SCAI Quality Improvement Toolkit

Working on QUALITY, One Cath Lab at a Time

www.SCAI.org/QIT
Acknowledgements

The SCAI Cardiovascular Professional (CVP) Quality Improvement Toolkit was developed with support from Daiichi Sankyo and Lilly. The Society gratefully acknowledges this support, while taking sole responsibility for all content developed and disseminated through this effort.
Vision

“We have talked for a number of years about the need for interventionalists to “own” the QI process in the cath lab.

SCAI QIT offers a unique opportunity for SCAI members to demonstrate their commitment to improving quality of care and to reassure our patients that their expectations of receiving the highest quality of care in the cath lab are being met.

It’s time for you to get involved. It’s time for you to get to work.”

– Christopher J. White, MD, MScAI
SCAI CVP QIT

Purpose: To provide SCAI Cardiovascular Professionals (CVPs), who are SCAI QIT champions, the foundation to promote and implement quality improvement processes.

Audience: Non-physicians involved in leading quality improvement in the area of cardiac and/or endovascular angiography and/or intervention.
Module 4
2016 Cath Lab Best Practices
Recognize that the Cardiac Catheterization Lab (CCL) is a unique environment distinct from operating rooms and therefore should have its own set of best practice guidelines.

The CCL is an area of high throughput and cares for patients with elective, urgent, and emergent presentations.

To ensure patient safety and high quality, there should be an emphasis on-
- Optimal periprocedural communication
- Clinical management
- Documentation
- Protocols
- Training
Outline

➢ Pre-Procedure
➢ Intra-Procedure
➢ Post-Procedure
➢ CCL Governance
Pre-procedure Best Practices

Documentation of indications for procedure
- CCS angina class, anti-anginal medications
- Stress test results (low, intermediate, high risk)
- Reconciliation of indications with AUC www.scaiaucapp.org/auc

History and Physical (H&P)
- Within past 30 days for outpatients, with attending physician update within 24 hours prior to procedure
- Within past 24 hours of admission for inpatients
- Essential elements include-
  - CCS angina class, NYHA class
  - Medications, especially those taken in past 48 hours
  - History and nature of allergy to contrast
  - Barriers, if any, to dual anti-platelet therapy (DAPT)
  - Airway or moderate sedation issues
Pre-Procedural Best Practices

- **Risk scores**
  - Ideally risk scores for prediction of complications should be calculated automatically, based on data entry prior to PCI
    - [www.scaipciriskapp.org](http://www.scaipciriskapp.org)
    - NDR CathPCI risk score
    - SCAI PCI risk assessment tool
    - Mass-DAC mortality risk calculator

- **SCAI QIT tip of the month on use of risk scores for PCI**
Pre-Procedural Best Practices

- **Informed consent**
  - Within past 30 days and reaffirmed on day of procedure
  - In patient’s native language
  - Ideally witnessed by family member or staff member independent of cath lab
  - Specific mention of DNR and revocation of DNR for 24 hours after procedure

- **Sedation, analgesia and anesthesia**
  - Pre-sedation assessment with ASA class and Mallampati grade, and updated within 24 hours of procedure
  - Level of sedation, oxygenation and ventilation should be monitored by CCL staff
  - Typically 2 hours NPO after liquids and 6 hours after solids, though lack of supportive evidence
Medications

- Obtain INR < 24 hours before procedure for patients on warfarin
- INR < 1.8 for femoral procedures
- INR cutoff for radial procedures should be based on physician’s assessment of risk of bleeding and discontinuation of anticoagulation
- Target-specific oral anticoagulants (TSOACs) should be discontinued at least 1-2 days prior to procedure and for longer in case of abnormal renal function
- Metformin and short acting insulin held on day of procedure
Labs and other studies

- CBC and electrolyte/renal function within 30 days, and repeated within 24-48 hours if indicated
- PT/INR not required, unless on warfarin or liver disease
- Beta-HCG within past 2 weeks for fertile women
- Baseline EKG (chest X-ray not required routinely)
- Ideally review prior cath and bypass surgery reports
Allergies and medications
- Latex, contrast, aspirin, heparin (HIT), narcotics
- Each CCL should have protocol for contrast allergy prevention
- Example - 50mg of oral prednisone 13, 7, and 1 hour prior to the procedure + 50mg of oral diphenhydramine 1 hour before
- Shell fish allergy does not need prophylaxis

Chronic kidney disease
- For patients with eGFR < 60 ml/min/1.73 m2 or elevated risk score
- Pre-procedure hydration with normal saline unless presence of CHF
- No role of Mucomyst/N-acetyl cysteine based on data
- Limit contrast to < 3.7 x CrCl
Intra-procedural best practices

- **Patient preparation**
  - Pre-procedure check list (link to table 1)
  - Review NCDR related information with physician and personnel entering information
  - Non-invasive hemodynamic and oximetry monitoring
  - Defibrillation pads in STEMI patients
  - At least one working IV

- **Sedation**
  - Documentation of ASA class
  - Moderate sedation should be considered for all patients
  - Nurse trained in administration of sedation and reversal agents available in room
  - All drugs must be recorded in procedure or electronic log and signed by attending physician
Infection Control in the Lab

- Electric clippers for femoral access site
- Chlorhexidine based scrub with adherent drapes
- Surgical scrub for all tableside personnel is recommended for first case, followed by self-drying solutions for subsequent cases
- Hats and masks are optional for routine percutaneous procedures.
- Antibiotic prophylaxis often used for permanent implants and sometimes when closure devices are used in immunocompromised patients
Radiation Safety

- Each facility must have a radiation safety program.
- Documentation of radiation safety training must be provided.
- Goal - As low as reasonably achievable (ALARA).
- Lead aprons, thyroid shields and radiation badges for all staff, lead glasses for those close to X-ray source.
- Radiation exposure to staff must be monitored and posted in a central area.
- Record total radiation dose in Gray (Gy) in real time, and inform the operator when thresholds for potential radiation damage are reached.
## Radiation Safety

<table>
<thead>
<tr>
<th>Radiation Threshold</th>
<th>Action</th>
</tr>
</thead>
</table>
| 5 Gy                | Patient education  
30-day phone call  
Office visit, if required |
| 10 Gy               | Medical physicist should calculate  
peak skin dose  
Skin should be examined in 2-4 weeks |
| 15 Gy               | Joint Commission sentinel event,  
contact risk management and  
regulatory agencies within 24 hours |
Intra-procedural best practices

➢ Time-Out
  • All members of the procedural team must be present
  • Performed immediately prior to vascular access
  • Physician for case leads the Time-Out
  • Sample Time-Out (link to table 2 of best practices document)
  • Team members should brief their replacement during staff switch

➢ Universal Protocol
  • Universal infections precautions for all patients
  • Routine site marking is not necessary
  • All solutions on the table must be labeled in real-time (not pre-labeled)
  • Nurse or technician should document MD’s verbal orders and have MD sign them at case end
➢ Pre-PCI Time Out

- For ad hoc PCI or if proceduralist changes during case (interventionalist steps in after completion of diagnostic angiogram)
- Appropriateness of PCI (AUC class), need for heart team approach
- Availability of equipment for PCI
- Radiation and contrast used
- Hemodynamics
- Patient discomfort
- Status of pre-procedure antiplatelet therapy and candidacy for DAPT
Intra-Procedure Best Practices

➢ Procedural data reporting
  • All elements (procedure and events) should be documented electronically
  • Record should be immediately available to staff in post-procedure area
  • Special emphasis to ensure accurate pre and intra-procedural data for NCDR reporting
  • Link to sample cath report (table 3 of best practices document)
Post procedure Best Practices

➢ Physician to Patient Communication
  • Physician should discuss procedure results with patient and family and document the discussion
  • Management plans should be discussed, including need for and duration of DAPT in those who receive a stent

➢ Procedure report
  • Generated immediately post-procedure and placed in patient chart prior to transfer
  • Should include essential elements mandated by TJC for operative procedures + indications for procedure
  • Key data elements and definitions should be used (link to 2013 ACCF key elements document)
  • Following information should also be included in report (link to table 3 of best practices document)
Access site management

- Femoral
  - Sheath removal generally when ACT < 180 seconds (for heparin), after 2 hours (bivalirudin) or after 8-12 hours (LMWH)
  - In patients with Cr Cl < 30 ml/min or dialysis who receive bivalirudin, check ACT before sheath removal
  - Bed rest for 2-6 hours for manual pressure and 1-4 hours for vascular closure devices (VCD)

- Radial
  - Sheath removed immediately after case
  - Patent hemostasis method strongly encouraged (pulse oximeter placed on ipsilateral index finger and ulnar artery compressed manually while loosening hemoband or lowering TR band pressure till plethysmographic waveform returns without pulsatile bleeding at radial access site
  - Avoid weight-bearing or other activity of the arm for 2–4 hours after sheath removal
Post-Procedure Best Practices

Gen Monitoring and Length of Stay
- Telemetry monitoring in recovery or other unit specializing in cardiac care
- Vital signs q15 minutes x 2 hours
- Length of stay for diagnostic cases ranges 2-6 hours
- Length of stay for PCI dependent on risk of complications, patient comorbidities and need for further care

Discharge Instructions
- Duration of and adherence to DAPT must be discussed and emphasized
- Stent card should be filled out and given to patient
- Physical activity limitations and follow up discussed
- Cr rechecked in 3-5 days if at risk for CIN
- Phone call in 24-48 hours to answer questions and detect complications
Post-Procedural Best Practices

- Medication Reconciliation
  - Pre-discharge medication reconciliation to update medication list
  - Special care in those requiring oral anticoagulation in addition to DAPT (“triple therapy”)
  - Metformin re-started in 48 hours, warfarin on same day, target-specific oral anticoagulants (TSOACs) on next day
  - Routine use of LMWH for bridging typically reserved for patients at high risk of thrombosis (mechanical heart valves, prior stroke or pulmonary embolism/DVT)

- Handoff and follow up
  - Formal nurse-to-nurse and physician-to-physician handoff
  - Handoff includes procedure note and post-procedural plan
  - Follow up within 4 weeks with physician should be arranged and sooner for patients with anemia, renal insufficiency or complications
CCL governance

➢ Role of Director and Manager
  • CCL director
    • Physician
    • Minimum 5 years experience
    • Responsibilities (link to table 6 of best practices document)
  • CL manager
    • RCVT or RN
    • Minimum 5 year CCL experience
    • Administrative experience
    • Partners with director on QI, fiscal administration, patient throughput, team training, debrief after adverse events, education, preparation for The Joint Commission visits
CCL governance

➢ Incorporation of Guidelines, New Data and New Procedures

• CCL policies and policies should be reviewed and updated annually by entire CCL team

• Operators and staff should receive education and training regarding changes

• Protocols should define the roles of all personnel
CCL governance

➢ Cost considerations

➢ Goal- Reduction in CCL expenses

• Collaboration between CCL physician and managers
• Negotiation of lower prices
• Volume-related discounts
• Supply-chain management
• Reduction in staff turnover
• Reduction in overtime pay
CCL governance

➢ Management of industry presence
  • Role should be consistent with policies set by hospital and/or CCL director.
  • Presence reasonable when it helps physician with patient care
  • Presence without specific purpose (for observation) may be prohibited

➢ Patient experience optimization
  • CMS regulated survey ([HCAHPS survey](#))
  • Key techniques to enhance patient satisfaction (link to table 6 of best practices)
CCL governance

- CCL Emergency Preparedness Protocols
  - Drills at routine intervals to practice team response to rare and serious complications
  - Link to table 5 of best practices document
Other considerations - vascular access

- Link to femoral checklist
- Link to radial checklist
Other considerations - infection control

- Screening for blood borne pathogens is not routinely performed
- Wearing two pairs of gloves reduces inner glove punctures by 60% (not proven to prevent transmission of hepatitis or HIV)
- Report skin puncture or laceration immediately
- Employee health protocol for the management of such event with CDC published guidelines available for guidance
- Gloves mandatory during femoral/brachial sheath removal in holding room, eye protection strongly encouraged
- Staff vaccination for Hepatitis B virus is encouraged
Other considerations- infection control continued

- The CCL should be thoroughly cleaned once a day and spot-cleaned, with trash removal between each case
- The ventilation system should provide at least 20 air exchange/hour and be cleaned monthly
- The doors to the CCL should be kept closed, except for essential personnel leaving or entering room
- Equipment near the entry site, such as foot switches, should be covered
- Multi-dose vials should be avoided, unless used with an approved device to protect against backflow
- Blood-contaminated drapes, gowns, gloves, and sponges should be discarded in containers labeled as health care waste. Needles and blades should be placed in puncture-proof containers
Other considerations - radiation safety

- Assessment of Risk
  - Consider the obese patient
  - Complex PCI/CTO
  - Repeat procedures within 30-60 days
  - Other radiation-related procedures

- Measures to mitigate risk
  - Use of 7.5 fps instead of 15 fps
  - “Fluoro-save” instead of cine
  - Maximize distance between X-ray tube and patient, and minimize distance between detector and patient
  - Appropriate use of shielding and distance from source
  - Monitoring of radiation exposure with use of personal dosimeters

www.SCAI.org/QIT
Cath Lab Equipment

- Imaging equipment and archival storage
- Multichannel physiologic monitoring (at least 2 pressure and 3 ECG channels)
- Inventory of disposable supplies, including adequate inventory for the scope of services provided
- Emergency management equipment
- Documentation of preventive maintenance and testing of laboratory equipment
  - For radiographic systems this includes but is not limited to
    a) image quality
    b) dynamic range
    c) modulation transfer function
    d) fluoroscopic spatial resolution
    e) fluoroscopic field of view size accuracy
    f) low contrast resolution
    g) record and fluoro mode automatic exposure control and
    h) maximum table-top exposure rate
- Documentation of the safe operation of infrequently-used equipment
Information Storage and Inventory

- Should link reporting system with the hospital information system.

- Linking inventory and billing creates a seamless interface to provide an accessible report, enhanced inventory management and can verify billing.

- Compliance with the 1996 Health Insurance Portability and Accountability Act (HIPAA) is required.

- Disaster recovery is essential to any archival storage system.
Expert Consensus Document for cardiac cath lab standards

- 2012 cardiac cath lab standards document
Resources & Support

- SCAI QI Committee Assistance: Info@scai.org

- SCAI QIT Updates: http://www.scai.org/QIT/default.aspx

- SCAI QIT Tip of the Month: http://www.scai.org/QITTip/default.aspx
Acknowledgments

- SCAI President: James C. Blankenship, MD
- SCAI QI Committee Chair/Vice-Chair: Sunil V. Rao, MD and Kalon K. Ho, MD
- Original Authors (2011 QIT): Christopher J. White, MD; Sunil V. Rao, MD; Kalon K. Ho, MD; Skip Anderson, MD; Lyndon J. Box, MD; Charlie E. Chambers, MD; Kirk N. Garratt, MD; Srihari S. Naidu, MD; Steven J. Yakubov, MD; Suresh R. Mulukutla, MD; Henry S. Jennings, MD
Acknowledgments

- 2016 QIT Update: Rajesh V. Swaminathan, MD; Jordan G. Safirstein, MD; Henry S. Jennings, MD, Jayant Bagai, MD; Craig J. Beavers, PharmD; Dmitriy N. Feldman, MD; Sunil V. Rao, MD

- 2016 Cath Lab Best Practices Expert Consensus Statement: Srihari S. Naidu, MD; Herbert D. Aronow, MD; Lyndon C. Box, MD; Peter L. Duffy, MD; Daniel M. Kolansky, MD; Joel M. Kupfer, MD; Faisal Latif, MD; Suresh R. Mulukutla, MD; Sunil V. Rao, MD; Rajesh V. Swaminathan, MD; and James C. Blankenship, MD

- SCAI Staff: Joel C. Harder, MBA