Patient Preparation, Safety, and Post-procedure Care

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Case Example 1

• A 65 yo woman with HTN, DM, CRI presents for a complex planned PCI. The labs at her diagnostic angiogram 3 weeks prior showed a Cre of 1.5, and normal electrolytes.

• Her labs are drawn, but come back partially hemolyzed. They are redrawn, but it will take up to an hour before they return a result.
Case Example 1

- The physician is told labs were drawn, and proceeds with PCI. After the first balloon inflation, the patient develops ventricular tachycardia and fibrillation, refractory to CPR and defibrillation.

- Labs drawn that morning subsequently show a Cre of 1.8, and K of 6.7 mEq/L.
Case Example 2

• A 60 yo gentleman with stable angina is found to have an intermediate coronary stenosis in the LAD. Heparin is ordered, and a pressure wire is placed across the lesion.

• The patient begins to experience chest pain, and angiography shows thrombosis of the entire LAD requiring thrombus aspiration and multiple stents.

• An ACT was checked and was <150 sec. Heparin was never given, because the (new) nurse says she never heard the order.
Case Example 3

- A 50 yo ICU patient is ordered for unfractionated heparin infusion for DVT.
- Heparin ordered/delivered as 10,000 units/ml concentration
- The pharmacist dispenses and ICU nurse administer heparin at 10,000 units per hour for 6 hours.
“To Err is Human”

- Institute of Medicine Report, 1999
- 44,000 – 98,000 deaths annually from adverse events
- Equivalent to 1 airplane crash each day.
Swiss cheese model

Ian D Coombes, Danielle A Stowasser, Judith A Coombes and Charles Mitchell
Adapted from Reason’s model of accident causation
What makes for a successful cath lab team?

Effective teams possess the following features:

- a common purpose
- measurable goals
- effective leadership and conflict resolution
- good communication
- good cohesion and mutual respect
- situation monitoring
- self-monitoring
- flexibility
A number of techniques have been developed to promote communication in health care including:

- SBAR (Situation-Background-Assessment-Recommendation)
- call-out
- check-back – “Close the circle”
- handover/handoff
- debriefings
Resolving disagreement and conflict

A number of techniques have been developed to help all members of a team speak out including:

- the two challenge rule
- CUS
- DESC script
Two-Challenge Rule

Invoked when an initial assertion is ignored...

- It is your responsibility to assertively voice your concern at least two times to ensure that it has been heard.
- The member being challenged must acknowledge.
- If the outcome is still not acceptable:
  - Take a stronger course of action.
  - Use supervisor or chain of command.
CUS – “Code words”
TeamSTEPPS
Conflict Resolution DESC Script

A constructive approach for managing and resolving conflict

D—Describe the specific situation
E—Express your concerns about the action
S—Suggest other alternatives
C—Consequences should be stated

Ultimately, consensus shall be reached.

Let’s “DESC-It”
- Have timely discussion
- Frame problem in terms of your own experience
- Use “I” statements to minimize defensiveness
- Avoid blaming statements
- Critique is not criticism
- Focus on what is right, not who is right
Barriers to teamwork

- changing roles
- medical hierarchies
- individualistic nature of medicine
- unstable nature of teams
Failures in the following team behaviours have been identified as being responsible for accidents in other industries:

- roles not being clearly defined
- lack of explicit coordination
- miscommunication/communication
Tenerife, 1977

The Deadliest Plane Crash
Cath Lab Timeout: Most important components

- Patient identification, consent confirmed
- Patient recent clinical status / potential complications reviewed (EF, CHF, shock)
- Procedure, indication
- Equipment needed available
- Access site planned
- Allergies (esp. contrast), and premeds
- Antibiotic prophylaxis for implants
- Medications stopped (Metformin, heparin, warfarin) or preloaded (Plavix) appropriately
- Labs reviewed
Most important labs

- Hemoglobin / Hematocrit
  - Over 30 / stable
- Potassium (K+)
  - 3.5-5.0, maybe up to 5.6 in ESRD
- Creatinine
- PTT / INR
- Platelets > 50
Airway Risk Evaluation

- Mallampati Classification
- Thyromental distance
- Neck mobility issues
- Obesity
- Known OSA
- Difficulty with prior intubation
The Mallampati classification is a simple scoring system that relates the amount of mouth opening to the size of the tongue, and provides an estimate of space available for oral intubation by direct laryngoscopy. According to the Mallampati scale, class one is present when the soft palate, uvula, and pillars are visible, class two when the soft palate and base of the uvula are visible, class three when only the soft palate is visible, and class four when only the hard palate is visible.
Ensuring Correct Procedures
Universal Protocol “Time - Out”

1. Correct patient identity (2 identifiers)
2. Correct procedure to be performed
3. Correct site/side
4. Correct consent form
5. Correct patient position
6. Procedure site marked/visible after draping
7. Correct imaging labeled and displayed
8. Correct implant available
9. Antibiotic prophylaxis given
10. Appropriate DVT prophylaxis
11. Blood availability
12. Special equipment available
13. Allergies confirmed

ABBREVIATED
TIME OUT

1. Correct patient identity (2 identifiers)
2. Correct procedure to be performed
3. Correct side/site
4. Correct consent form
5. Correct imaging (as applicable)
6. Allergies confirmed

DO WE ALL AGREE?

*Site may not be marked if consent obtained by provider and provider does not leave prior to performing procedure.
A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population

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Abdel-Hadi S. Breizat, M.D., Ph.D., E. Patchen Dellinger, M.D.,
Teodoro Herbosa, M.D., Sudhir Joseph, M.S., Pascience L. Kibatala, M.D.,
Marie Carmela M. Lapitan, M.D., Alan F. Merry, M.B., Ch.B., F.A.N.Z.C.A., F.R.C.A.,
Krishna Moorthy, M.D., F.R.C.S., Richard K. Reznick, M.D., M.Ed., Bryce Taylor, M.D.,
and Atul A. Gawande, M.D., M.P.H., for the Safe Surgery Saves Lives Study Group*

RESULTS
The rate of death was 1.5% before the checklist was introduced and declined to 0.8% afterward (P=0.003). Inpatient complications occurred in 11.0% of patients at baseline and in 7.0% after introduction of the checklist (P<0.001).
2nd Time out for PCI

- **A** - Anticoagulation, Antiplatelet
  - Heparin or Bivalirudin?
  - Clopidogrel, Ticagrelor, Prasugrel, or GPI

- **E** – Equipment, Environment

- **I** – Indications
  - ACS? Stable Angina? Ischemia?

- **O** – Outcomes
  - BMS or DES? PCI or CABG?

- **U** – Unexpected complications
  - Dissection, Vessel Closure, Shock
Closing Timeout

• Is the procedure really done?
• Are sponge/needle counts correct?
• All of the vessels/grafts imaged?
• Have we done everything we can to maximize the outcome?
• How do we plan on managing the access site?
Nursing Report/Signout Essentials

• What vessel was stented?
• What anticoagulation was used?
• Did the patient receive his Plavix load?
• Were there any complications?
• Which access site was used?
• Was a vessel closure device used?
Common Pitfalls in PCI Pharmacology

• Restarting heparin after PCI
  - Increases vascular complications without reducing ischemic events
• Failing to reduce dose of Integrillin, Angiomax in renal patients
• Delays in providing Plavix after PCI
Typical Arterial Femoral Access Site Management

• Sheath left in place
  □ Pull when ACT < 150 (PTT <60)
  □ Manual pressure x 15 minutes
  □ Hold pressure proximal to skin insertion

• Supine position x 4-6 hours

• Closure device – supine x 2 hours

• Varies with anticoagulation, venous, sheath size
Vascular access complications

- #1 complication of cath lab procedures
- 1-4% typical for femoral procedures
- Bleeding and transfusions are associated with mortality
- Most vascular access complications are eliminated with radial access
Importance of access
AV fistula
Femoral Dissection
Femoral Leak
Post cath groin pain, tenderness, swelling, hematoma, bruit, low Hgb.

What is this?

Femoral Artery Pseudoaneurysm after cath
Clinical Signs of Retroperitoneal Hemorrhage

<table>
<thead>
<tr>
<th>Condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anemia</td>
<td>100%</td>
</tr>
<tr>
<td>Hypotension</td>
<td>92%</td>
</tr>
<tr>
<td>Abdominal tenderness</td>
<td>69%</td>
</tr>
<tr>
<td>Diaphoresis</td>
<td>58%</td>
</tr>
<tr>
<td>Groin pain</td>
<td>46%</td>
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<tr>
<td>Low abdominal pain</td>
<td>42%</td>
</tr>
<tr>
<td>Groin hematoma</td>
<td>31%</td>
</tr>
<tr>
<td>Bradycardia</td>
<td>31%</td>
</tr>
<tr>
<td>Back pain</td>
<td>23%</td>
</tr>
</tbody>
</table>

Cullen
Vascular Closure and Hemostasis Devices

Perclose

Angio-Seal

Starclose
Typical TR band protocol

- Withdraw sheath 2-3 cm from vessel
- Apply band with green marker over puncture site
- Inflate 15-18 cc air using Inflator
- Remove sheath
- Deflate band until bleeding is observed, inflate 2 cc additional to ensure hemostasis
- Check distal radial pulsation or oximetry
- Tape TR band syringe to patient
- Deflate band in 2 hours (diagnostic cath) or 4 hours (PCI) and remove. Progressive deflation unnecessary. Reinflate if bleeding occurs.
## Radial Access Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Prevalence</th>
<th>Risk factors</th>
<th>Prevention &amp; Treatment</th>
</tr>
</thead>
</table>
| Radial artery occlusion       | 2–18%            | • Prolonged high-pressure compression  
                                | • Repeat entry  
                                | • Low radial artery to sheath ratio | • Anticoagulation  
                                | • Patent hemostasis                                                   |
| Nonocclusive radial artery injury | Common          |                                                                              |                                                             |
| Hand ischemia                 | Extremely rare   | • Prolonged cannulation  
                                |                                                             | • Careful evaluation before harvesting as a graft  
                                |                                                             | • Careful examination of circulation                                  |
| Radial artery spasm           | 5–10%            | • Small radial arteries  
                                | • Female  
                                | • Multiple catheter exchanges  
                                | • Larger sheath size  
                                | • Inexperience | • Antispasmyotic cocktail  
                                |                                                             | • Gentle manipulation                                                 |
| Perforation                   | 0.1%–1%          | • Aggressive wire manipulation  
                                | • Excessive anticoagulation | • Early detection and pressure bandage for hematoma  
                                |                                                             |                                                             | • Compression  
                                |                                                             | • Thrombin injection  
                                |                                                             | • TR band                                                      |
| Pseudoaneurysm                | Rare (<0.1%)     | • Multiple puncture  
                                | • Catheter infection  
                                | • Excessive anticoagulation  
                                | • Larger sheath sizes |                                                             | • Compression  
                                |                                                             | • Thrombin injection  
                                |                                                             | • TR band                                                      |
| Nerve damage                  | Extremely rare   | • Multiple puncture  
                                |                                                             | • Supportive care  
                                | 2.8%              | • Cook sheath                                                                 | • Removal of the coating  
                                |                                                             |                                                             | • Surgical repair if necessary                                      |
| Granuloma                     | Extremely rare   | • Multiple puncture  
                                |                                                             |                                                             | 0.15%             | • Cook sheath                                                                 | • Removal of the coating  
                                |                                                             |                                                             | • Surgical repair if necessary                                      |
| AV fistula                    |                  |                                                                              |                                                             |                                                             |                   |                                                                              |                                                             |
Radial pseudoaneurysm
Non-access complications

- **Periprocedural Myocardial Infarction**
  - Involves 8% of patients post-PCI, esp. in higher risk patients.
  - May reflect distal embolization, side branch closure, or stent thrombosis.
  - Report any chest pain or ST-changes on monitor following PCI.
  - 12-lead EKG for any chest pain, ST-changes following PCI.
Non-access complications

• **Arrhythmia**
  - Continuous EKG monitoring essential
  - Report any new arrhythmias following PCI

• **Stroke**
  - Report any new neurologic changes after PCI (vision/sensation/motor deficits)

• **Contrast Nephropathy**
  - IV hydration after procedure reduces this risk

• **Allergic reactions**
  - Hives, wheeze, hypotension
  - Call MD for any of these symptoms after PCI
Typical patient monitoring

• Post-PCI labs (CBC, CKMB, BMP):
  ▪ 12-Lead EKG on arrival, in AM, and PRN CP
  ▪ Immediately after procedure, and in AM

• Frequent assessments for chest pain, neurologic changes, access site pain/pulses/bleeding.

• Telemetry monitoring, ST-Segment monitoring

• Monitor I/O’s strictly
Patient education

• Stent booklet/wallet card
  ▪ Identifies stent used, vessel, date, MD

• Vascular closure device pamphlet/label, if used

• Patient should be educated on vascular access site assessment
  ▪ Bruising, small lump is ok
  ▪ Return to ER if: Expanding mass, pulsatile groin swelling, leg weakness/numbness, pus, pallor.
Patient education

- Shower after 24 hours
- No immersion bath/swimming for 3 days
- Avoid strenuous activity x 1 week
- Return to light duty work after 1 day.
- Emphasize importance of taking Plavix daily with Aspirin
  - Reduced risk of Stent thrombosis
- Instruct patient to resume medications
  - Metformin should be held for 2 days
- Followup appointments