate units?
  - Changes in MD or RN leadership (not executive)
  - had a facility redesign within existing unit
  - Low safety climate units rely more on agency nurses

Take Home

- A little structure goes a long way to improve communication: daily goals, briefing, SBAR
- Barriers to sustainability: changes in management, structure, staffing, leadership attention span
- Extraordinary consensus about culture within units – "inter-rater reliability" of over 80%!
- Patient safety and quality with methodological rigor is a pioneering effort – the science of safety is racing to keep pace
- Be ready to answer the question:
  – "Are We Safer?"

Hierarchy of Effectiveness (within a cultural context)

1. Forcing functions
2. Automation / computerization
3. Simplification / standardization
4. Reminders, checklists, double checks
5. Rules and policies
6. Education
7. Information

Human Factors - Design

Iterative Design: Baseline Code Cart Drawer

Code Cart Drawer 5th Version

Look-alike packaging

Organizational Readiness

Clear and consistent organizational process for management of critical incidents is essential.

- Immediate actions to be taken by staff
  - Care of the patient
  - Quarantine articles/secure health record
  - Notifications
- Support for Staff
- Disclosure
- Incident reporting

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Conducting an RCA

Assemble a Team

- Multi-disciplinary
- Those with direct knowledge of the event processes
- Those responsible for change

Team Management

- Establish ground rules
  - Respect for individuals and opinions
  - Decisions by consensus
  - Manage group dynamics
- Respect for privilege of group discussions

Meeting Process

Single Meeting

- All information is prepared in advance by the Facilitator who collaborates with the Leader and experts as required

Multiple Meetings

- Duties are shared among the team members who may come together on 4-6 occasions to move through the process

Sample Case Scenario

- An 82 y/o female weighing approximately 45 kilograms is seen in the ER after a slip and fall.
- Complaining of pain to her ankle - obvious swelling
- Physician sees patient - orders x-ray and 1.0 mg of Morphine IV.
- RN reads the physician's order, draws up and gives Morphine 10 mg
- Patient experiences dizziness and respiratory depression
- RN recognizes the overdose and calls for assistance
- Naloxone 2 mg given, SpO2 closely monitored and supplementary oxygen provided
- Patient recovers from overdose and is monitored for 4 hours
- Patient discharged with diagnosis of sprained ankle

Components of Root Cause Analysis

- Gather Information
- Initial Understanding
- Additional Information
- Literature Review
- Final Understanding and Timeline

Timeline & Final Understanding (additional information in green)

Time	Item	Information Source
0230	Elderly patient sustains injury after fall at home.	Ambulance record
0235	**Ambulance call**	Ambulance record
0258	**4 mg Morphine and 25 mg Gravol administered by IV en route to hospital**	Ambulance record
0310	Ambulance arrives at Emergency Dept (ED). Pt. assessed by Triage RN.	Patient chart/ Ambulance record
0312	**Ambulance crew leaves to respond to motor vehicle accident 2 blocks from hospital. ED staff on alert for trauma victims.**	Interviews
0315	**Pt seen by ED physician who discusses pain management. Pt. states pain still at 6 out of 10 despite Morphine given in ambulance.** MD orders: X-ray and "1.0 mg Morphine IV" and "25 Gravol IV". **RN A (new grad) admitting acute MI for RN B who is on break.**	Patient chart
0317	**ED physician attends to acute MI with RN B returning from break**	Patient chart/ Interviews
0318	**RN A takes chart to narcotic preparation area. RN A has difficulty reading order but believes it to be "10" and is reluctant to interrupt MD in resuscitation room with acute MI pt.** RN A prepares and administers 10 mg Morphine and 25 mg Gravol IV.	Patient chart
0321	Patient c/o dizziness, speech is slurred. Decreased respiratory rate identified by RN A	Patient. chart
0322	ED physician alerted. Pt given 2 mg Naloxone IV	Patient chart

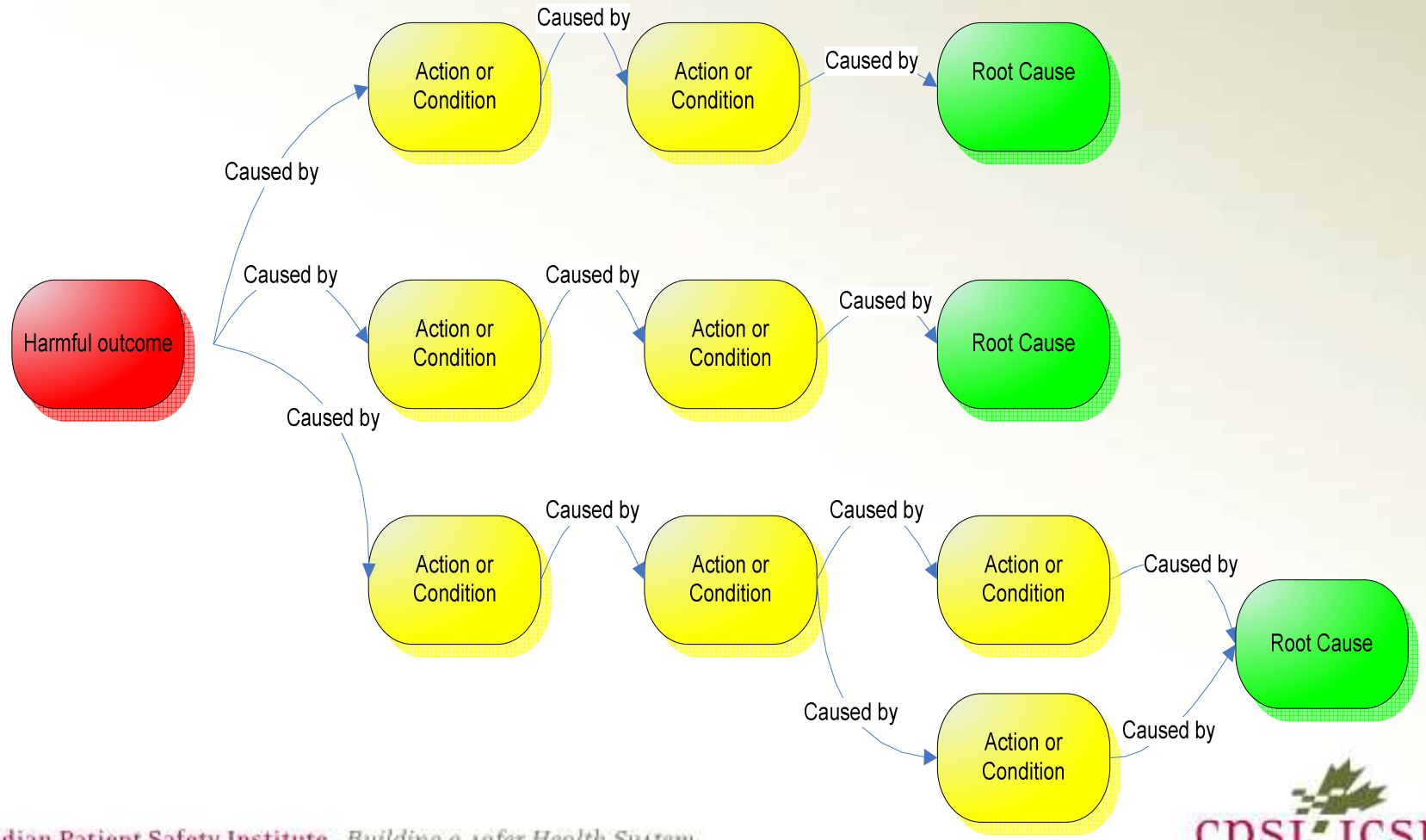
Components of Root Cause Analysis (cont.)

- Determine Root Causes
- Formulate Causal Statements
- Develop Actions

Contributing Factors & Root Causes

- “Cause” refers to a relationship or potential relationship between certain factors that enabled an event to occur.
- “Cause” does not imply blame.
- True root causes are the earliest points where action could have been taken to enhance the support system to prevent the event or mitigate the harm from the event.
- Root causes are derived from contributing factors.

Types of Cause and Effect Diagrams: Tree Diagram



“Are we there yet?”

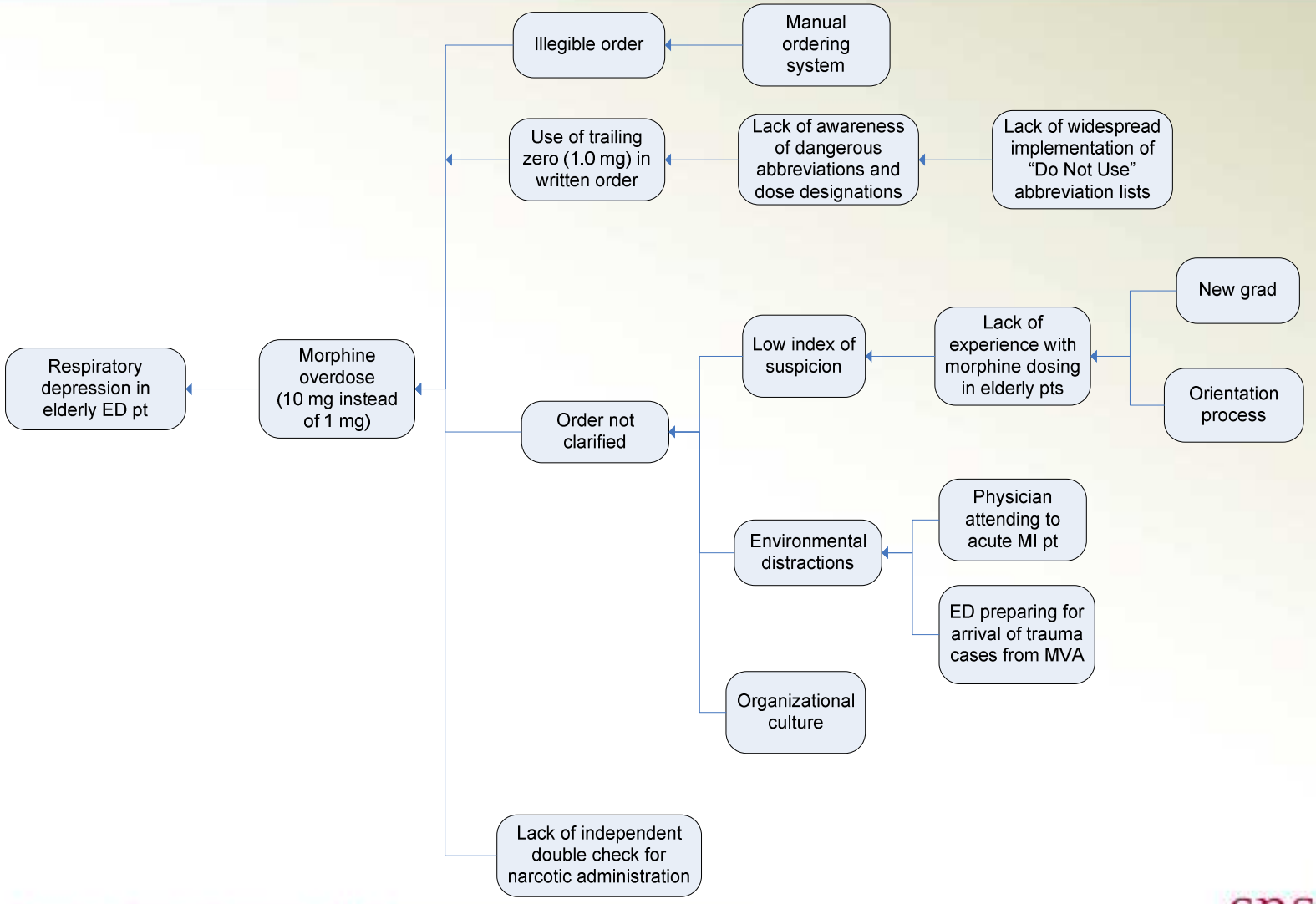
Continue to dig deeper by asking “why?” at each level of cause and effect.

Bottom line question:

If this factor were eliminated or corrected, would there be a real chance to prevent a similar event from happening?

Morphine Event

Sample Cause and Effect Diagram



Action Development

- “Action” oriented
- Encourage system level changes
- Clear and concise
- Specifically address root causes
- Offer long term solutions
- Objective and measurable
- Leadership endorsement is critical to success

Sample Action Table

Causal Statement # 1	The use of a trailing “0” in a written order increased the likelihood that a nurse would select and administer a ten fold overdose of morphine.				
	1 A	Standardize a list of (error prone) abbreviations, acronyms, symbols and truncated (stem) drug names that are NOT to be used throughout the organization.	Control	Immediate	P&T & MAC

Outcome Measurement

- Define time period for evaluation.
- Measure effectiveness of action, not just the completion of the action.
- Should be quantifiable.
- Balance measures – did something else get worse?

Communication of Results

Communicate the information learned from the RCA in a generic way to those who could also benefit from the information

- Within the organization
- Outside the organization
- Incidental findings
  - Factors that may not be causal but may impact patient care in other ways

The Orange Wire Test

"Imagine a jet aircraft which contains an orange coloured wire essential for its safe functioning. An airline engineer in one part of the world doing a pre-flight inspection spots that the wire is frayed in a way that suggests a critical fault rather than routine wear and tear. What would happen next? I think we know the answer. It is likely that – probably within days – most similar jet engines in the world would be inspected and the orange wire, if faulty, would be renewed."

"When will health-care pass the orange-wire test?"

Sir Liam Donaldson, WHO Draft Guidelines for Adverse Event Reporting and Learning Systems, 2005

Canadian Root Cause Analysis Framework Document

Available at: www.patientsafetyinstitute.ca

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