Defining Quality in the Cath Lab

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Disclosures

- Pitta, Sridevi: No relevant relationships with commercial interests to disclose.
- Bagai, Jayant: No relevant relationships with commercial interests to disclose.

Quality as it relates to patient care

- Quality is a science that involves ensuring that appropriate structural and process elements are in place to achieve the best patient selection and the best patient outcomes

- Quality, at the patient level, ensures providing the right procedure to the right patient at the right time in the right way

Evaluation of quality in the Cath Lab

- Quality can be evaluated in three broad areas or "domains"

Structural Domain

- Refers to the context in which care is delivered (hospital, cardiac catheterization lab (CCL) and its human resources)

- Examples:
  - Hospital and CCL infrastructure
  - CCL Quality Improvement (QI) committee
  - Staff education, training and specialty certification
  - Institutional PCI volume

Process Domain

- Refers to the processes and procedures for delivering care

- Examples:
  - System-related (pre-procedure checklists, STEMI/hypothermia protocols, D2B time, patient turnaround, adequacy of ancillary services)
  - Patient care related (quality of angiograms, CCL documentation and reporting)
  - Guideline-related (dual antiplatelet therapy or DAPT, statin post MI, infection control, radiation safety, appropriateness use criteria or AUC)
  - Cost and utilization related (supplies, length of stay and readmission post PCI)

Outcome Domain

- Refers to the consequence of care delivered

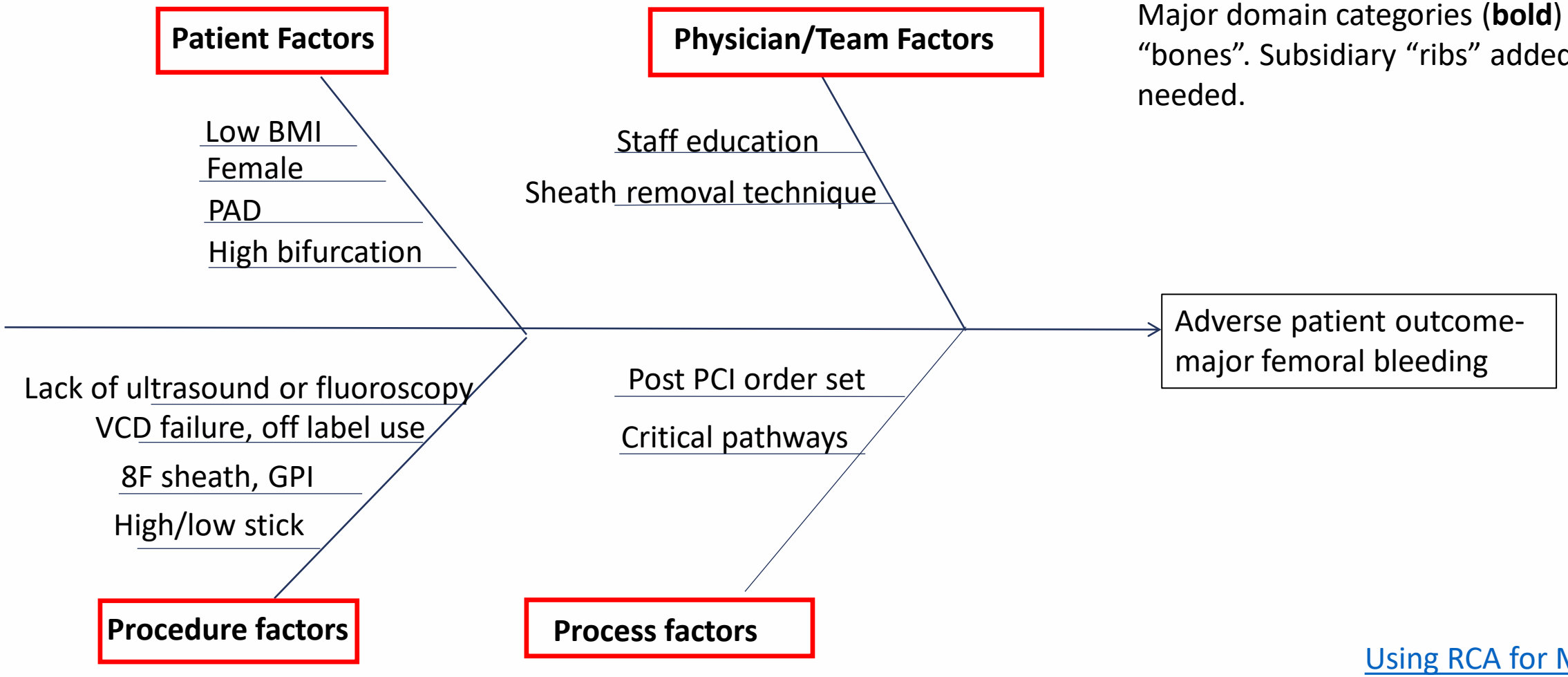
- Examples:
  - PCI risk-adjusted mortality
  - Morbidity due to radiation, contrast nephropathy, bleeding, stroke
  - Patient satisfaction

QI tools

Root Cause Analysis (RCA)

- Retrospective analysis which evaluates the cause of failure after the event has occurred
- Required by The Joint Commission (TJC) for sentinel events
- Typically represented by a cause and effect or “fishbone” or Ishikawa diagram
- Examples in CCL- analysis of medication or communication errors, adverse events discussed in Morbidity and Mortality Improvement (MM&I) conference, slow case turnover

Example of fish-bone diagram for MMI
Major domain categories (**bold**) are "bones". Subsidiary "ribs" added as needed.



Using RCA for MM&I

FOCUS-PDSA

- **F**ind a problem or process to improve
- **O**rganize a team
- **C**larify the current process
- **U**nderstand the process, variations and the root cause(s) of the problem
- **S**elect the improvement or intervention

- **P**lan
- **D**o
- **S**tudy
- **A**ct

PDSA

Plan

- Define the current situation and process
- Define specifically what you are trying to accomplish
- Obtain buy-in from key stakeholders and identify ways to counteract resistance to change
- Develop a plan to implement the improvement and how to test the change

Do

- Implement the plan
- Record any unexpected events and other observations

Study

- Monitor outcomes
- Determine if the interventions improved the process/problem
- Evaluate need for modifications to the approach and identify additional area for improvement

Act

- Decide if it is appropriate to implement the plan broadly, modify or discard it
- Determine if processes can be improved further.

Failure mode and effects analysis

- Prospective (analysis performed **before** event has taken place), unlike RCA which is retrospective
- Identifies probability, possible mode(s), timing and impact of failure
- Develops action plan to follow in case event occurs
- “Fish-bone” or Ishikawa diagram can be used during analysis

- Example in CCL- prevention of radiation induced skin damage

  - Recognize risk factors and probability for radiation induced injury (obesity, complex PCI, especially chronic total occlusion (CTO) PCI, prior radiation exposure/damage, faulty equipment)
  - Gain awareness of implications of radiation damage (skin ulceration, malignancy)
  - Develop **prospective** action plan if high radiation exposure were to occur (establish limits for hard stop, change to 7.5 fps during case, stage additional PCI, close follow-up of patient and reporting)

Total Quality Management

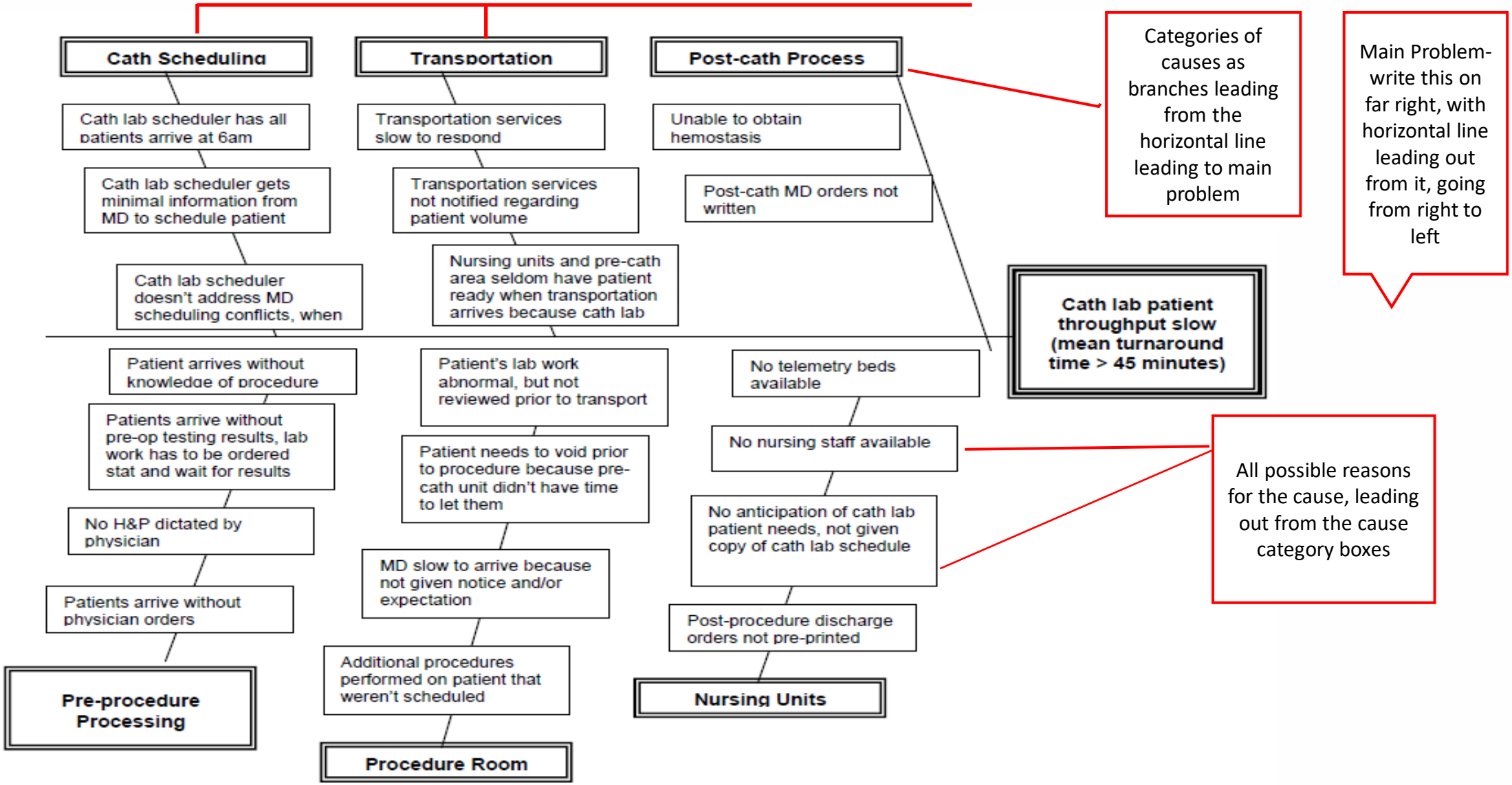
- Stresses importance of multidisciplinary or cross-organizational approach
- System wide emphasis on importance of quality, measurement, empowerment and continuous improvement
- Examples in CCL-
  - Development of multi-disciplinary team of nurses, physicians, NPs and pharmacists/pharmacy residents to ensure post PCI compliance with DAPT, statins and smoking cessation
  - Coordination of care with patient's primary care physician to ensure adequate follow-up post PCI and medication counselling

Lean production

- Focus on cost/value equation
- Aim is "doing better with less (cost)"
- Example in CCL-choosing lower cost equipment of equivalent efficacy and safety in cath lab inventory, after consultation with physicians and staff in cath lab

Case example of quality issue in CCL

- Physicians and CCL staff complain about the long turnaround between cases.
- CCL, holding room staff and physicians are blaming each other, contributing to stress and low morale
- RCA and PDSA techniques can be applied to resolve this issue


Cath Scheduling
Transportation
Post-cath Process
Cath lab scheduler has all patients arrive at 6am
Cath lab scheduler gets minimal information from MD to schedule patient
Cath lab scheduler doesn't address MD scheduling conflicts, when
Transportation services slow to respond
Transportation services not notified regarding patient volume
Nursing units and pre-cath area seldom have patient ready when transportation arrives because cath lab
Unable to obtain hemostasis
Post-cath MD orders not written
Cath lab patient throughput slow (mean turnaround time > 45 minutes)
Patient arrives without knowledge of procedure
Patients arrive without pre-op testing results, lab work has to be ordered stat and wait for results
No H&P dictated by physician
Patients arrive without physician orders
Pre-procedure Processing
Patient's lab work abnormal, but not reviewed prior to transport
Patient needs to void prior to procedure because pre-cath unit didn't have time to let them
MD slow to arrive because not given notice and/or expectation
Additional procedures performed on patient that weren't scheduled
Procedure Room
No telemetry beds available
No nursing staff available
No anticipation of cath lab patient needs, not given copy of cath lab schedule
Post-procedure discharge orders not pre-printed
Nursing Units
Categories of causes as branches leading from the horizontal line leading to main problem
Main Problem- write this on far right, with horizontal line leading out from it, going from right to left
All possible reasons for the cause, leading out from the cause category boxes

Using PDSA to resolve quality issues

- **Plan**: focus group consisting of holding room and CCL charge nurses, CCL Director, patient representative, bed manager and discharge coordinator
- **Do**: electronic charting, eliminate need to give report more than once, discharge patients from holding room in timely manner, physicians asked to place post-cath orders and speak with family immediately after case, use pre-procedure checklist to keep next patient ready
- **Study**: measure reduction in turn around time and obstacles to implementation of plan
- **Act**: Decision made to implement plan after significant reduction noted in turnaround

Question 1- A 67-year-old obese male with chronic kidney disease is scheduled for coronary angiography via the R radial artery for atypical chest pain. A 60-70% distal circumflex stenosis is noted, and a decision is made to perform PCI. The procedure is lengthy due to poor guide support, proximal tortuosity and poor quality images. 350 ml of contrast is used with a fluoroscopy time of 26 minutes and Air Kerma of 3.2 Gy. The patient is discharged the day following PCI and presents to an outside hospital 1 week later with severe renal failure. Quality assessment and improvement is required in which of the following domains

A. Structural domain

B. Process domain

C. Outcome domain

D. All three domains

Correct Answer: D

- Quality assessment in this case with an adverse patient outcome (contrast-induced acute kidney injury) should focus on all three domains. There is potential for quality improvement in the structural (outdated cath lab equipment with high x-ray output), process (non-utilization of appropriateness use criteria before performing PCI on a lesion with borderline angiographic severity with non-limiting symptoms and no functional testing) and outcome (education and close monitoring for radiation and contrast induced injury) domains.

Question 2- A 56-year-old diabetic male weighing 290 lbs. is scheduled for PCI on a chronically occluded left circumflex coronary artery. Dual injection is planned. The procedure is expected to be challenging due to presence of calcification, tortuosity and prior failed attempt. Which of the following QI tools can be used to improve patient outcomes?

A. Root cause analysis

B. Lean production

C. Failure mode and effects analysis

D. PDSA

Correct Answer: C

- This case is likely to be associated with high radiation dose delivered to the patient. By recognizing this before the case, efforts can be made prospectively to lower radiation dose by using a lower frame rate, fluoro save, last image hold, collimation, dose spreading, monitoring table height and using shallower working angles. A hard stop limit can be decided if the occlusion is not crossed by a wire. This is an example of failure mode and effects analysis. RCA is used to determine the cause of an event retrospectively (i.e. after its occurrence). Lean production is not a relevant tool in this case as it focuses on cutting cost and utilization. PDSA cycles are also applied retrospectively.

Question 3- You are concerned about quality issues in a case involving a 63 year old man who suffered a stroke surrounding PCI. The patient was restless on the cath lab table and required large doses of sedation. 4 hours after being transferred to the floor, a nurse discovered him to be unresponsive and not breathing. He was emergently intubated and treated for respiratory failure with CO2 retention. CT imaging 12 hours later showed a large MCA territory stroke. He was outside the window for reperfusion and sustained a severe neurological deficit. Which of the following quality issues does this event raise concern about?

A. Structural domain

B. Process domain

C. Both A and B

D. Neither A or B

Correct Answer: C

- This patient likely suffered a stroke during or soon after the procedure. Unfortunately due to the confounding effect of the sedation and CO2 retention, he was treated for respiratory failure. Inclusion of q 1 hour neurochecks in the order set with immediate notification of the procedural MD/Neurology for any mental status change post PCI as part of the post-PCI process/system of care could have resulted in earlier diagnosis of stroke and possible reperfusion with improved neurological outcome. In addition, improved staff education (structural domain) could have resulted in improved outcome as well.