SCAI Quality Improvement Toolkit

Working on QUALITY, One Cath Lab at a Time

www.SCAI.org/QIT
The SCAI 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, MScAII
Outline

- Defining Quality in the Cath Lab
- Operator and Staff Requirements
- Procedural Quality
- 2016 Cath Lab Best Practices
- Facility and Environmental Issues
- Care Coordination with Referring Physicians
Cath Lab Best Practices
2016 Cath Lab Best Practices

Purpose
- SCAI continues to share best practices for pre-, intra-, and post-procedure patient evaluation and management
- This update of the 2012 Expert Consensus Statement includes new 2016 best practices on CCL governance
- 2016 Best Practices are supplemented by tools and checklists to assist providers in implementation

Intended Audience
- CCL directors, hospital administrators, interventionalists, nurses, technologists, advanced practice providers, primary care/referring physician, SCAI QIT Champions

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The 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.

CCL physicians and staff should be properly trained and equipped to handle increasing patient complexity and emerging technology.
Outline

- Competence, Optimal CCL Team, & Maintenance of Qualifications
- Pre-Procedure
- Intra-Procedure
- Post-Procedure
- CCL Governance
Competence

- Physicians should maintain procedure-specific credentialing and privileging by their institution
- Technologists should obtain RCIS certification
- Nursing staff should ideally have a minimum of 1 year of critical care experience
- A procedure for recertification of privileges is required every 2 years by The Joint Commission (TJC)
  - Ongoing professional practice evaluation (OPPE) annually
  - Focused professional practice evaluation (FPPE) for newly hired operators or established operators requesting new procedures
Competence

- Institutional volume ≥200 PCIs/year
- Operator volume ≥50 PCIs/year (averaged over 2 years)
- Institutional volume ≥36 Primary PCIs/year (STEMI)
- Operator volume ≥11 Primary PCIs/year (STEMI)

*JACC 2013;62(4):357-96
Competence

- Document and review case numbers, procedural outcomes, and risk-adjusted outcomes at least bi-annually.

- Participate in national or regional quality improvement registry (such as NCDR).

- Hold at least quarterly meetings for Angio Review (Procedural Appropriateness), Cath Lab Conference, and M&M Conference.
Maintenance of Qualifications

- ABIM/AOA Certification in Interventional Cardiology is required for operators completing training after 1993 and strongly recommended for all operators.

- NBPAS may be an alternative to ABIM/MOC.

- CME should be completed every 2 years.

- SCAI and ACC Membership is strongly encouraged.

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Pre-Procedural Best Practices

- A pre-cath H&P should be completed within 30 days for outpatients or 24 hrs for inpatients

- A focused update should be performed by the attending physician within 24 hours prior to the procedure

- Incorporate use of SCAI AUC calculators
  - IPhone, Android, and Web-Based
  - http://www.scaiaucapp.org/auc

- Utilize risk scores for predicting complications and document methods employed to reduce risk www.scaipciriskapp.org
Pre-Procedural Best Practices

- Informed Consent (IC)
  - Obtain within 4 weeks (by physician or informed team member)
  - Present in native language and in lay man terms
  - Outline indications, risks, benefits, alternatives, and outcomes of the procedure
  - Discuss when witnessed by 3rd party, preferably a family member
  - Reaffirm on the day of the procedure

- Sedation, Anesthesia and Analgesia Evaluation
  - Physicians must be credentialed for conscious sedation
  - ASA and/or Mallampati classification should be established by the physician or designee (although no supportive data in the CCL)
  - NPO for 2 hrs (clear liquids) and 6 hours (solids)
  - Some institutions are not requiring NPO status given lack of supportive evidence¹

¹. Anesthesiology 2011; 114:495–511
Medications

- Initiate antiplatelet therapy prior to the procedure when PCI is possible/likely
- Review potential issues with long-term DAPT for these patients
- Discontinue warfarin with goal INR <1.8 on day of procedure (consider radial access, especially for emergent cases)
- Discontinue novel oral anticoagulants 1-2 days prior to procedure
- Adjust insulin dosing for NPO status
- Hold Metformin on day of procedure and restart a minimum of 48 hrs after procedure
Other considerations

- Hydrate patients at risk of CIN with Normal Saline
  - e.g. 1-1.5ml/kg/hr for 3-12 hrs before procedure and 6-24 hrs after

- N-acetyl cysteine is no longer recommended

- Document contrast reactions & pre-medicate for severe reactions
  - e.g. 50mg of oral prednisone 13, 7, and 1 hour prior to the procedure in addition to 50mg of oral diphenhydramine 1 hour before

- Shellfish allergy is not a predictor of contrast reactions and does not require pre-treatment
Pre-Procedural Best Practices

- Labs and Other Studies
  - Draw CBC and SMA within 4 weeks of procedure
  - PT/INR is not required unless there is warfarin use, severe anemia, or liver disease
  - Consider alternative options/cancellation of elective case if INR >1.8 (consider radial access, especially for emergent cases)
  - Obtain baseline EKG
  - A CXR is not routinely required
  - Check B-HCG for women of childbearing age (<2 weeks)
## Table 1. Pre-Procedure Check List for Cardiac Catheterization

**Patient Name:**

**MRN:**

**Procedure Date:**

### Planned Procedure:

(circle all that apply)
- Diagnostic Cardiac Catheterization (L, R, simultaneous)
- Coronary Angiography
- Left Ventriculography
- Intravascular Imaging/Hemodynamic Assessment (IVUS, OCT, FFR)
- Possible PCI
- Planned PCI
- Other

### History and Physical Examination:

**Elective Outpatient Procedures:**
- H&P documented within 30 days? [Yes] [No]

**Inpatient Procedures:**
- H&P documented within 24 hours of admission? [Yes] [No]

**History of prior PCI or CABG:**
- If yes, report/s obtained? [Yes] [No]

**Stress test/ LVFS assessment:**
- If yes, report/s obtained? [Yes] [No]

### Candidacy for Drug-Eluting Stent:

1. Major surgery in the past month or next year? [Yes] [No]
2. Is there any clinically overt or suspected bleeding? [Yes] [No]
3. Is patient on chronic anticoagulation (e.g., warfarin, TSOAC)? [Yes] [No]
4. Is there history of/anticipated medication non-adherence? [Yes] [No]

### Allergies:

1. Contrast: [Yes] [No] If yes, the patient pre-treated? [Yes] [No]
2. Aspirin: [Yes] [No] If yes, the patient desensitized? [Yes] [No]
3. Heparin (HIT): [Yes] [No] If yes, consider alternative anti-thrombotic agents (DTI)
4. Latex: [Yes] [No] If yes, remove all latex products from procedural use

### Medications:

1. Did patient take aspirin within the past 24 hours? [Yes] [No]
2. Did patient take clopidogrel, prasugrel, or ticagrelor within the past 24 hours? [Yes] [No]
3. Did patient take metformin within the past 24 hours? [Yes] [No]
4. Did patient take sildenafil (or other PDE5 inhibitor) within the past 24 hours? [Yes] [No]
5. Did patient receive LMWH within the past 12 hours? [Yes] [No]
   If yes for LMWH, time of last dose
6. Did patient take anticoagulants if yes, which agent and when was last dose

### Informed Consent:

Was informed consent obtained within 30 days? [Yes] [No]

Is there a healthcare proxy? [Yes] [No]

Is the patient DNR or DNI? [Yes] [No]
   If yes, was it revoked for procedure?

### Sedation, Anesthesia and Analgesia:

Are ASA and Mallampati Class documented? [Yes] [No]

Is there any contraindication to sedation present? [Yes] [No]

Risk scores applied? [Yes] [No]
- Bleeding
- CIN
- Mortality

### Laboratories and Studies:

- CBC and renal profile within 30 days (outpatient) or 24 hours (inpatient)? [Yes] [No]
  
  Hgb _________  eGFR _________

- Was ECG performed within 24 hours? [Yes] [No]

- PT/INR performed within 24 hours (for patients on warfarin)? [Yes] [No]
  
  INR ≤ 1.8?

- Urine/serum human chorionic gonadotropin (HCG) in woman of childbearing age? [Yes] [No]

- Does the patient require pre-procedure hydration? [Yes] [No]

### Preferred vascular access:

R, L, TR, TF

### Same Day Discharge candidate? [Yes] [No]
Intra-Procedure Best Practices

- **Patient Preparation in Procedure Room**
  - Review medical record and checklist
  - Briefly re-confirm procedure and consent with patient

- **Sedation, Anesthesia and Documentation**
  - Consider conscious sedation for all patients (especially transradial procedures)
  - Monitor for side effects and log doses of administered agents
  - Keep reversal agents readily accessible
Intra-Procedure Best Practices

- Universal Protocol and “Time Out”
  - Routine site marking is not necessary in the CCL
  - Label table solutions in real-time (do not pre-label)

- “Time Out” Protocol
  - Perform prior to vascular access when all team members present
  - Check patient ID with double-identifiers
  - Ensure unanimous agreement as to the nature of the procedure

- Consider “Pre-PCI Timeout” for ad-hoc PCIs
**Intra-Procedure Best Practices**

**Table 2. Sample “Time Out” Pre-procedure Checklist**

All members of the procedural team must be present for the “Time Out.”

<table>
<thead>
<tr>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Out must take place immediately before vascular access is obtained.</td>
</tr>
<tr>
<td>The physician taking ultimate responsibility for the procedure should lead the Time Out and ensure each of the following items is announced:</td>
</tr>
<tr>
<td>• Patient’s name and medical record number</td>
</tr>
<tr>
<td>• Procedure to be performed (e.g., left heart catheterization, coronary angiography, right heart catheterization)</td>
</tr>
<tr>
<td>• Confirm that the equipment needed is available or alternatives are available including intended stent type for PCI or cath-possible patients</td>
</tr>
<tr>
<td>• Patient’s allergies and premedication if appropriate (e.g., heparin-induced thrombocytopenia, contrast allergy)</td>
</tr>
<tr>
<td>• Special laboratory or medical conditions (e.g., INR, GFR)</td>
</tr>
<tr>
<td>• Confirm IC signed, witnessed and present</td>
</tr>
</tbody>
</table>
Infection Control

- Infectious complications are exceedingly rare
- Use electric clippers to shave/prep the femoral access site
- Scrub access sites with anti-microbial and chlorine based preps
- Use either traditional surgical scrub with water/soap or chlorhexidine/ethyl alcohol hand antiseptic solutions
- Wear hats/masks for every procedure involving device insertion
- Antibiotics are not recommended for routine cases
  - Consider antibiotics during insertion of vascular closure devices in high-risk patients (i.e. diabetics)
Radiation Exposure

- Goal: ALARA (As Low as Reasonably Achievable)
- All: Wear lead aprons, thyroid shields, radiation badges, lead glasses (when close to radiation source)
- Techs: Notify operator when approaching harmful thresholds

<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 examined at 2-4 wks |
| 15 Gy               | *TJC → hospital risk management/regulatory agencies should be contacted within 24 hrs |
Post-Procedure Best Practices

Access Site Management

- Perform femoral angiography (particularly before PCI or VCD)
- Remove femoral sheath when ACT < 180 seconds (for heparin), after 2 hours (for bivalirudin, unless eGFR < 30 in which case follow ACT), or after 8-12 hours (for LMWH)
- Restrict ambulation for 2-6 hours after manual compression
- Restrict ambulation for 1-4 hours after VCD
- Use the patent hemostasis technique with immediate sheath removal after radial cases and keep the arm immobile for 2-4 hours

Panchofy S et al. CCI 2008;72:335-40
Gupta S et al. Cardiac Intv Today May/June 2015
Post-Procedure Best Practices

- **Physician to Patient Communication**
  - Physician should discuss procedure results with patient and family
  - Delay discussions with patients until cognitive impairment due to sedation has resolved

- **Appropriate Attending to Referring Physician Handoff**
  - Formal handoffs (RN-to-RN and MD-to-MD) should be conducted
  - Ensure procedure note is available to receiving team and that formal procedure note is sent to all referring physicians
Post-Procedure Best Practices

- **Procedure Report**
  - Generate a formal procedure note immediately post-procedure and included in the chart prior to transferring to the next level of care
  - Finalize the report within 24 hours
  - At a minimum, a brief progress note with the following elements should be included in the chart prior to patient transfer:
    - Name of operator
    - Indication & Type of Procedure
    - Findings
    - Estimated blood loss
    - Specimens removed (if appropriate)
    - Complications
    - Post-procedure diagnosis
    - Recommendations
## Post-Procedure Best Practices

### Table 3. Recommended Elements of the Procedure Report\(^a\)

<table>
<thead>
<tr>
<th>Element</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient demographics</td>
<td>Age, gender, risk factors, medications</td>
</tr>
<tr>
<td>Primary operator and CCL team members</td>
<td>Primary and assisting physicians, fellows, nurses, technicians, anesthesiologists</td>
</tr>
<tr>
<td>Procedures performed</td>
<td>Right/Left heart catheterization, PCI</td>
</tr>
<tr>
<td>Indications</td>
<td>Clinical presentation, symptoms, exam findings, prior studies</td>
</tr>
<tr>
<td>Access site</td>
<td>Femoral, radial, brachial</td>
</tr>
<tr>
<td>Equipment</td>
<td>Sheaths, catheters, wires</td>
</tr>
<tr>
<td>Drugs and doses</td>
<td>Cardiac medications and sedation</td>
</tr>
<tr>
<td>Contrast data</td>
<td>Type and amount used</td>
</tr>
<tr>
<td>Radiation exposure</td>
<td>Dose</td>
</tr>
<tr>
<td>Complications</td>
<td>Clear description of complications, otherwise report “none”</td>
</tr>
<tr>
<td>Hemodynamics</td>
<td>Computer generated measurements must be verified by the operator: Initial and end aortic pressure, left ventricular systolic and end-diastolic pressure, valve gradients and areas, right sided chamber pressures, cardiac output, and shunt data</td>
</tr>
</tbody>
</table>

### Table 3. Recommended Elements of the Procedure Report\(^a\)

<table>
<thead>
<tr>
<th>Element</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left ventriculogram</td>
<td>Ejection fraction, wall motion abnormalities</td>
</tr>
<tr>
<td>Coronary angiography</td>
<td>Detailed anatomy, lesions, variants, size of vessels, collaterals</td>
</tr>
<tr>
<td>Intervventional procedures</td>
<td>Procedure description including equipment, results and complications, TIMI flow pre- and post-PCI</td>
</tr>
<tr>
<td>IVUS, OCT</td>
<td>Indication, artery segment evaluated, measurements performed, morphology and changes in management</td>
</tr>
<tr>
<td>FFR</td>
<td>Indication, documentation of vasodilator used and route, location of lesion evaluated, results, interpretation</td>
</tr>
<tr>
<td>Method of hemostasis</td>
<td>If vascular closure device (VCD), comment on whether or not device was successful</td>
</tr>
<tr>
<td>Summary of findings, diagnosis, and follow-up</td>
<td>Management plan, admission or observation status, follow-up</td>
</tr>
<tr>
<td>Communication</td>
<td>Report that results and complications were discussed with the patient and/or family, receiving team, consultants, and referring provider</td>
</tr>
</tbody>
</table>

Post-Procedure Best Practices

- Appropriate Monitoring and Length of Stay (LOS)
  - Patients should be monitored on a telemetry floor specializing in cardiac care
  - Check vital signs q15 min for the first 2 hours
  - Diagnostic LOS ranges from 2-6 hrs depending on access site used, patient ambulation, and well-being
  - Post-PCI LOS varies based on any complications, comorbidities, and need for further procedures, therapy, or testing
  - Low-risk patients after elective PCI can be considered for same-day discharge \(^1\)

Post-Procedure Best Practices

Medication Reconciliation

◦ The recommended duration of DAPT is per current guidelines, which is at least 6-12 months after 2nd generation DES and 1-12 months after BMS depending on whether the patient presented with an ACS

◦ Pay careful attention to “triple therapy” and duration of each medication

◦ Start novel oral anticoagulants the next day

◦ Start warfarin immediately with a follow-up PT/INR within 1 week

◦ Hold metformin for 48 hours

◦ Start PPI for patients with prior history of GI bleed on DAPT and consider starting for all patients on triple therapy1

1. Levine GN et al, JACC 2011;58:e44-122
DES = 2nd generation DES

Levine GN et al, JACC 2016.
2016 ACC/AHA Focused Update on Duration of Dual Antiplatelet Therapy

www.SCAI.org/QIT
Analysis of DAPT Study suggests that in patients treated for 1 year with DAPT and without significant bleeding or ischemic events, subsequent use of the “DAPT Score” can be helpful in assessing the benefit/risk ratio with prolonged DAPT.

- A score of ≥2 was associated with a favorable benefit/risk ratio for prolonged DAPT, while a score of <2 was associated with an unfavorable benefit/risk ratio.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age ≥75</td>
<td>-2</td>
</tr>
<tr>
<td>Age 65 - &lt;75</td>
<td>-1</td>
</tr>
<tr>
<td>Age &lt;65</td>
<td>0</td>
</tr>
<tr>
<td>Current cigarette smoker</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1</td>
</tr>
<tr>
<td>MI at presentation</td>
<td>1</td>
</tr>
<tr>
<td>Stent diameter &lt;3mm</td>
<td>1</td>
</tr>
<tr>
<td>Paclitaxel-eluting stent</td>
<td>1</td>
</tr>
<tr>
<td>CHF or LVEF&lt;30%</td>
<td>2</td>
</tr>
<tr>
<td>Saphenous vein graft PCI</td>
<td>2</td>
</tr>
</tbody>
</table>

DES = 2^{nd} generation DES

Post-Procedure Best Practices

- **Discharge Instructions and Patient Information**
  - Stress DAPT duration and adherence
  - Provide stent card with device information and location
  - Counsel on physical activity limitations and driving restrictions

- **Appropriate Follow-up Evaluation**
  - CCL team member should contact all patients within 24-48 hrs to ensure no complications, reinforce med adherence, and to answer questions
  - Arrange serum Cr check within 3-5 days for those at risk of CIN
  - Provide clinic follow-up within 4 weeks of discharge or earlier if presence of baseline renal insufficiency, anemia, or procedural complications
    - Document evaluation of access site
    - Re-assess medication list and compliance
    - Address lifestyle modifications including need for cardiac rehab/smoking cessation
CCL Governance

- **Role of CCL Director, Manager, and Hospital Administration**
  - Collaboration between a physician director, non-physician manager, and hospital administration is important
  - A minimum of 10% effort is necessary for the CCL director
  - CCL director responsibilities – Administrative, QI, Academic

- **Management of Industry Presence**
  - Industry role should be consistent with policies set by the hospital and/or director
  - Hands-on equipment should only be present for defined educational purposes or device preparation
  - An industry rep presence without specific purpose is of uncertain appropriateness and may reasonably be prohibited

www.SCAI.org/QIT
CCL Governance

Cost Considerations

- Goal is to provide highest value of care which translates to:
  - Appropriateness
  - Reducing complications
  - Judicious use of resources

- Target CCL operating costs and/or costs of care outside the CCL
  - Negotiate lower device prices and volume-related discounts (“bulk purchase”)
  - Use the most cost-effective device when there is clinical equipoise
  - Track physician-specific cost data (adjusted for case complexity)
  - Participate in hospital technology-assessment committees
  - Be aware of evolving strategies that lower cost (e.g. radial access, heparin)
CCL Governance

- Major Complication CCL Preparedness Protocols
  - Develop specific protocols for rare, but serious complications
  - Drills should be performed at routine intervals in the CCL to practice response to these complications

Vascular Complications
- Acute Stroke
- Emergency Pacing
- VF/Cardiac Arrest
- Coronary Perforation
- Contrast Reaction
- Tamponade
- Sudden Cardiogenic Shock
Patient Experience Optimization

- Patient experience/satisfaction impacts clinical outcome

- HCAHPS (http://www.hcahpsonline.org) → regulated by CMS

- Results are publicly available at www.hospitalcompare.hhs.gov

- Not specific to CCL → all CCLs should consider developing and administering a unique survey for this purpose

- Implement techniques for enhancing patient satisfaction
Table 6. Key Techniques for Enhancing Patient Satisfaction in the CCL

<table>
<thead>
<tr>
<th>Pre-Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Prompt, easy scheduling for outpatients</td>
</tr>
<tr>
<td>• Minimize or eliminate NPO period before procedure (some institutions allow clear liquids until 2 hours before procedure, or no longer require NPO)</td>
</tr>
<tr>
<td>• All outpatient suite and CCL personnel introduce themselves by name</td>
</tr>
<tr>
<td>• Update patients when delays are anticipated</td>
</tr>
<tr>
<td>• Emphasize comfort and privacy, including of family members</td>
</tr>
<tr>
<td>• Respect confidentiality</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intra-Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Careful attention to adequate sedation and pain control during the procedure</td>
</tr>
<tr>
<td>• Time out with introduction of all team members to the patient</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post-Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full explanation of results of procedure to patients and family when appropriate</td>
</tr>
<tr>
<td>Prompt food and drink when tolerated after procedure</td>
</tr>
<tr>
<td>Discuss follow-up plans, provide instructions for emergency help after discharge, and provide appointment before discharge</td>
</tr>
<tr>
<td>Follow-up call to answer questions and identify post-procedural problems</td>
</tr>
</tbody>
</table>
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/QITTtip/default.aspx
Acknowledgments

- SCAI President: James C. Blankenship, MD
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- 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

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