

PERFUSION TECHNOLOGY

PHCL 691L

FALL/SPRING/SUMMER 1997/98

CLINICAL COMPETENCY EXAMINATIONS POLICY

Policy Approved by Advisory Board on August 26, 1996

OBJECTIVE: The objective of the clinical competency examinations is to assess the student's clinical competency at four specified times over a two year period. This assessment will provide the mechanism to identify strengths and weaknesses of each student and assure the faculty that a graduate is competent in all aspects of cardiovascular perfusion as outlined in the Clinical Perfusion Preceptorship Guidelines. A student will not receive approval by the program to sit for the American Board of Cardiovascular Perfusion until the successful completion of all four examinations.

REQUIREMENTS: The student will be registered for 3 credits of PHCL 691L for Fall and Spring semester and 1 credit for SS1 and SS2 sessions. The student will record all clinical encounters with the Clinical Case Evaluation Form, including: perfusion cases, IABP, CPS, Cardiac Catheterization Laboratory rotations, and rotations through other medical institutions. The completed forms will be turned in at colloquium within 14 days of the encounter.

CASE REQUIREMENTS: The case requirements are defined by the Clinical Perfusion Preceptorship Guidelines. Also, IABP requirements require 5 insertions and/or separate monitoring hours in the ICU. The student also must have documentation to support attendance of IABP inservice twice per year. The student must observe at least 5 clinical cases at "remote" clinical sites (i.e. Phoenix, Loma Linda) by the completion of the program. The student must have documentation of cell saver training and at least five clinical cases using cell saver.

COMPETENCY EXAMINATIONS: The requirements for each examination are listed in the Clinical Perfusion Preceptorship Guidelines. The examination will be given by two perfusionists on the teaching staff of UMC. One perfusionist will be the primary perfusionist scheduled for the clinical case and the second examiner will be selected randomly to ensure impartiality. Each student will be tested by all six staff perfusionists by the completion of the program. If the student fails a test, the student must take a second test within 30 days. If the student fails a second time, members of the Advisory Board will meet with the student to determine what action should take place - dismissal or retesting or retention for an additional year.

DEFINITION OF EACH EXAMINATION:

EXAM 1.

Taken during the first two weeks of December (Semester 1).
Must have completed requirements through Level 3 of the Clinical Perfusion Preceptorship Guidelines.
Must have performed greater than 15 clinical cases.

EXAM 2.

Taken during the second or third week of May (Semester 2).
Must have completed requirements through Level 6 of the Clinical Perfusion Preceptorship Guidelines.
Must have performed greater than 30 clinical cases.

EXAM 3.

Taken during the first two weeks of December (Semester 3).
Must have complete requirements through Level 9 of the Clinical Perfusion Preceptorship Guidelines.
Must have performed greater than 60 clinical cases.

EXAM 4.

Taken during the second or third week of May (Semester 4).
Must have completed requirements through Level 12 of the Clinical Perfusion Preceptorship Guidelines.
Must have performed greater than 75 clinical cases.

CIRCULATORY SCIENCES CLINICAL QUALIFYING EXAM

STUDENT _____

Exam Date _____

Upon successful completion of ALL the below requirements, the student will be permitted to count any subsequent clinical encounters as case credit. The student must demonstrate satisfactory clinical competency performing the following tasks:

P= Pass: F= Failure

PREOPERATIVE PREPARATION

- Properly QCs blood gas machine
- Review of patient chart (relevant patient history, lab values, and medications)
- Correct calculation of estimated patient flow and hematocrit on CPB

PERFUSION EQUIPMENT SELECTION AND ASSEMBLY

- Demonstrates proper selection and assembly of pump circuit components

PERFUSION MANAGEMENT AND DECISION MAKING

- Satisfactory control of arterial pump head in response to patient and surgical needs with the direct instruction of the clinical instructor.

Clinical Examiner Signature

Date

CIRCULATORY SCIENCES CLINICAL COMPETENCY EXAM I

STUDENT _____

Exam Date _____

To receive a passing grade, the student must demonstrate satisfactory clinical competency performing the following tasks:

P= Pass: F= Failure

PREOPERATIVE PREPARATION

- Properly QC the blood gas machine and thromboelastograph.
- Demonstrate knowledgeable review of the patient chart (relevant patient history, lab values, and medications) and relate abnormalities to the conduct of perfusion.
- Correctly calculate the estimated range of pump flow and hematocrit on CPB.
- Demonstrate the proper selection and assembly of pump circuit components and be knowledgeable of the operation of each piece of equipment (i.e., oxygenator, reservoir, filters, hemoconcentrator, pump, heat exchanger, gas flow regulator, and safety devices).
- Demonstrate good sterile technique while in the operating room (i.e., when assembling the pump circuit and opening sterile packages).

PERFUSION MANAGEMENT

- Demonstrate satisfactory control of arterial pump head in response to patient and surgical needs with the direct supervision of the clinical instructor.
- Properly maintain the perfusion record.

Clinical Examiners Signatures

Date

Circulatory Sciences Clinical Competency EXAM II

STUDENT _____

Exam Date _____

To receive a passing grade, the student must demonstrate satisfactory clinical competency performing the following tasks:

P= Pass: F= Failure

- Set up the adult perfusion system in less than 20 mins, including priming and setting of the occlusion.
- Set up and prime the blood cardioplegia system.
- Perfusion record preparation according to the Preceptorship Guidelines
- Hand off sash, initiate perfusion, administer cardioplegia, monitor blood gas, coagulation and temperature status.
- Operate the hemoconcentrator and administer fluids as appropriately needed.
- Clearly communication with surgical staff – echo surgeon's requests.
- Terminate CPB with corrected hemodynamic, metabolic, and coagulation status.
- Demonstrate procedural awarness for the type of case and specific needs of the surgeon.
- Complete documentation and restock perfusion supplies.

COMMENTS:

Clinical Examiners Signatures

Date

Circulatory Sciences Clinical Competency EXAM III

STUDENT _____

Exam Date _____

To receive a passing grade, the student must demonstrate satisfactory clinical competency performing the following tasks:

P= Pass: F= Failure

- Performed over 60 perfusion cases including at least 3 pediatric
- Demonstrate a knowledge of pediatric cardiovascular perfusion:
 - Oral exam regarding specific perfusion techniques for the following congenital cardiac anomalies (ASD, VSD, TET, TGV, Endocardial Cushion Defects).
- Demonstrate the ability to setup and run a pediatric perfusion case with minimal supervision.
- Fulfill requirements described for Level 7 for an adult perfusion case.
- Demonstrate the ability to operate the IABP and centrifugal pump.
- Describe how to correct the metabolic status for K^+ , HCO_3^- , and compute the oxygen consumption of a patient on CPB.

COMMENTS:

Clinical Examiners Signatures

Date

Circulatory Sciences Clinical Competency EXAM IV

STUDENT _____

Exam Date _____

To receive a passing grade, the student must demonstrate satisfactory clinical competency performing the following tasks:

P= Pass: F= Failure

- Performed over 75 clinical perfusion cases.
- Orally describe the correct response to the catastrophe events described in **Level 10**.
- Demonstrate proficiency with IABP, Cell Saver, and ECLS
- Describe cannulation techniques for ECMO
- Demonstrated competency in the following:
 - 5 IABP
 - 5 Cell Saving procedures
 - ≥1 Liver perfusion
 - ≥1 Organ ProcurementObserved 5 cases in Phoenix, San Diego, or Loma Linda, Ca

COMMENTS:

Clinical Examiners Signatures

Date

CIRCULATORY SCIENCES GRADUATE PROGRAM

PHCL 691L

CLINICAL PERFUSION PRECEPTORSHIP GUIDELINES

1996/97

This booklet is to serve as a guide for the clinical education and training of the perfusion students in the Circulatory Sciences Graduate Program at the University of Arizona. The approach for clinical training presented this guideline defines scope of responsibility of the student at each level of training. As the students move into increasingly higher levels they remain responsible for all topics of the previous levels.

1. Operating Room
 - a. Understand the policies of the O.R.
 - b. Be assigned a locker
 - c. Observe surgical procedures
 - d. Know safety precautions policies related to handling needles and blood contaminated items
 1. Know proper clothing - scrub suits, jackets policies
 2. Know eye protection policies
 3. Know glove protection policies
 4. Know how and when to recap a blood contaminated needle
 5. Know policies in the event of a needle stick or blood exposure
 - e. Know sterile technique
 1. Know how to perform a surgical scrub
 2. Know how to wrap sterile supplies
 3. Know how to unwrap sterile supplies
 - f. Blood Monitoring Equipment
 1. Know operation and policies of blood gas machine
 2. Know how to properly perform QC's on blood gas machine
 3. Know operation and policies of TEG
 4. Know how to properly perform QC's on TEG
2. ICU orientation
 - a. Understand the policies of the ICU
 - b. Know where the equipment and supply rooms are located
 - c. Learn to read the ICU flow charts
3. Cardiac Catheterization Laboratory Orientation
 - a. Understand the functions of the cath lab
 - b. Understand the role of the perfusionist in the cath lab

LEVEL 2**OBSERVATION****LEVEL 2**

1. Operating Room (at least 5 cases)
 - a. Understand the role of the perfusionist during an open heart procedure
 - c. Observe surgical procedures and begin to understand the surgical routine
 - e. Know sterile technique
 1. Demonstrate the ability to move around the O.R.
 2. Demonstrate the ability to open sterile packages
 - f. Blood Monitoring Equipment
 1. Operate the blood gas machine
 2. Perform QC's on blood gas machine
 3. Operate the TEG
 4. Perform the QC's on TEG
 - g. Report clinical cases at colloquium
2. ICU - Patient Follow-up (at least 5 cases)
 1. One Hour
 2. Assess twenty-four hours status of the following;
 - a. Hemodynamics
 - b. Blood Loss
 - c. Coagulation
 - d. Oxygenation
 - e. CNS
 - f. Renal
 - g. Pulmonary
 3. Report clinical cases at colloquium
3. Cardiac Catheterization Laboratory
 1. Observe at least 3 cardiac catheterizations
 2. Report observations at colloquium

LEVEL 3**BASIC I CLINICAL PERFUSION****LEVEL 3**

- A. Patient Evaluation - ADULT - (>15 cases)
 - 1. Understand History
 - a. Know the disease process, its etiology
 - b. Identify any problems of the disease to the conduct of CPB
 - c. Identify any other problems that might be important to the operation of CPB
 - 2. Understand the Physical Examination
 - a. Understand the systems reviewed.
 - b. Relate abnormalities to diagnosis
 - c. Relate any abnormalities to the conduct of CPB
 - 3. Cardiac Catheterization Laboratory Data
 - a. Know the anatomical involvement
 - b. Identify the patient's C.O., C.I., E.F.,
 - c. Identify the patient's vascular disease
 - d. Understand the significance of chamber pressures
 - e. Understand the chamber saturations, shunts, and resistances
 - f. Know patient's EKG rhythm
- B. Equipment Selection
 - a. Identify all equipment required for the procedure.
 - b. Be able to describe how each piece of equipment is used - oxygenator reservoir, filters, hemoconcentrator, pump, hemotherm, gas flow regulator, and cardioplegia administration sets.
 - c. Know the operational characteristics of each piece of equipment
 - d. Know the prime volume of each piece of equipment
 - e. Know the gas exchange, heat exchange, filtration, flow characteristics and capabilities of each piece of equipment
- C. Observe the conduct of perfusion performed by instructor
 - a. Maintain perfusion record while instructor runs the case
 - b. Gain understanding of sequence of events of perfusionist
 - c. Begin to develop a check list
- D. Post-pump Activities
 - 1. Perfusion Record
 - a. Record all hemodynamic, metabolic, and coagulation studies at the appropriate levels.
 - b. Record all blood, crystalloid, and colloid intake against output of blood and urine. The student should also take into account the pump prime and the use of the cell saver.
 - c. Note any changes in patient status and drugs used to maintain or improve that status.
 - d. Insure that the record is signed appropriately.
 - e. Insure that a copy of the record goes on the patient chart, if required to do so.
 - f. Maintain a neat and legible record.
 - g. Do all calculations correctly.
 - h. Have the record completed prior to the patient leaving the room.
- E. Transfers, accompanies, and monitors patient to ICU

A. Patient Evaluation - ADULT -

1. Laboratory Results

- a. Identify patient's blood type, Hct, Hgb, WBC, PLT CT, PT ,PTT, and electrolyte panel.
- b. Know normal values
- c. Understand meaning and significance of abnormal values.
- d. Relate laboratory results to operation of CPB

2. Pharmacology

- a. Identify all the drugs being taken by the patient
- b. Know activities of drug related to patient's diagnosis
- c. Identify the drugs that may affect the conduct of CPB - especially anticoagulants
- d. Define the actions and indication of all the drugs being taken
- e. Identify what drugs are being given by the anesthesiologist
- f. Know the anesthetic agents being used, their mechanism of action, and effects on the cardiovascular system

B. EQUIPMENT

1. Equipment Procurement

- a. To be able to select the appropriate prime for the circuit
- b. Procure all needed support materials
- c. Insure that there is extra emergency disposable available
- d. Insure extra fluids available including crystalloids and blood.
- e. Insure backup equipment available including: pumps, hemotherms, IABP, centrifugal pumps and oxygen

2. Equipment check

- a. Insure that all non-disposable equipment is in proper condition
- b. Check that all disposables are free of defects and breaches of sterility
- c. Check hemotherms for water and operation
- d. Check heart-lung machines for pump calibrations

C. Circuit Assembly

1. Process

- a. Assemble the circuit related to the procedure and the equipment
- b. Assemble the circuit without kinks, lines on floor, and ports open
- c. Assemble all components in correct positions
- d. Assemble the circuit with all monitoring lines and vents appropriately attached
- e. Assemble circuit in a logical way from most important to least - to mimic an emergency set-up
- f. Allow tubing length and position for replacement of components in an emergency
- g. Prime circuit
- h. Time of assembly should be < 20 minutes

D. Pre-bypass

1. Record preparation
 - a. Procedure
 - b. Diagnosis
 - c. Blood band number and blood type
 - d. Patient name and number
 - e. Laboratory values
 - f. Calculations
 1. Calculate Hct based on prime volume and composition based on the patient and equipment selected
 2. Calculate pump flow rate and RPM based on ml/kg and L/m².
 - g. Model and Serial numbers of equipment
 - h. Plan of Care; prime, cannulas, flow rates, temperatures, techniques, drugs, monitoring
2. Complete check list
3. Aware of surgeon's protocols and variances
4. Support equipment
 - a. Alarms; justify what alarms should be used and where they should be placed
 - b. Gas flow; justify FIO₂, and sweep rate
5. Occlusion set on all pumps, meters calibrated for tubing size
6. Cardioplegia debubbled
7. Time heparin given
8. Time ACT started
9. Aware of any complication that may require emergency initiation of CPB

E. Observe Conduct of perfusion performed by instructor

1. Maintain perfusion record while instructor runs the case
2. Gain understanding of sequence of events of perfusionist
3. Refine a check list

F. Coagulation Management

1. Understand the acceptable ACT range and procedures to maintain the range including frequency of sampling ACT
2. Understand the TEG values and their meaning to coagulation management during and post-CPB

G. Procedural Awareness

1. Begin to disassemble the pump at the appropriate time.
2. Monitor patient status throughout tear down procedure.
3. Maintain sterility of the blood in the system while tearing down and salvage as many pump volume as possible.
4. Be ready to transport, if applicable.

H. Clean-up and Restocking

1. Begin clean up at the appropriate time.
2. Maintain sterility of the blood and salvage as many cells as possible.
3. Tear down the pump in a timely manner.
4. Insure that the disposables are disposed of in an appropriate manner.
5. Not throw away any re-usable items, such as clamps, shims, and etc.
6. Understand the necessity for being able to tear down and set up a new system quickly if the occasion arises.
7. Tear down done neatly, no blood on the floor or equipment.
8. Remove all blood splattered on the equipment during the case with the appropriate disinfectant.
9. Replace all used items.
10. Make sure enough supplies are available for an emergency.
11. Check all stock to insure that is enough for a two day period.
12. Check expiration date and rotate stock accordingly.

(perform 20 clinical cases)

A. Surgical Procedure for the adult patient

1. Understand the potential surgical procedure(s) that could be used to correct the cardiac anomaly
2. Know the planned surgical procedure for the patient's lesion
3. Know the specific steps of the surgical procedure as they relate to the conduct of perfusion

B. Run Pump

1. Sash Hand Off
 - a. Maintain sterility
 - b. Assure that connections are to appropriate cannulas
2. Pre-Bypass Preparation
 - a. Check the circuit prior to initiation to make sure that there are clamps only in the appropriate places.
 - b. Assure that ACT >400s.
 - c. Assure that oxygen gas mixture is set properly and flow rate is set at desired rate
3. Initiation of CPB
 - a. Set timers
 - b. Preload the patient prior to removal of the venous clamp.
 - c. Check the arterial line pressure and recognize any abnormal readings, and take the appropriate action during preload.
 - d. Understand the volume changes created in the patient as the venous clamp is removed and pump flow increased.
 - e. Maintain an appropriate blood volume in the extracorporeal circuit as bypass is initiated.
 - f. Communicate appropriately with surgeon and anesthesiologist.
 - g. Be able to achieve a mechanically smooth initiation of bypass.
 - h. Be able to achieve a balanced initiation of bypass (volume).
 - i. Check for A-V difference between arterial and venous lines and make changes if appropriate.
 - j. Assure that mean arterial pressures are greater than 50 mmHg
 - k. Be able to recognize problems (such as an air lock) and take the appropriate action.
 - l. Open the purge line within one minute.
 - m. Set all pump heads at the appropriate speeds.
4. Cardioplegia Administration
 - a. Understand the principles of cardioplegia.
 - b. Be able to deliver cardioplegia appropriately while maintaining bypass, i.e., correct pressures and flows.
 - c. Be aware of the need for additional cardioplegia.
5. Blood Gas Status
 - a. Maintain arterial and venous PO₂ levels at that prescribed by your instructor
 - b. Maintain P_aCO₂'s in the appropriate range (30-40 mmHg).
 - c. Know how to correct respiratory acidosis and alkalosis.
6. Temperature Control
 - a. Understand the affects of temperature changes on the metabolic status and blood gases.
 - b. Understand the affects of temperature gradients.
 - c. Be able to cool the patient to the appropriate level and maintain that temperature.
 - d. Be aware of rewarming time and when warming should be initiated.
 - e. Know procedure for profound hypothermia technique

7. Hemoconcentrator Operation
 - a. Select and assemble appropriate Hemoconcentrator unit
 - b. Select appropriate vacuum settings
 - c. Understand and adjust metabolic (electrolyte) alterations caused by hemoconcentration
8. Communication
 - a. Hear and understand most directives from the surgeon.
 - b. Clearly advise the surgeon of changes (when appropriate) and/or any problems.
 - c. Echo surgeon's requests

C. Termination of CPB

1. Correct Volumes
2. Metabolic Status
 - a. Correct all acid base abnormalities prior to termination of bypass.
 - b. Monitor the blood gases and electrolyte balance at the appropriate time intervals.
 - c. Know if the lab values are within the normal limits.
 - d. Be able to explain why the values are abnormal, if they are.
3. Hemodynamic Status
 - a. Assure that patient is being ventilated
 - b. Begin the transfer of volume from the extracorporeal circuit to the patient before reducing the pump flow.
 - c. Understand the relationship between the patient's blood volume and the patient's hemodynamic performance.
 - d. Turn off the purge lines before bypass is terminated.
 - e. Monitor pressures constantly.
 - f. Know if pressures are within normal limits and if not, be able to explain why.
 - g. Be able to explain the rationale for all hemodynamic manifestations, such as the intra-aortic balloon pump, increased preload, decreased afterload, inotropic and chronotropic drugs.
4. Coagulation Status
 - a. Insure that they are obtained at the appropriate time and done correctly.
 - b. Determine if the values are within normal limits and what actions should be taken if abnormal.
 - c. Explain why the values are measured.
 - d. Explain why the values are abnormal.
5. Response to unexpected events
6. Procedural Awareness
 - a. Communicate off bypass with surgeon and anesthesiologists.
 - b. Communicate any lab, EKG, or pressure abnormalities with surgeon and/or anesthesia.
 - c. Be aware of the patient hemodynamics and metabolic status.
 - d. Be aware of the patient volume status and bleeding.
 - e. Start the cell saver if appropriate.
 - f. Anticipate the patients needs and make appropriate decisions.

D. Documentation

1. Pre-bypass checklist
2. Perfusion Sheet - accurate, legible.

LEVEL 6**INTERMEDIATE II PEDIATRIC CLINICAL PERFUSION LEVEL 6****A. Patient Evaluation -PEDIATRIC - (>30 cases of any age group or type)**

1. Understand History
 - a. Know the disease process, its etiology
 - b. Identify any problems of the disease to the conduct of CPB
 - c. Identify any other problems that might be important to the operation of CPB
2. Understand the Physical Examination
 - a. Understand the systems reviewed.
 - b. Relate abnormalities to diagnosis
 - c. Relate any abnormalities to the conduct of CPB
3. Cardiac Catheterization Laboratory Data
 - a. Know the anatomical involvement
 - b. Identify the patient's potential associated congenital vascular malformations
 - c. Understand the significance of chamber pressures
 - d. Understand the chamber saturations, shunts, and resistances
 - e. Know patient's EKG rhythm
 - f. Identify the patient's C.O., C.I., E.F., if available
4. Laboratory Results
 - a. Identify patient's blood type, Hct, Hgb, WBC, PLT CT, PT, PTT, and electrolyte panel.
 - b. Know normal values
 - c. Understand meaning and significance of abnormal values.
 - d. Relate laboratory results to operation of CPB
5. Pharmacology
 - a. Identify all the drugs being taken by the patient
 - b. Know activities of drug related to patient's diagnosis
 - c. Identify the drugs that may affect the conduct of CPB - especially anticoagulants
 - d. Know the specific drugs and dosages used for pediatric patients
 - e. Identify what drugs are being given by the anesthesiologist
 - f. Know the anesthetic agents being used, their mechanism of action, and effects on the cardiovascular system
6. Disposable Selection for pediatric perfusion
 - a. Identify all equipment required for a pediatric procedure.
 - b. Be able to describe how each piece of equipment is used - oxygenator reservoir, filters, Hemoconcentrator, pump, hemotherm, gas flow regulator, and cardioplegia administration sets.
 - c. Know the operational characteristics of each piece of equipment
 - d. Know the prime volume of each piece of equipment and how it relates to The conduct of pediatric perfusion
 - e. Know the gas exchange, heat exchange, filtration, flow characteristics and capabilities of each piece of equipment

B. Surgical Procedure for the pediatric patient

1. Understand the potential surgical procedure(s) that could be used to correct the cardiac anomaly
2. Know the planned surgical procedure for the patient's lesion
3. Know the specific steps of the surgical procedure as they relate to the conduct of perfusion
4. Understand the procedure and application of profound hypothermia - circulatory arrest

C. Equipment Adult vs Pediatric Equipment

- a. Know why equipment is specific for patient size
- b. Know what modifications may be done to accommodate pediatric procedures

(performed >40 cases)

1. Hemodynamic Status
 - a. Maintain pressures in the range set by the surgeon without big swings in pump flow or drug dosage.
 - b. Understand the significance of changes in the venous pressure and make the appropriate responses.
 - c. Understand procedures to control pressures within prescribed range; flow rates, pharmacological agents
 - d. Understand factors to determine adequacy of pressures; peripheral vascular resistance, pulmonary vascular resistance.
 - e. Avoid roller coaster pressures.
 - f. Realize when pressures may need to vary from normal.
2. Volume Status
 - a. Maintain reservoir volumes at ranges set by perfusion instructor
 - b. Understand procedures to adjust volumes to desired levels; hemoconcentrator, add volume
 - c. Understand what an appropriate HCT is during CPB and how to achieve that value
 - d. Understand the relationship of the HCT to temperature
3. Pharmacological Agents
 - a. Understand and be able to discuss the indications and actions of the drugs used on bypass and be aware of possible complications, including: cardiovascular, anesthetics, and anti-coagulants.
 - b. Use these drugs at the appropriate time and in the appropriate dosage for patient size.
 - c. Understand and be able to discuss the side effects and contradictions of the drugs used on bypass.
4. Perfusion Record
 - a. Accurately complete all entries on the pump record.
 - b. Document all on and off pump times, aortic cross clamp times, fibrillation times, and ischemic times.
 - c. Record all changes in flows, gas settings and other pump parameters.
 - d. Record all data on the pump record at appropriate intervals (usually every 10 minutes).
 - e. Understand and be able to discuss the relationship between the document data on the pump record and the physiologic phenomena.
 - f. Maintain the record in a neat, and legible manner.
5. Suction Control
 - a. Be aware of when the left ventricular vent should be on or off and the level of ventricular suction required.
 - b. Be aware of pump sucker speed.
6. Procedural Awareness
 - a. Be aware of cross clamp time and the need for cardioplegia.
 - b. Be able to discuss the stage of the operative procedure.
 - c. Know when to increase or decrease pump flow and how long

LEVEL 8 ADVANCED I CLINICAL PERFUSION**LEVEL 8**

1. Performed over 50 clinical cases
2. Support Equipment
 - a. Know how to operate the IABP
 - b. Know how to check the IABP for proper function
 - c. Know where balloon catheters are stored and the proper sizing related to patient size
 - d. Know how to operate centrifugal pump
 - e. Understand when centrifugal pumps would be used
 - f. Know the tubing circuit for the specific indications for the centrifugal pump
3. Flow Status
 - a. Understand procedure for inability to flow calculated flow
 - b. Understand and understand factors to determine adequacy of flow rate:
P_vO₂, SvO₂, Oxygen consumption, HCO₃, lactate, PCO₂ gradient, arterial pressure

LEVEL 9 ADVANCED II CLINICAL PERFUSION**LEVEL 9**

1. Performed over 60 clinical cases (at least 3 being pediatric)
2. Metabolic Status
 - a. Know how to correct metabolic acidosis.
 - d. Know how to correct [K⁺]
 - c. Know how to correct [HCO₃]
 - f. Know how to correct [Ca⁺⁺]
 - g. Know how to compute oxygen consumption of the patient
 - h. Know how to compute oxygen and CO₂ transfer by the oxygenator

LEVEL 10 ADVANCED III CLINICAL PERFUSION**LEVEL 10**

1. Performed over 65 clinical cases (at least 5 being pediatric)
2. Response to unexpected events, know procedures for the following:
 - a. Oxygenator failure and change-out
 - b. Pump failure
 - c. Arterial boot rupture
 - d. Venous air-lock
 - e. Cardiomy plugging
 - f. Elevated [K⁺]
 - g. Massive hemodilution
 - h. Hemothrm failure
 - i. Air embolus in arterial perfusion line/patient aorta
 - j. Oxygenator failure to adequately oxygenate
 - k. Oxygenator failure to adequately remove carbon dioxide
 - l. Aortic dissection

LEVEL 11 ADVANCED IV CLINICAL PERFUSION**LEVEL 11**

1. Performed over 70 clinical Cases (at least 7 being pediatric)
2. Assist Devices - know when to use and how to operate
 1. IAPB
 2. Cell Saver
 3. LVAD/BIV AP
 4. ECMO
 5. ECLS - and portable CPB systems

LEVEL 12 ADVANCED V CLINICAL PERFUSION**LEVEL 12**

1. Performed over 75 cases
2. Ancillary experiences
 - Performed over 5 IABP insertions and ICU monitoring
 - Performed over 5 cell saver procedures
 - Performed liver perfusion
 - Performed lung harvest perfusion
 - Performed organ procurement trip
 - Rotated in Phoenix and/or at Loma Linda (observed at least 5 cases)

PERFUSION TECHNOLOGY

PHCL 691L Fall, Spring, SS1, SS2 (1997/98)

Instructor: Douglas F. Larson, Ph.D.

Office hours: 1-5 Mondays Room 4325

Class Meets: Wednesday 12-1:00 3223B LRC

OBJECTIVES:

Policy Approved by Advisory Board on Aug. 19, 1996

To perfuse clinical cardiovascular perfusion under direct supervision of a clinical instructor.

CLINICAL REQUIREMENTS:

1. Clinical Case Evaluation form is to be jointly filled out by the student and instructor. The student will use the Clinical Perfusion Guidelines to determine their level #, and desired perfusion skills to be learned. The level # and skills to be learned will be written by the student into the 'objectives' box. It is the responsibility of the student to have the form completed. All completed forms (including the instructor's signature) will be turned in at colloquium.
2. A perfusion student is never permitted to perform perfusion tasks in a clinical setting without direct supervision and approval by a staff instructor - doing so will result in immediate dismissal from the Circulatory Sciences Program.
3. A student will be assigned for clinical perfusion training at least once a week. The assignment schedule will be the responsibility of a designated second year student. The assigned student will contact the scheduled instructor by telephone the night before the clinical case.
4. Students will attend Wed. morning M&M.

ACADEMIC REQUIREMENTS:

1. Attendance of colloquium is mandatory.
2. The student must register for this course each semester - otherwise will not be considered as a perfusion student. If there are any conflicts special arrangements can be made.
3. Observation cases are important but can count for only 10% of the total number of cases for a semester.
4. The first year student must observe three cardiac catheterization laboratory procedures to receive a grade for the semester.
5. Grade: $S \geq 1.2$ cases /week for the semester
 $P \geq 0.8$ and < 1.2 / week for the semester
 $F < 0.8$ cases /week for the semester
6. In addition, each student must pass the Clinical Competency Exam given at the end of Fall and Spring semesters. See attached Competency Exam Policy and Clinical Perfusion Preceptorship Guidelines. Failure to pass the Clinical Competency Exam (according to the Clinical Competency Examination Policy) and/or meet the minimum cases numbers per semester will result in automatic dismissal from the program.

BOARD REQUIREMENTS:

1. Seventy-five clinical cases are required prior to May 1999
2. Suggested CABG 40%, Other 40%, Pediatric 20%.

STUDENT CALL:

1. Each student will be required to take call. Call consists of 24 hour for one week from one colloquium session to the next. Two students will take call; first with 1909, and second with 1976. It is the responsibility of the first call student to arrange coverage.
2. Failure to cover call will result in a warning letter may influence the course grade. All pages should be answered in ten minutes.

