Session 9e: Supporting practice with Standards and Guidelines

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Goal Statement

The goals of the Standards and Guidelines:

- Provide Perfusionists with a framework to guide safe and effective extracorporeal support care to their patients.
- AmSECT recommends that clinical teams use the Standards and Guidelines as a guide for developing institution-specific protocols for patients receiving extracorporeal support.
Definitions:

- **Standard**: Practices, technology and/or conduct of care that institutions shall meet in order to fulfill the minimum requirements for cardiopulmonary bypass.

- **Guideline**: A recommendation that should be considered and may assist in the development and implementation of protocols.

- **Protocol**: An institution-specific written document, derived from professional standards and guidelines, which contains decision and treatment algorithms.
Word Usage:

- **Shall**: In this document, the word *shall* is used to indicate a mandatory requirement.

- **Should**: In this document, the word *should* is used to indicate a recommendation.

- **Surgical Care Team**: In this document, the term surgical care team is used to indicate the group surgeon, anesthesiologist, Perfusionist, nurse and technicians.
My current role at my institution is?

- Staff member
- Leadership role, but not Chief
- Chief
Poll: My current role at my institution is:
I practice perfusion at more than 1 institution?

- No
- Yes
Poll: I practice perfusion at more than 1 institution.
The perfusionists at my institution?

- Are members of the hospital staff
- Contracted
- Other
Poll: The perfusionists at my institution:
The perfusionists at my institution report to?

- Operating room
- Nursing
- Cardiothoracic surgeons
- Other
Poll: The perfusionists at my institution report to:
Which of the following categories best describes your career stage?

- Early career (10 years or less)
- Mid career (11-20 years)
- Late career (more than 20 years)
Poll: Which of the following categories best describes your career stage?
Have you read or used the AmSECT Standards and Guidelines (S&Gs) in the past 4 years?

- Yes
- No
Poll: Have you read or used the AmSECT Standards and Guidelines (S&Gs) in the past 4 years?
Has your team implemented the S&Gs as part of its policy manual?

- Yes, fully
- Yes, partially
- No, but we tried
- No, wasn’t aware of the S&G
Poll: Has your team implemented the S&Gs as part of its policy manual?
Please rate importance of utilizing scientific reference material to help support S&Gs?

- Not at all useful
- Slightly useful
- Moderately useful
- Very useful
- Extremely useful
- Not sure - unaware of the S&G
Poll: Please rate importance of utilizing scientific reference material to help support S&Gs:
Please rate importance of utilizing regulatory reference material to help support S&G’s?

- Not at all useful
- Slightly useful
- Moderately useful
- Very useful
- Extremely useful
- Not sure - unaware of the S&G
Poll: Please rate importance of utilizing regulatory reference material to help support S&Gs:
Which format(s) for displaying or accessing S&Gs would you find most useful in your daily practice?

- Online publication of full S&Gs
- Print publication of full S&Gs
- Mobile app
- Wall chart
- Print pocket guide
- No preference
- Other
- Not sure - unaware of the S&G
Poll: Which format(s) for displaying or accessing S&Gs would you find most useful in your daily practice?
Which factor(s) have hindered adoption of S&Gs at your institution?

- Lack of awareness of the S&Gs
- Organizational Culture
  - Lack of management support & enthusiasm
  - Lack of financial support
  - Lack of non-clinical time to implement
- Concerns about the level or amount of scientific evidence
- Age- older or more experienced perfusionists are less inclined to use
Poll: Which factor(s) have hindered adoption of S&Gs at your institution?
Would it be beneficial if the S&Gs were endorsed by other medical societies (AATS, STS, SCA, AACP, etc.)?

- Not at all useful
- Slightly useful
- Moderately Useful
- Very useful
- Extremely useful
Poll: Would it be beneficial if the S&Gs were endorsed by other medical societies (AATS, STS, SCA, AACP, etc.)
Which standards would you like us to discuss today?

- **Standard 1.** Protocols
- **Standard 3.** Communication
- **Standard 5.** Checklists
- **Standard 17.** Quality Assurance and Improvement
Poll: Which standards would you like us to discuss today?
Which standards would you like us to discuss today?

- **Standard 2:** Qualification, Competency and Support Staff***
- **Standard 4:** Perfusion Record
- **Standard 6:** Safety Devices
- **Standard 7:** Monitoring
- **Standard 8:** Anticoagulation
- **Standard 9:** Gas Exchange
- **Standard 10:** Blood Flow
Poll: Which standards would you like us to discuss today?
Which standards would you like us to discuss today?

- **Standard 11:** Blood Pressure
- **Standard 12:** Protamine and Cardiotomy Suction**
- **Standard 13:** Blood Management
- **Standard 14:** Level of Readiness**
- **Standard 15:** Staffing**
- **Standard 16:** Duty Hours
- **Standard 18:** Maintenance***
Poll: What standards would you like us to discuss today?
Standard 1: Development of Institutionally-based Protocols

- **Standard 1.1**: As a mechanism for applying each standard to clinical practice, an institution or service provider shall develop and implement an operating procedure (protocol) for each of the standards.

- **Standard 1.2**: The protocol shall be:
  - Approved by the Chairman of Cardiac Surgery, or his/her designee, Director of Perfusion or equivalent, and other relevant clinical governance committees if available.
  - Reviewed and revised annually or more frequently when deemed necessary.

- Guideline 1.1: Deviation from protocol may be at the discretion of the Surgical Care Team and should be documented in the perfusion record.
Standard 2: Qualification, Competency and Support Staff

- **Standard 2.1**: A Perfusionist, who is Board Certified by the American Board of Cardiovascular Perfusion or who demonstrates equivalent qualifications and competency, shall conduct cardiopulmonary bypass (CPB). AmSECT recognizes that individual states may license Perfusionists based on other criteria. These laws supersede this standard.

- **Standard 2.2**: Perfusionist competency shall be assessed annually to evaluate compliance with departmental protocols.

- **Standard 2.3**: The Perfusionist shall attend, participate, and engage in perfusion-related continuing education courses on an annual basis.
Standard 2.4: Support staff shall be available on site to assist the primary Perfusionist during CPB procedures.

Standard 2.5: A process to educate, train, and annually evaluate perfusion staff shall be developed and followed.

Guideline 2.1: An individual graduating from an accredited perfusion education program should complete all requirements for American Board of Cardiovascular Perfusion certification within 3 years of graduation.

Guideline 2.2: A standardized process should be developed and followed to identify, orient and educate support staff to ensure they have general knowledge of the duties performed by the Perfusionist, flow of the operation and location of primary and ancillary items required during CPB. Support staff may include a Perfusionist, nursing, technical, or non-technical staff.
**Standard 3: Communication**

- **Standard 3.1**: A patient-specific management plan for the cardiopulmonary bypass (CPB) procedure shall be prepared and communicated to the surgical team either during the pre-operative briefing or prior to beginning the procedure.

- **Standard 3.2**: The primary Perfusionist shall use a set handoff protocol e.g. SBAR when transitioning the management of the case to a second Perfusionist.
Guideline 3.1: The use of cellular telephone technology in the operating room should be guided by the principles of ST-59 Statement on use of cell phones in the operating room, written by the American College of Surgeons.

Guideline 3.2: Protocol driven communication (e.g. closed-loop), should be utilized to acknowledge verbal commands, verify the content, and reduce ambiguity.

Guideline 3.3: The primary Perfusionist should participate in the post-procedure debrief with the surgical team.
**Standard 4: Perfusion Record**

- **Standard 4:1:** The perfusion record (written and/or electronic) for each cardiopulmonary bypass (CPB) procedure shall be included as part of the patient’s permanent medical record. The perfusion records shall be maintained and stored according to institution policy for retaining patient medical records.

- **Standard 4.2:** The record shall include:
  - Patient information including demographics and pre-operative risk factors (Appendix A)
  - Information sufficient to accurately describe the procedure, personnel, and equipment (Appendix B).
  - Patient physiological parameters documented at a frequency determined by institutional protocol (Appendix C)
  - Blood gas and anticoagulation monitoring results (Appendix D)
  - Signature of the Perfusionist (and all relief Perfusionists) performing the procedure.
Guideline 4.1: The perfusion record should include open text (factual) commentary including supervising physician verbal orders pertinent to the CPB procedure

Guideline 4.2: The perfusion record should include the signatures of the physician(s) providing oversight for the CPB procedure

Guideline 4.3: Raw data (e.g. blood flow, pressure and temperature values) contained in electronic perfusion databases should be stored for a time period in accordance with your institution’s policy for retaining electronic patient medical records.
**Standard 5: Checklist**

- **Standard 5.1**: The Perfusionist shall use a checklist for each cardiopulmonary bypass (CPB) procedure.

- **Standard 5.2**: Checklists shall be included as part of the patient's permanent medical record.

- Guideline 5.1: The Perfusionist should use checklists in a read-verify manner where critical steps that should have been performed are confirmed. Completion of the checklist should be performed by two people, one person being the primary Perfusionist responsible for operation of the heart lung machine during the intra-operative period.

- Guideline 5.2: The Perfusionist should utilize a checklist throughout the entire peri-operative period (e.g. set-up, pre-bypass, initial onset of bypass, prior to cessation of bypass, post bypass, and/or any return to bypass).

- Guideline 5.3: The Perfusionist should utilize a checklist for other ancillary perfusion services (e.g. cell salvage, intra-aortic balloon pump, extracorporeal membrane oxygenation).
**Standard 6: Safety Devices**

- **Standard 6.1:** Pressure monitoring of the arterial line, cardioplegia delivery systems and venous reservoir (when augmented venous drainage is utilized), shall be employed during cardiopulmonary bypass (CPB) procedures.
  - The pressure monitor shall be either servo regulated to control the arterial/cardiacoplegia pump or to allow interruption to the arterial/cardiacoplegia flow.
  - The pressure monitor shall include an audible and visual alarm.

- **Standard 6.2:** A bubble detector shall be employed during CPB procedures
  - The gross/macro bubble detector shall be used to control the arterial pump or to allow interruption of the arterial blood flow.
  - The detector system shall include an audible and visual alarm, and be positioned according to manufacturer instructions for use to enable timely identification and action.
Standard 6.3: A level sensor shall be employed during CPB procedures utilizing a (hard-shell) reservoir.

- The level sensor shall be either servo regulated to control the arterial pump or to allow interruption of the arterial blood flow
- The level sensor shall include an audible and visual alarm, positioned according to manufacturer’s instructions to allow an appropriate reaction time and a safe operational volume.

Standard 6.4: Temperature monitoring of the arterial outflow from the oxygenator shall be employed during CPB procedures.

- The temperature sensor shall include an audible and visual alarm to prevent high arterial outlet temperatures.

Standard 6.5: An arterial-line filter shall be employed during CPB procedures.
Standard 6.6: A one-way valve in the vent line shall be employed during CPB procedures.

Standard 6.7: A method for retrograde flow avoidance when using a centrifugal pump shall be employed during CPB procedures.

- Examples of retrograde avoidance systems may include the following:
  - One way flow valves
  - Hard stop detent controls to prevent accidental reduction in pump speed
  - Electronically activated arterial line clamps
  - Low speed visual and audible alarm.

Standard 6.8: An anesthetic gas scavenge line shall be employed whenever inhalation agents are introduced into the circuit during CPB procedures.
Standard 6.9: Hand cranks shall be readily available during CPB procedures.

Standard 6.10: A back-up gas supply shall be available during CPB procedures.

Standard 6.11: A back-up battery supply for the CPB machine shall be available during CPB procedures.
Guideline 6.1: A ventilating gas oxygen analyzer should be employed during CPB procedures.

Guideline 6.2: A level sensor should be employed during CPB procedures utilizing a soft shell reservoir.

- The level sensor should be either servo regulated to control the arterial pump or to allow interruption of the arterial blood flow.
- The level sensor should include an audible and visual alarm, and be positioned according to manufacturer’s instructions to allow an appropriate reaction time and a safe operational volume.
- The use of an air bubble detector distal to the outlet can be used utilized as a surrogate level detector.
**Standard 7: Monitoring**

- **Standard 7.1:** Patient arterial blood pressure shall be monitored continually during cardiopulmonary bypass (CPB)
- **Standard 7.2:** Arterial line pressure shall be monitored continually during CPB
- **Standard 7.3:** Arterial blood flow shall be monitored continually during CPB.
- **Standard 7.4:** Cardioplegia dose, delivery method, line pressure (antegrade), coronary sinus pressure (retrograde) and ischemic intervals shall be monitored continually during CPB.
**Standard 7.5:** Patient and device temperatures shall be monitored continually during CPB.

- Patient (e.g. nasopharyngeal, rectal, bladder, esophageal)
- Heart lung machine (arterial, venous and cardioplegia)
- Heater cooler (H20 temperature)

**Standard 7.6:** Blood gas analyses shall be monitored continually or at regular intervals during CPB (Appendix D)

**Standard 7.7:** Hematocrit (or hemoglobin) shall be monitored continually during CPB.

**Standard 7.8:** Oxygen fraction and gas flow rates shall be monitored continually during CPB (Appendix D).
Standard 7.9: The percentage of venous line occlusion of the venous occluder shall be monitored continually during CPB.

Standard 7.10: Venous oxygen saturation shall be monitored continually during CPB.

Guideline 7.1: Carbon dioxide removal should be monitored continually during CPB.

Guideline 7.2: Arterial oxygen saturation should be monitored continually during CPB.

Guideline 7.3: The following patient pressures should be monitored during CPB
  - Central venous pressure and/or
  - Pulmonary artery blood pressure

Guideline 7.4: Continuous in-line blood gas monitoring should be used during CPB.
Guideline 7.5: Cerebral oximetry should be used during CPB.

Guideline 7.6: Arterial blood flow should be monitored continually at a point in the CPB circuit where it accurately reflects the flow delivered to the patient during CPB (eg distal to intra-circuit shunts).
**Standard 8: Anticoagulation**

- **Standard 8.1:** The Perfusionist, in collaboration with the physician-in-charge, shall define the intended treatment algorithm for anticoagulation management (heparin) and an alternative algorithm for when heparin is not suitable, including acceptable ranges for ACT.

- **Standard 8.2:** The Perfusionist shall work closely with the surgical care team to monitor and treat the patient’s anticoagulation status before, during, and after the cardiopulmonary bypass (CPB) period.
Guideline 8.1: The surgical care team should determine the target activated clotting time by considering relevant factors; including variability in the measurement of activated clotting time (ACT) attributed to the device’s performance characteristics.

Guideline 8.2: Patient-specific initial heparin dose should be determined by one of the following methods:

- Weight
- Dose Response Curve (automated or manual)
- Blood Volume
- Body Surface Area
Guideline 8.3: Anticoagulation monitoring should include the testing of ACT. Additional monitoring tests may include:
  - Heparin level measurement (e.g. heparin/protamine titration or unfractionated heparin level)
  - Partial Thromboplastin Time
  - Thromboelastograph
  - Thrombin Time
  - Anti Xa

Guideline 8.4: Additional doses of heparin during CPB should be determined by using an ACT and/or Heparin/Protamine titration

Guideline 8.5: Heparin reversal should be confirmed by ACT and/or heparin/protamine titration.
**Standard 9: Gas Exchange**

- **Standard 9.1:** Gas exchange shall be maintained during cardiopulmonary bypass (CPB) according to protocol, accounting for:
  - The individual patient characteristics/risk profile
  - Oxygenator type, design and instructions for use
  - Blood flow, temperature and metabolic demand

- **Standard 9.2:** Devices used to measure gas exchange shall be calibrated according to the manufacturer’s instructions for use

- **Standard 9.3:** Blood gas analysis shall be performed and recorded according to protocol.
Guideline 9.1: Point-of-Care testing should be considered to provide accurate and timely information for blood gas analysis.

Guideline 9.2: Oxygen delivery and consumption calculations should be utilized to evaluate and optimize gas exchange.

- Oxygen Delivery: $DO_2 = 10 \times CI \times CaO_2$
- Oxygen Consumption: $VO_2 = 10 \times CI \times (CaO_2 - CvO_2)$

Where:

$CaO_2$ (arterial oxygen content) = $(Hb \times 1.36 \times SaO_2) + (0.0031 \times PaO_2)$, and

$CvO_2$ (mixed venous oxygen content) = $(Hb \times 1.36 \times SvO_2) + (0.0031 \times PvO_2)$

CI = cardiac index
HB = hemoglobin
SaO2 = arterial oxygen saturation
PaO2 = partial pressure of oxygen in arterial blood
SvO2 = venous oxygen saturation
PvO2 = partial pressure of oxygen in venous blood
Standard 10: Blood Flow

- **Standard 10.1:** Target blood flow rates shall be determined prior to cardiopulmonary bypass (CPB) according to protocol.

- **Standard 10.2:** The Perfusionist shall work closely with the surgical care team to maintain targeted blood flow rate during CPB.
Guideline 10.1: Variance from intended and targeted blood flow should be communicated to the physician-in-charge.

Guideline 10.2: Appropriate blood flow rate should be determined by evaluation of:
- Acid base balance
- Base Excess
- Anesthetic level
- Arterial blood pressure
- Cerebral oximetry
- Lactate burden
- Oxygen delivery and consumption (refer to guideline 10.2 for formula)
  - Venous pO₂
  - Arterial pO₂
  - Hemoglobin concentration
  - Arterial oxygen saturation
- Systemic vascular resistance (SVR)
- Temperature
- Venous oxygen saturation
Standard 11: Blood Pressure

- **Standard 11.1:** The Perfusionist, in collaboration with the physician-in-charge, shall define and communicate the intended treatment algorithm for blood pressure management prior to cardiopulmonary bypass (CPB), including acceptable ranges for blood pressure.

- **Standard 11.2:** The Perfusionist shall work closely with the surgical care team to maintain blood pressure according to protocol during CPB.

- Guideline 11.1: Variance from intended and targeted blood pressure should be documented and communicated to the physician-in-charge to allow for changes in the blood pressure management plan.

- **Standard 12.1**: Cardiotomy suction shall be discontinued at the onset of protamine administration to avoid clotting within the CPB circuit.
Standard 13: Blood Management

- **Standard 13.1**: The Perfusionist shall participate in efforts to minimize hemodilution and avoid unnecessary blood transfusions.

- **Standard 13.2**: The Perfusionist shall minimize the cardiopulmonary bypass (CPB) circuit size to reduce prime volume.

- **Standard 13.3**: The Perfusionist shall calculate and communicate to the surgical team prior to initiating CPB, a patient's predicted post-dilutional hemoglobin or hematocrit.
Guideline 13.1: Blood management efforts should include the following:

- Participate in pre-operative briefings (discussions) with the surgical care team (Standard 5.1) regarding transfusion strategies and target hematocrit values.
- Participation in a multidisciplinary blood management team.
- Minimize hemodilution by:
  - Matching the size of the CPB circuit to the size of the patient
  - Autologous priming of CPB circuit, including retrograde arterial and venous antegrade priming
  - Biocompatible coating on the surface of all CPB components
  - Perioperative blood cell recovery and reinfusion after being appropriately processed.
  - CPB circuit blood salvage at the end of the procedure

Guideline 13.2: Point-of-Care hemostasis monitoring should be utilized to minimize blood loss. Monitoring may include:

- International normalized ratio
- Partial thromboplastin time
- Prothrombin time
- Thrombin time
- Thromboelastography/Thromboelastometry
- Platelet count
- Platelet function analysis
**PROPOSED: Standard 14: Level of Readiness for Procedures that may require cardiopulmonary bypass**

- **Standard 14.1:** Procedures identified preoperatively to be at elevated risk of requiring conversion to cardiopulmonary bypass (CPB) shall have a protocol for transition to CPB.

- **Standard 14.2:** One Perfusionist shall be assigned for each such procedure.

- **Standard 14.3:** A heart-lung machine consisting of a sterile extracorporeal set-up and ancillary equipment (Ref: Appendix B) shall be readily available for the procedure.
Guideline 14.1: The level of readiness for utilizing CPB during a surgical procedure should be determined through consultation with the surgical team.

Guideline 14.2: A heart-lung machine consisting of a sterile extracorporeal set-up and ancillary equipment (Ref: Appendix B) should be readily available for emergency procedures or as part of disaster planning protocols.
PROPOSED: Standard 15: Staffing and On-call

- **Guideline 15.1:** The “n+1” staffing model should be utilized at all times, where “n” equals the number of operating/procedure rooms in use at any given time at a single site.

- **Guideline 15.2:** An on-call Perfusionist should be present and clinically ready for unscheduled and emergency procedures within 60 minutes of being called. Generally, the minimum safe number of perfusion staff: defined as $N + 1$, where $N$ equals the number of operating/procedure rooms in use at any given time at a single site.
Standard 16: Duty Hours

- **Standard 16.1:** In order for the Perfusionist to ensure proper provision of care, he/she shall receive an adequate rest period between scheduled work hours.

- Guideline 16.1: The Perfusionist should receive a minimum of 8 hours of rest period for every 16-hour consecutive work period.
Standard 17: Quality Assurance and Improvement

- **Standard 17.1:** The Perfusionist shall actively participate in both institutional and departmental quality assurance and improvement programs.

- Guideline 17.1: The Perfusionist should collect data concerning the conduct of perfusion via a clinical registry or database.

- Guideline 17.2: The Perfusionist should use such data for quality assurance, and improvement projects.
Standard 18: Maintenance

Standard 18.1: The Perfusionist shall assure that properly maintained and functioning equipment is used in the conduct of cardiopulmonary bypass (CPB), including (but not limited to):

- Heart lung machine
  - Pumps
  - Timers
  - Pressure monitors
  - Temperature monitors
  - Low Level alarm
  - Air bubble detector(s)
  - Blood flow sensors
- Heater/Cooler
- Anesthetic vaporizer
- Oxygen Blender/Flow Meter
- Oxygen analyzer
- Ancillary Equipment
  - IABP
  - VAD device
  - Cell salvage device
Standard 18.2: Preventive maintenance on perfusion equipment shall be performed by appropriately trained and qualified manufacturer technicians, representatives or Bio-Medical technicians. Regularly scheduled maintenance shall be documented by the perfusion department and/or Bio-Medical engineering staff. The interval of such maintenance shall be consistent with manufacturer recommendations, applicable external accrediting agency guidelines and institutional requirements.

Standard 18.3: The organization shall follow a protocol for perfusion equipment failures.
- **Standard 18.4**: Appropriate backup perfusion supplies shall be readily available.

- **Standard 18.5**: The organization shall follow a protocol for acknowledging and addressing perfusion equipment notices (e.g., recalls, warnings, and advisories).
What did I walk into?

- No protocols
- No guidelines
- No standards
Poll: What did I walk into?
What did I do?

- Printed Standards & Guidelines
- Printed Guidelines
- Collected protocols
Poll: What did I do?
What’s the plan now?

- Creating protocols
- Team approval
  - Discussion
  - Team building
- Standardization
Poll: What is the plan now?
Why did WE do this?

- Improved patient care
- Education of staff members
- Standardization
Poll: Why did we do this?
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| Intubation |
| Echo / UV function |
| Venous access and invasive pressure |
| infusions |
| analgesia |
| major events / complications |
| bleeding |
| transfusions |
| pacing |
| Intra-op issues |
| Other issues |

<table>
<thead>
<tr>
<th>R</th>
<th>Recommendations and requests</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Surgeons documented post-op orders:</strong></td>
<td></td>
</tr>
<tr>
<td>BP</td>
<td></td>
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<tr>
<td>Anticoagulation requirements</td>
<td></td>
</tr>
<tr>
<td>Suction pressure for drains</td>
<td></td>
</tr>
<tr>
<td>X-ray</td>
<td></td>
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<tr>
<td>Registrar to phone family</td>
<td></td>
</tr>
<tr>
<td><strong>Questions</strong></td>
<td></td>
</tr>
</tbody>
</table>

Team Members present until the end of hand off:
- ICU Nurse
- Theatre Nurse
- Perfusionist (If required)
- Anaesthetist/team member
- Surgeon/team member
- Intensivist/team member

NOTE: Intensivist: may be a senior reg /consultant, unstable patients require a consultant.
### Perfusion Structured Handover

**Primary Perfusionist to lead handover**

<table>
<thead>
<tr>
<th><strong>C</strong></th>
<th><strong>D</strong></th>
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</thead>
<tbody>
<tr>
<td><strong>Connect</strong></td>
<td><strong>Identify</strong></td>
</tr>
<tr>
<td>Select a suitable and safe time to change perfusionist</td>
<td>Patient name, allergies, relevant medical/surgical history, alerts</td>
</tr>
</tbody>
</table>

**Determining length of time for rotation**

- **e.g.** break or permanently taking over

**Situation**

- **Surgical**

**Background**

- Emergency vs. elective

**Assessment**

- What is the proposed procedure
- What stage of procedure currently at

**Anaesthetic**

- Any information handed over by anaesthetist prior to CPB

**Perfusion**

- **ACT** time since last sample taken, result
- Any heparin given

**Blood Gas**

- Time since last sample taken, result
- Any action:
  - **Hb**
  - **BSL** any action eg insulin given
  - **K**

**Cardioplegia**

- Time since last dose
- Route of administration
- Delivery flows, pressures, any issues
- Any issues maintaining MAP

**Recommendations and requests**

- Any surgical directives e.g. if cooling to what temp?
- If terminating CPB - pre CVP CVP, rhythm, average MAP

---

**Perfusion Clinical Handover completed by Primary Perfusionist**

- **Name:**
- **Date:**
- **Signature:**
- **Time:**

**Perfusionist taking over**

- **Name:**
- **Date:**
- **Signature:**
- **Time:**

---
<table>
<thead>
<tr>
<th>Situation</th>
<th>Select a suitable time to change over</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of rotation (break/permanently)</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Background</th>
<th>Patient</th>
<th>Name, history, alerts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surgical</td>
<td>Surgeon/planned and stage of procedure/difficulties</td>
<td></td>
</tr>
<tr>
<td>Requests (eg flow/MAP), Issues for perfusion (eg flow/drainage/air/volume)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anesthetic (anesthetist, infusions, issues, handover)</td>
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</tr>
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</table>

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Perfusion ACT</th>
<th>time last sample, result, additional heparin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Gas</td>
<td>time last sample, result, action</td>
<td></td>
</tr>
<tr>
<td>HB transfusions / K / BSL actions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cardioplegia</td>
<td>time last dose, route, flows/pressures/issues</td>
<td></td>
</tr>
<tr>
<td>MAP</td>
<td>any issues maintaining MAP</td>
<td></td>
</tr>
<tr>
<td>Equipment Issues</td>
<td>Complete preop checklists</td>
<td></td>
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<tr>
<td>Pharmacologic</td>
<td>volume</td>
<td></td>
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<tr>
<td>Autotransfusion</td>
<td>Set up / processing</td>
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<th>Recommendation</th>
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<td>If terminating CPB - pre CPB CVP, rhythm, average MAP</td>
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**Perfusion Clinical Handover completed by Primary Perfusionist**

Name: ____________________________

Date: ____________________________

Signature: ________________________

Time: ____________________________

**Perfusionist Taking over:**

Name: ____________________________

Date: ____________________________

Signature: ________________________

Time: ____________________________
Impact of Lower Hematocrit During Bypass on AKI Differs by Gender

\[
\text{OR}_{\text{adj}}: 2.0, p<0.001 \\
\text{OR}_{\text{adj}}: 1.2, p=0.25
\]
Role of ANH on Transfusions

Ann Thorac Surg 2015
This report is a confidential professional peer review and quality assurance document of the MSTCVS Cardiac Surgery Quality Collaborative and is intended for use by physicians and data managers for development and evaluation of quality improvement plans. All data in this report is protected from disclosure pursuant to the provisions of Michigan Statutes MCL 333.20175; MCL 333.21513; MCL 333.21515; MCL 331.531; MCL 331.532; MCL 331.533 or such other statutes as may be applicable. Unauthorized disclosure or duplication is absolutely prohibited.
Model for Improvement

Generalizable Knowledge + Context Knowledge (Systems of Care) = Improvement through engagement

Distribution of Procedures by Center
Since Inception
isol CABG isol Valve CABG+Valve Other

Only Includes Cases Matched to Surgical Records