

# CIRCULATION TECHNOLOGY DIVISION

---

## STUDENT HANDBOOK

### MISSION STATEMENT

The mission of the Circulation Technology Division at The Ohio State University is three-pronged:

- **Exceptional Professional Education** - Circulation Technology was the first university-based Perfusion Education Program in the United States and will continue to serve as the world-class quality, benchmark academic program.
- **Excellent Clinical Rotations and Training** – The clinical strength of the Circulation Technology Program lies in our excellent clinical Perfusion partners. The Circulation Technology graduate demonstrates excellence in clinical practice as a result of their affiliation and experience with multiple cardiac surgical centers of excellence.
- **Advance the Profession through Scholarship and Service** – Circulation Technology students and faculty will thrive in an environment that fosters professional behavior, respect and service to patients and healthcare teams. The Circulation Technology Division will be a recognized contributor to the scientific literature through relevant and productive research program and national continuing education offerings.

March 2006

JEFFREY B. RILEY, MHPE, CCT, DIVISION DIRECTOR  
PHILIP D. BECKLEY, PHD, EMERITUS  
RICHARD TALLMAN, PHD  
ALLISON SPIWAK MS

152 ATWELL HALL, SCHOOL OF ALLIED MEDICAL PROFESSIONS  
453 WEST 10<sup>TH</sup> AVENUE, COLUMBUS, OH 43210  
614.292.7261: <http://amp.osu.edu/CT>

## TABLE OF CONTENTS

Introduction.....	3
Policy.....	3
Academic Faculty.....	4
Clinical Faculty and Hospital Affiliations .....	4
Financial Information.....	6
Professional Curriculum .....	7
Professional and Major Courses.....	9
Probation and Disenrollment .....	9
Student Research.....	12
Professional Appareal.....	13
Divisional Policies.....	13
Professional Activities .....	16
Immunizations.....	16
Knowledge and Performance Competencies .....	19

# Circulation Technology Division

## STUDENT HANDBOOK

---

### INTRODUCTION

---

The Circulation Technology Division prepares its graduates for careers that involve diagnosis, monitoring, surgical support, and long-term life support of patients. The primary role is the performance of cardiopulmonary bypass, perfusion, for patients undergoing cardiac surgery. The Circulation Technologist is also involved in support procedures related to transplant surgery as well as partial to complete replacement of cardiac and/or other organ function with artificial devices. Monitoring and diagnostic procedures revolve mainly around major surgical procedures, but also extend into intensive medical and surgical care areas. Respiratory support, intra-operative autotransfusion, isolated organ or limb perfusion, and pacemaker analysis are other activities often performed. Graduates typically accept positions throughout the country. Many choose to concentrate in one or more areas of Circulation Technology while others continue with a broad application of the technology. The Circulation Technologist additionally may also serve as an administrator, educator, and/or researcher.

---

### POLICY

---

The Circulation Technology Handbook is a working document and therefore subject to change. Students in the Circulation Technology Program will be made aware of changes as they occur.

The most recent version of the Handbook will be available on the Circulation Technology Division website, and for reference in hard copy in the Circulation Technology Division offices in 152 Atwell Hall at SAMP.

---

## ACADEMIC FACULTY

---

Jeffrey B. Riley, MHPE, CCT Assistant Professor - Clinical Allied Medicine Division Director	152 Atwell Hall 614.292.7261 EXT 2# <a href="mailto:riley.267@osu.edu">riley.267@osu.edu</a>
Philip D. Beckley, PhD Assistant Professor, Emeritus Admissions Coordinator	152 Atwell Hall 614.292.7261 EXT 1# <a href="mailto:beckley.1@osu.edu">beckley.1@osu.edu</a>
Richard D. Tallman, PhD Associate Professor	152 Atwell Hall 614.292.7261 EXT 4# <a href="mailto:tallman.1@osu.edu">tallman.1@osu.edu</a>
Allison J. Spiwak, MS Circulation Technologist	152 Atwell Hall 614.292.7261 EXT 4# <a href="mailto:spiwak.4@osu.edu">spiwak.4@osu.edu</a>
Glenn P. Gravlee, MD Department of Anesthesiology Professor, College of Medicine and Public Health Medical Advisor, Circulation Technology	N437 Doan Hall 410 W. 10 <sup>th</sup> Avenue 614.293.9081 <a href="mailto:gravlee.1@osu.edu">gravlee.1@osu.edu</a>
Shakti Chaterjee, PhD Adjunct Assistant Professor	

---

## CLINICAL FACULTY AND HOSPITAL AFFILIATIONS

---

<b>Clinical Faculty</b>	<b>Affiliation</b>
Bruce Ratcliff, BS John Jacober, BS	Riverside Methodist Hospital Columbus, OH
Jana Bach, BS	Indiana-Ohio Heart Fort Wayne, IN
Joseph Niman, BS	University of Michigan Medical Center Ann Arbor, MI

**Clinical Faculty****Affiliation**

Jeff Burnside, BS  
Vince Olshove, BS

Columbus Children's Hospital  
Columbus, OH

Robert Dragan, BS

University of New Mexico Medical Center  
Albuquerque, NM

Alex Bezrucko, BS

Indiana University Medical Center  
Indianapolis, IN

Doug Frank, BS

Grant Hospital  
Columbus, OH

Michael Kostiuk, BS

Henry Ford Hospital  
Detroit, MI

Scott Turner, BS

Bay Area Medical Center  
Panama City, FL

Marcia Mandly, BS

Medical University of Ohio  
Toledo, OH

Tim Weaver, BS

Charleston Area Medical Center  
Charleston, WV

Richard Ginther, BS

Children's Hospital Dallas  
Dallas, TX

Mark Dumond, BS

The Ohio State University Medical Center  
Columbus, OH

Robert Split, BS

University of South Alabama Medical Center  
Mobile, AL

Sharon Mick, BS

Emory University Clinic  
Atlanta, GA

Judith Proemba, BS

Hamot Medical Center  
Erie, PA

Tony Cromer, BS

Jewish Hospital  
Louisville, KY

James Ralston, BS

Fairfield Medical Center  
Lancaster, OH

**Clinical Faculty****Affiliation**

Ryan Pagnanelli, BS

Oakwood Hospital and Medical Center  
Dearborn, MI

Tim Shrewsberry, BS

The Toledo Hospital  
Toledo, OH

David Middleton, PhD

SUMMA: Akron City Hospital  
Akron, OH

---

**FINANCIAL INFORMATION**

---

**A. Related Costs** - Students are required to purchase:

- A. Sort white lab coat and SAMP pocket patch upon admission to the program
- B. Scrub pants and shirts for specified clinical observations and labs
- C. Photographs and nametags during the first quarter
- D. Expenses for food, transportation and lodging may be incurred while on clinical rotations during the last three quarters of the program.
- E. Liability insurance is required for the senior year to cover clinical experiences. The fee is paid during the fourth quarter.
- F. The independent research project may incur costs that cannot be completely covered by the Circulation Technology Division.

**B. Financial Assistance** – Students enrolled in the Circulation Technology Division are also eligible for additional scholarships and loan programs. Scholarships include:

- A. Sandra Claar Scholarship: information available at Circulation Technology website
- B. The American Society of Extra-Corporeal Technology Scholarships
- C. The American Academy of Cardiovascular Perfusion Scholarships

It is the student's responsibility to obtain scholarship application material, and to complete and submit the appropriate material for consideration. Other scholarships and student loans are available through the OSU Financial Aid Department.

---

## PROFESSIONAL CURRICULUM

---

Students are admitted to the Division of Circulation Technology in the Autumn Quarter following the completion of their pre-professional course work. The professional curriculum is two years and is taken in sequence as shown in the following table.

### **Philosophy of Circulation Technology Curriculum**

The academic and clinical courses of study in Circulation Technology at The Ohio State University contain a wealth of knowledge and experience to be gained. As a student, you will get from the CT Program what you actively seek. You can have an outstanding education or a mediocre one, you are the person who controls and manages what you learn. To this end, you must constantly be asking questions and seeking guidance by the faculty and clinical preceptors.

The successful CT student displays a strong and genuine professional commitment and exhibits an inquisitive attitude. Very few persons care how much you know until they know how much you care. This is true in your professional education and for working with patients.

The CT Curriculum is well-designed, challenging, contains no fluff and is cumulative. What you learn on day one and subsequent days will be employed in your daily clinical practice after graduation.

The first three quarters of the professional curriculum include lectures with an increasing amount of laboratory experience. The curriculum progresses toward laboratory experiences (first quarter of the final year) where clinical conditions are closely simulated. Four weeks of the summer quarter along with the second and third quarters of the final year of the professional curriculum are predominantly clinical experiences and require the student to travel to clinical affiliate hospitals. Students will be responsible for liability insurance and for travel, food, and housing during clinical rotations (a list of current clinical rotations is found on pages 2 and 3).

The Ohio State University requires a minimum total of 196 quarter hours, including the graduation requirements, for students receiving first-time baccalaureate degrees. Students can expect to graduate with 221 credit hours following completion of the program pre-requisites, the outline of university degree requirements for Circulation Technology and the professional curriculum.

## Circulation Technology Professional Curriculum

### FIRST YEAR, Professional Program

	AUTUMN		WINTER		SPRING		SUMMER
	(1 <sup>st</sup> quarter)		(2 <sup>nd</sup> quarter)		(3 <sup>rd</sup> quarter)		(4 <sup>th</sup> quarter)
Physiology 311*	5	Physiology 312*	5	Circ Tech 430	5	Circ Tech 500	5
Circ Tech 400	5	Circ Tech 415	5	Circ Tech 450	5	Circ Tech 505	3
Circ Tech 595	1	Circ Tech 420	5	Circ Tech 470	6	Circ Tech 593	4
Allied Med 419	5	Circ Tech 460	5	Circ Tech 593	1		
Allied Med 680	3	Circ Tech 593	1	Circ Tech 595	1		
		Circ Tech 595	1	Pharmacology 600*	3		
Total Credit Hours	19		22		21		12

### SECOND YEAR, Professional Program

	AUTUMN		WINTER		SPRING
	(5 <sup>th</sup> quarter)		(6 <sup>th</sup> quarter)		(7 <sup>th</sup> quarter)
Circ Tech 510	8	Circ Tech 560	5	Circ Tech 560	5
Circ Tech 512	4	Circ Tech 561	10	Circ Tech 561	10
Circ Tech 513	5	Circ Tech 593	3	Circ Tech 593	3
Circ Tech 593	3				
Circ Tech 595	1				
Total Credit Hours	21		18		18

Professional Course Work Total Credit Hours = 131

\* If PHY and PHARM courses are taken prior to admission to Circulation Technology, a grade of C- or higher is required

Students who have a conferred baccalaureate degree at the time of admission have the option of completing a Certificate of Study or a second baccalaureate degree. Certificate students must complete all program prerequisites and requirements. Second degree students must also complete all GEC requirements. A list of courses approved to fulfill GEC requirements is available in the Student Affairs Office.

Graduates earn a Bachelor of Science degree in Allied Health Professions with a major in Circulation Technology or a Post Baccalaureate Certificate in Circulation Technology. School of Allied Medical Professions (SAMP) certificates of program completion are conferred on all graduates at a SAMP pre-commencement ceremony held prior to the University commencement.

---

## **PROFESSIONAL AND MAJOR COURSES**

---

A grade of "S" is required in all CT 595 and CT 593.

The independent research project (CT593 or AM693) must be completed prior to graduation. Specific deadlines for each research project component will be made available at the first meeting of CT 595 and are explained in the Handbook.

A grade of "C-" or better is required in each of the following courses. Each of these courses will be taken for a letter grade. Auditing or taking the course Pass/Fail is not an option regardless of the academic or experiential background of the student.

Physiology 311 and 312

Pharmacology 600

Allied Medicine 419 and 680

Circulation Technology 400, 415, 420, 430, 450, 460, 470, 500, 505, 510, 512, 513, 560, 561, 570, and 571

---

## **PROBATION AND DISENROLLMENT**

---

The Circulation Technology Division adheres to the policies pertaining to warning, probation, and dismissal as described in the School of Allied Medical Professions Student Policies / Procedures.

Each Circulation Technology student must be familiar with the School policies as well as the additional policies that follow.

Any student admitted into the program and earns a letter grade below "C-" in a prerequisite course but does not fail the course will automatically be placed on probation the first quarter of enrollment. The condition for removal of probation will be satisfactory completion of all course work the first quarter of enrollment.

First quarter probation and unsatisfactory performance in first quarter course work may result in disenrollment from the program.

It is the student's responsibility to monitor his or her progress through each professional course and to consult with the course instructor if unsatisfactory performance is, at any time, suspected. The course instructor will advise the student of his or her standing in the course and will recommend actions that may help to achieve successful completion of the course.

#### **CATEGORY IA COURSES**

**AM419, AM680, PHY311, PHY312, PRM600, CT400, CT415, CT420, CT430, CT450, CT460, CT470, CT500, CT505, CT510, CT512, CT513, CT560, CT561, CT570, CT571, CT593, CT595**

Any enrolled student who earns below a "C-" or a "U" in a Category Ia course will be placed on probation the following quarter and will be delayed in continuing the professional course work until the course can be repeated.

The conditions for removal of probation will be defined at the time the probation is imposed and may include the following:

1. Will submit an "intention to continue" and "plan of action" letter to the Division Director within 2 weeks of the start of the following quarter;
2. Will satisfactorily complete any course work taken (professional or non-professional) during the delay period with a grade of "C-" or better;
3. Will sign an agreement to the conditions for returning to the program (sent to the student by the Division Director after receipt of the letter described in #1).

When a student fails to fulfill any of the provisions of his or her probation, enrollment in the division will be discontinued immediately.

The faculty of Circulation Technology recognizes that there may be extenuating circumstances relating to an individual student's successful academic progress through the course work. Students may appeal these policies as directed in the School section of this handbook.

#### **PROCEDURES FOR REINSTATEMENT REVIEW**

A student, who has been disenrolled from the School of Allied Medical Professions, Circulation Technology Division may petition for reinstatement. Such a request must be supported by compelling evidence indicating that the student has made substantial changes in his or her ability to meet current cognitive standards and noncognitive standards of the Division.

Reinstatement review is initiated by the student preparing a written petition to the circulation technology faculty in the quarter prior to the desired quarter of reinstatement. The student's reinstatement petition must include the following:

1. A letter from the student that:
  - a. Requests reinstatement;
  - b. Describes recent activities that are significant in terms of ability to undertake circulation technology academic or fieldwork assignments;
  - c. States how the student's ability to perform has changed since disenrollment from the program, including how specific performance problems have been resolved.
2. Documentation to support the above (for example, letters from therapists, counselors, or instructors; completion of courses; participation in continuing education; or volunteer or work experience since disenrollment).

In general, the circulation technology faculty will not consider petitions for reinstatement sooner than nine months following disenrollment or withdrawal from the program. If the petition or reinstatement is denied, the faculty will consider a subsequent petition no sooner than six months. The faculty may ask for additional information, including a meeting with the student. In reviewing a petition for reinstatement, the faculty will consider whether or not the student may meet current cognitive and noncognitive standards and will be able to successfully complete academic and/or field work requirements. In response to a petition for reinstatement, the faculty may choose to:

- a. Recommend reinstatement
- b. Recommend reinstatement with conditions
- c. Deny reinstatement
- d. Recommend that the student reapply for admission to the program.

The circulation technology faculty recommendation will be forwarded to the SAMP Executive Committee and with their concurrence, the student will be informed in writing of the decision regarding reinstatement.

---

## **STUDENT RESEARCH**

---

The student research effort encompasses the entire two-year curriculum. Specific course work related to this effort includes AM 680, CT 593, and CT 595.

### **AUTUMN QUARTER, FIRST YEAR**

The student will enroll in AM 680 (3 credit hours) and CT 595 (1 credit hour). The first eight weeks of AM 680 is classroom lecture presenting concepts related to initiating and conducting research, experimental design, use of computer graphics and statistics, and analysis of research reports. The final two weeks will be conducted as a journal review during which time several scientific articles will be critiqued with respect to design, analysis, and validity. The companion CT 595 seminar course will present the research of faculty, guests, and senior students to further reinforce the processes of research design, data collection, and analysis.

### **WINTER QUARTER, FIRST YEAR**

The student will enroll in CT 593 (1 credit hour). During this quarter the student will identify a research question, develop a problem statement, perform a literature review, develop a research hypothesis, and submit a first draft of the research proposal.

### **SPRING QUARTER, FIRST YEAR**

The student will enroll in CT 593 (1 credit hour) and CT 595 (1 credit hour). During this quarter the student will submit the final research proposal and begin to perform pilot experiments. The companion CT 595 seminar course will again present the research of faculty and guests, but the completed research proposals will also be presented for review and critique. Also in this quarter, students who qualify for the SAMP Honors Program and wish to graduate “with Distinction” will submit their proposals to the SAMP Honors and Research Committee for approval. Students who wish to apply for the Undergraduate Research Scholarship must submit their proposals at this time.

### **SUMMER QUARTER, FIRST YEAR**

The student will enroll in CT 593 (4 credit hours). During this quarter the student will collect and analyze data as described in their research proposals.

### **AUTUMN QUARTER, SECOND YEAR**

The student will enroll in CT 593 (3 credit hours) and CT 595 (1 credit hour). During this quarter the student will continue to collect and analyze data as described in their research proposal. The companion CT 595 seminar course will again present the research of faculty and guests, but the ongoing research projects will also be presented for review and critique. Again in this quarter, students who qualify for the SAMP Honors Program and wish to graduate “with Distinction” can submit their proposals to the SAMP Honors and Research Committee for approval. Submission during this quarter, however, disqualifies the student from also applying for the Undergraduate Research Scholarship. Typically, abstracts of research projects are submitted to the American Society of Extracorporeal Technology (AmSECT) on the first Friday of

December. Students are encouraged to submit abstracts and, if accepted, will present their research work at a national professional meeting and publish in the Journal of Extra-Corporeal Technology (<http://JECT.org>).

#### **WINTER QUARTER, SECOND YEAR**

The student will enroll in CT 593 (3 credit hours). During this quarter the student will begin to work on the first draft of their research thesis. Students who have abstracts accepted by AmSECT will prepare for their presentation and publication.

#### **SPRING QUARTER, SECOND YEAR**

The student will enroll in CT 593 (3 credit hours). During this quarter the student will finish and submit their research thesis. Honors students will submit and Honors Thesis to the Honors and Research Committee and will defend their research work to a thesis committee.

---

### **PROFESSIONAL APPAREAL**

---

During the junior and senior professional years, the student will wear a standard uniform during educational and professional activities. The uniform, consisting of a short white coat with SAMP crest and ID badge, is to be worn over appropriate business dress clothes. Jeans, shorts, and T-shirts are not acceptable. See School Section for information on required SAMP crest. During specified laboratories, scrub clothes purchased and maintained by the student will be worn. Professional appearance should be maintained in other laboratories and classes as well.

As persons who will be working within hospital and patient care areas, it will be expected that students' dress and personal grooming be appropriate and follow employee guidelines at the clinical site. Reference should be made to the SAMP Student Handbook under Personal Appearance.

---

### **DIVISIONAL POLICIES**

---

#### **ATTENDANCE**

**LECTURES** - It is our expectation of the students enrolled in any Circulation Technology class or as members of the Circulation Technology Division that you will behave in a responsible manner befitting your enrollment in a professional program. Class attendance (on time) is therefore an expectation for lectures, labs, and exams. If necessary, relay absences to the instructor a minimum of one hour prior to the start of class (292-7261, leave message). Further, the material covered, during an absence, will be the responsibility of the student to obtain, understand, and complete. Need for special consideration should be brought to the attention of the instructor. Missed exams will automatically revert to a score of 0. Missed examinations must be made up and arrangements for completion **MUST** be made within 24 hours of the exam missed. A cumulative 10% penalty per day will be assessed on all missed exams. A doctor's, clergy's or military advisor's note is **REQUIRED** for all missed exams.

## LABORATORIES

1. Attendance at and participation in all laboratory sessions, pre-lab and post-lab discussions are required. Any tardiness to laboratory sessions will result in a course grade reduction. Students failing to attend a laboratory session must notify the instructor at least one hour prior to the start of the laboratory (call 292-7261 and leave a message with the appropriate course instructor). Missed lab time must be made up and arrangements for completion must be made within 24 hours of the end of the lab missed.
2. Clean scrub suits are to be worn in all in-vivo laboratory sessions. Appropriate additional OR attire may be required (i.e. hat, mask, shoe covers, and protective eyewear).
3. Students may not leave the laboratory area without the permission of the instructor.
4. Professional behavior is demanded in the laboratory. The patient will, at all times, be treated with dignity (further information will be provided during the appropriate courses). Guest instructors are to be treated with courtesy and respect.
5. Late work will result in a course grade reduction. A 10% penalty will be assessed on all late work. Work turned in after 24 hours of due date WILL NOT BE ACCEPTED and will result in a score of 0% for that assignment. Missed examinations must be made up and arrangements for completion must be made within 24 hours of the exam missed.
6. Students are responsible for lab cleanup and organization (further information will be provided during the appropriate courses). The equipment and supplies used are expensive and must be handled carefully. Students who damage equipment through carelessness or negligence will be assessed replacement or repair costs.

**NOTE:** Failure to clean-up laboratory areas during assigned laboratories, following research projects, or during individual studies will result in the holding of grades for the student and/or students involved in the laboratory activity for the current or upcoming quarter. Holding of grades will prevent enrollment in courses. All non-disposables will be returned to the original location, in the same or better condition than found. All disposables will be properly disposed of. An inventory of all equipment used should be provided to the activity instructor.

7. "[Universal Blood and Body Fluid Precautions](#)" will be practiced in the *in vivo* laboratory

**CLINICAL ROTATIONS** - Attendance during clinical rotations is mandatory. Students unable to attend must notify the clinical instructor at least one hour prior to the scheduled arrival time. Arrival and departure times are set by the clinical instructor. Students who are absent from more than two clinical sessions during a quarter must notify the instructor responsible for the course. The instructor may set minimum levels of experience that must be attained in the event of absences or lack of availability of appropriate clinical cases. Every effort will be made to provide sufficient clinical case material for each student. If, in the unforeseen circumstance, the program loses clinical experience affiliates, clinical work may be extended. Clinical rotations may be scheduled to begin before the start of the academic quarter and extend beyond the academic quarter if required to gain sufficient clinical experience. Clinical competencies, as described at the end of this document, will be assessed via written, oral, and/or practical examinations. If the minimum competency level is not attained, an incomplete or failing grade may be given. This may require the student to register for (an) additional quarter(s) of clinical work.

Additional clinical policies and procedures will be reviewed with the student prior to entry into the clinical phase of the program. Procedures for the evaluation of competency will also be carefully reviewed at that time.

The student will be responsible for understanding and adhering to all of the policies stated in the "Syllabus for Circulation Technology 505 and the Clinical Evaluation Handbook" and "Syllabus for Circulation Technology 560, 561, 570, 571 and the Clinical Evaluation Handbook" as presented to them before the start of clinical rotations. Any student who does not adhere to these policies will be subject to disenrollment from the School.

#### **LATE WORK**

Individual instructors will set deadlines for projects, and homework. Work submitted after that deadline will be subject to a penalty assigned by the instructor unless prior permission has been obtained by the student. Work completed by the end of the quarter will be used to compute the final grade with any outstanding assignments contributing zero points. Only if extenuating circumstances existed during the quarter, and if requested by the student, will an incomplete grade be given. The instructor will set a deadline appropriate for the circumstances that will in no case exceed six weeks of the following quarter.

#### **CLINICAL RESPONSIBILITIES**

While in the clinical setting, the student will follow exactly the instructions of the clinical instructor or the physician in charge. The student shall not undertake procedures on patients for which he/she has not been trained. Confidentiality of patients' records must be maintained. Discussions of a patient should only be with physicians, instructors, or fellow students on the professional merits of the case.

Every attempt will be made to teach the currently known standard of practice for Circulation Technology. In most cases, this standard of practice is the result of a faculty member's many years of study and clinical experience and will prepare the student for the clinical activities assigned. During the senior year clinical experiences provided, it is the student's responsibility to thoroughly understand and adopt the standard of practice for the attending institution. Upon graduation, it is the graduate's responsibility to thoroughly understand and adopt the standard of practice for the employing institution. The Circulation Technology student may come in contact with blood or blood products contaminated with infectious agents including the Hepatitis B virus and the HIV. During the Circulation Technology clinical experiences provided, it is the student's responsibility to thoroughly understand and adopt the standard of practice for minimizing exposure as provided by the attending institution. We expect strict adherence to "Universal Blood and Body Fluid Precautions" and to view every patient as potentially infectious. Precautions, such as the use of mask, cap, gloves, fully sleeved paper gown, and eyewear, should be taken regardless of prior medical history or antibody screening. Needles, syringes, and blades should be handled and disposed of with the utmost precaution. Any student who suspects unprotected exposure should report the incident to the Clinical Faculty member.

#### **LAB RESPONSIBILITIES**

Students are responsible for lab cleanup and organization. Equipment must be carefully put away after each lab session unless the instructor gives permission to leave a setup intact for later sessions. The lab equipment is extremely expensive and difficult to replace. Students who damage equipment through carelessness or negligence will be assessed repair costs. Lab supplies are also very expensive and are available through limited donations from manufacturers or divisional funds. Wastage will not be tolerated and will result in replacement by the student at their own expense.

Laboratories often simulate clinical procedures and should be carried out with the same degree of professionalism as would be expected in the clinical setting. Students may not leave the laboratories for meals or at the end of the day without being released by the responsible faculty member.

Research projects performed in the laboratory will be scheduled with the student's advisor. Lab supplies and equipment left out for ongoing projects need to be clearly marked with the student's name. Clean up of all lab project materials is to be done to the same degree as stated for the lab courses.

**NOTE:** Failure to clean-up laboratory areas during assigned laboratories, following research projects, or during individual studies will result in the holding of grades for the student and/or students involved in the laboratory activity for the current or upcoming quarter. Holding of grades will prevent enrollment in courses. All non-disposables will be returned to the original location, in the same or better condition than found. All disposables will be properly disposed of. An inventory of all equipment used should be provided to the activity instructor.

---

## **PROFESSIONAL ACTIVITIES**

---

Students may belong to the following organizations. Each has a newsletter and journal and an annual national meeting. Many have regional meetings.

- American Society of Extracorporeal Technology (AmSECT)
- American Academy of Cardiovascular Perfusion (AACP)
- Association for the Advancement of Medical Instrumentation (AAMI)
- American Society for Artificial Internal Organs (ASAIO)
- National Society of Cardiopulmonary Technology (NSCPT)

Post-graduate certification is available from the following organizations:

- International Board of Clinical Technologies (IBOCT)
- American Board of Cardiovascular Perfusion (ABCP)
- National Society for Cardiopulmonary Technology (NSCPT)

Accreditation for the Circulation Technology Division is through CAAHEP (Commission on Accreditation of Allied Health Education Programs) and the Accreditation Committee – Perfusion Education (AC-PE).

Following graduation you and your employer will be surveyed at various times to provide programmatic evaluation in compliance with CAAHEP standards. For this reason, it is very important that you provide a current address as you assume your first employment and any subsequent moves.

---

## **IMMUNIZATIONS**

---

The SAMP immunization policy and documentation requirements are outlined in the School section of this Handbook. Documentation and forms were mailed to you from Stephen L Wilson, PhD, Director, School of Allied Medical Professions, explaining the immunization policies and requirements. The Circulation Technology Division policies and guidelines for immunizations are provided here.

## MAINTAINING RECORDS

Any questions concerning the required testing and supporting documentation should be directed to:

Nancy S. Hill, RN,  
[hill.56@osu.edu](mailto:hill.56@osu.edu)  
614.292.0146  
Preventive Medicine Nurse  
Student Health Services

For immunization appointments at the Student Health Center call 614.292.4321. Remember a PPD can only be administered Monday, Tuesday, Wednesday and Friday, to be evaluated two days after administration.

All information requested must be on file with OSU Student Health Services, 1875 Milkin Road. Any records from your doctor can be faxed to 614.292.7042. Please follow up with all requests to make sure records were received by Nancy Hill. Once you have completed all immunizations, Nancy Hill, by your request, will provide you with the Immunization Summary showing your status as compliant. Keep the Immunization Summary in a safe place and take it with you to your clinical sites. It is advised that you make additional copies for your own records in case the copy you take to the clinical site is misplaced.

If you need to replace your Immunization Summary you must contact Medical Records 614.292.0118. It may take several days to process your request. The request form can be obtained from the website [www.shc.ohio-state.edu](http://www.shc.ohio-state.edu). Follow the link Programs & Services; follow the link Medical Records Services; follow the "Directions for Completing the Authorization Form".

Medical records or documentation are NOT maintained by the Circulation Technology Division. Under HIPPA regulations we can not maintain healthcare records for students. All records are maintained by Nancy Hill at Student Health Services.

## SCHEDULE OF HEALTH CARE DOCUMENTATION

### TO ENTER SUMMER QUARTER CLINICAL ROTATIONS:

Autumn Quarter Junior Year (October 1. If October 1 falls on a weekend this date will revert to the first Monday of the following business week.) All records must be on file with OSU Student Health Services.

1. Satisfactory health evaluation.
2. Vaccines
  - a. First dose of Hepatitis vaccine.
3. Other
  - a. PPD Sensitivity Test.

Autumn Quarter Junior Year (November 15. If November 15 falls on a weekend this date will revert to the first Monday of the following business week.) All records must be on file with OSU Student Health Services.

1. Vaccines
  - a. Measles, Mumps and Rubella.

- b. Chickenpox (Varicella): Physician signature verifying past disease or photocopy of blood titer indicating immunity or Varicella vaccine.
  - c. Tetanus/Diphtheria booster (needed every 10 years).
  - d. Hepatitis B (second dose by November 15) (series of three injections required by April 15 of Junior Year, see following dates).
2. Titers
- a. Measles (Rubeola) Titer.
  - b. Mumps Titer.
  - c. Rubella Titer.
  - d. Varicella Titer.
  - e. Hepatitis Surface Antibody (upon completion of Hepatitis B vaccination sequence).

For persons born after 1957, titer and / or reimmunization for measles and rubella is strongly recommended and may prove more beneficial for future protection from these diseases.

Spring Quarter Junior Year (April 15. If April 15 falls on a weekend this date will revert to the first Monday of the following business week.) All records must be on file with OSU Student Health Services.

- 1. Vaccine
  - a. Hepatitis B third shot of series.
- 2. Other
  - a. PPD Skin Test should be completed between April 15 and June 15 of Junior Year.

Spring Quarter Junior Year (June 1. If June 15 falls on a weekend this date will revert to the first Monday of the following business week.) All records must be on file with OSU Student Health Services.

- 1. Titer
  - a. Hepatitis B surface anti-body titer
- 2. Other
  - a. PPD Skin Test
- 3. Obtain Immunization Summary for clinical rotations. One copy will be provided to you prior to leaving for clinical rotations.

Failure to complete this immunization schedule will prevent entrance into Summer Quarter Clinical Rotations. At any time, if the immunization schedule is not met enrollment into courses can be blocked.

**TO ENTER WINTER / SPRING QUARTER CLINICAL ROTATIONS:**

Autumn Quarter Senior Year (December 1. If December 1 falls on a weekend this date will revert to the first Monday of the following business week.) All records must be on file with OSU Student Health Services.

- 1. Other
  - a. PPD Skin Test must be completed between December 1 and December 15 of the Senior Year. This will cover all students with clinical rotations that require 6 month PPD.

Autumn Quarter Senior Year (December 15. If December 15 falls on a weekend this date will revert to the first Monday of the following business week.) All records must be on file with OSU Student Health Services.

1. Other
  - a. PPD Skin Test must be completed with documentation to Nancy Hill.
2. Contact Nancy Hill to obtain Immunization Summary for clinical rotations.

Failure to complete this immunization schedule will prevent entrance into Winter Quarter Clinical Rotations. At any time if the immunization schedule is not met enrollment into courses can be blocked.

---

## KNOWLEDGE AND PERFORMANCE COMPETENCIES

---

Circulation Technology can be divided into ten major content areas: extracorporeal technology, mechanical assist, monitoring, blood management, pacemaker analysis, pharmacology, anatomy, physiology, pathology, and surgery. Throughout the curriculum, examinations (written, oral, and/or practical) will be administered to each student to assess competency in these content areas.

In the senior year, students will be specifically tested at the conclusion of each quarter to qualify to advance to the clinical phases of the program and graduation. This comprehensive examination constitutes the final exam for CT 512 (Autumn), CT 560 (Winter), and CT 570 (Spring). Details regarding 'qualification to advance' will be found in the individual syllabi for these courses. The knowledge and performance competencies required for clinical practice and graduation as of the publication of this handbook are included here for your review.

The faculty reserves the right to modify these competencies as needed to accurately reflect the current body of knowledge and clinical practice.

## EXTRACORPOREAL TECHNOLOGY

1. Discuss the anatomy, physiology, and pharmacology of any anomaly or acquired cardiac/medical disease requiring extracorporeal perfusion.
2. Analyze patient information as it relates to diagnosis of any anomaly or acquired cardiac/medical disease requiring extracorporeal perfusion.
3. List the indications for and appropriate surgical procedures for any anomaly or acquired cardiac/medical disease requiring extracorporeal perfusion.
4. Discuss how the patient's specific disease impacts the design and course of extracorporeal circulation.
5. Demonstrate a knowledge of currently used extracorporeal components and circuit design to include
  - a. gas exchange devices
  - b. pumps
  - c. filters
  - d. cannulae
  - e. cardiomyotomies
  - f. cardioplegia
  - g. safety devices
6. Demonstrate a knowledge of currently used extracorporeal principles to include
  - a. initiation and termination processes
  - b. heat exchange
  - c. hypothermia
  - d. gas transfer
  - e. cardioplegia and myocardial preservation
  - f. hemodilution
  - g. hemofiltration
  - h. pulsatile perfusion
  - i. coagulation management
7. Discuss the association of anatomy, physiology, and pharmacology to extracorporeal circulation.
8. Demonstrate the ability to analyze monitored information and to make appropriate adjustments in the course of extracorporeal circulation.
9. Demonstrate a knowledge of the following specific applications of extracorporeal circulation by designing circuits and protocols for
  - a. pediatric and infant perfusion
  - b. ventricular assist
  - c. right and left heart bypass
  - d. long term respiratory assist
  - e. heart and liver transplantation
  - f. artificial heart
  - g. regional perfusion
  - h. total body washout
  - i. hypothermic resuscitation perfusion
  - j. portable cardiopulmonary support
  - k. circulatory arrest
10. Demonstrate knowledge of sterile technique.
11. Demonstrate knowledge of troubleshooting and emergency protocols and procedures.
12. Demonstrate knowledge of quality improvement and assurance principles.



## MECHANICAL ASSIST

1. Describe the ideal goals of IABP.
2. List and discuss medical and surgical indications for IABP.
3. List and discuss absolute and relative contraindications for IABP.
4. List the determinants of myocardial supply and demand.
5. Discuss the relationship of myocardial work to IABP.
6. Summarize the objectives of IAB inflation and deflation and consequences of incorrect timing.
7. Graphically describe IABP waveforms:
  - a. normal
  - b. early/late inflation
  - c. early/late deflation
8. Describe the trigger options for IABP.
9. Describe the proper positioning of the IAB including radiographic interpretation and the subsequent adverse sequelae from malposition.
10. Discuss the technique and hazards of central aortic pressure monitoring.
11. Describe the sequence of percutaneous placement of the balloon.
12. Describe basic differences between IAB systems.
13. Describe IABP complications and their relative frequency.
14. Describe appropriate set-up and check-out procedure initiation for an IAB system.
15. Discuss alarm systems for an IAB system.
16. Discuss alternative placement of the IAB for appropriate therapy.
17. Discuss considerations in the mobile/air transport of a patient on an IAB system.
18. Discuss available FDA approved VAD systems, including performance criteria: AbioMed and Heartmate.

## MONITORING

1. Identify the indications for non-invasive/invasive EKG monitoring.
2. Design a non-invasive/invasive EKG monitoring system, that would meet the indications for use; discuss the advantages and disadvantages of the system designed.
3. Describe the measurement of non-invasive/invasive cardiac electrical potentials by the three lead, five lead and twelve lead EKG; including advantages of electrode placement relative to the patient situation.
4. Describe the signal obtained by placement of non-invasive electrodes for measurement of cardiac electrical potential by the three lead, five lead and twelve lead EKG.
5. Describe the types of filtering used for display of the cardiac electrical potential. Explain the types of high and low frequency interference that are filtered.
6. Calculate the heart rate and determine the rhythm by viewing an electrical signal generated on a cathode ray tube or paper chart recorded from a specific EKG lead.
7. Identify the indications for non-invasive pressure monitoring of the cardiac patient.
8. Describe the techniques of operation for a non-invasive pressure monitoring system.
9. Identify the advantages and disadvantages of non-invasive pressure monitoring of the cardiac surgical patient.
10. Identify the indications for invasive pressure monitoring of the cardiac patient.
11. Describe the characteristic waveform for the pressure being monitored for the specific patient presented.
12. Design an invasive pressure monitoring system.
13. Identify and define the properties of a monitoring system including frequency response, natural frequency (or resonant frequency) and dampening coefficient.
14. Describe the effect of critical-, over- and under- dampening on the invasive pressure signal generated by a fluid filled pressure monitoring system described.
15. Discuss indications and anatomical positioning of arterial catheterization for pressure monitoring of the cardiac patient.
16. Identify techniques, advantages and contraindications for placement of an arterial catheter.
17. Interpret an invasive arterial pressure tracing and estimate the quality of the cardiac patient's hemodynamic status.

18. Discuss complications of invasive arterial pressure monitoring.
19. Make recommendations for blood pressure monitoring in the cardiac patient including central venous pressure (CVP), pulmonary artery pressure (PAP) and left atrial (LAP) pressure.
20. Describe the anatomical placement for monitoring of CVP, PAP and LAP and the techniques to gain access to the venous vascular system.
21. Describe the protocol for placement and the associated complications of the Swan-Ganz catheter during and after insertion.
22. Understand advantages, disadvantages, complications and contraindications of each technique for measurement of CVP, PAP and LAP.
23. Interpret waveform for CVP, PAP and LAP for a specific patient event.
24. Define methods of cardiac output measurement.
25. Understand sources of error in determining the cardiac output through assumptions, anatomical anomalies and the method, Fick and thermodilution.
26. Describe indications, advantages and disadvantages for pulse oximetry.
27. Describe indications, measuring devices and sites of measure for temperature, locally and systemically.
28. List components, not limited to resistors, of the Wheatstone bridge relative to strain gage operation.
29. Define the electrical properties of the Wheatstone bridge and calculate the voltage drop and current across the variable resistor in a resistor only Wheatstone bridge network, given the appropriate data.
30. Determine the sensitivity of patients to electrical shock by calculation of hazard currents given sufficient information and assess the risk to the patient of microshock and/or macroshock.
31. Explain the electrical and mechanical principles on which electromagnetic and Doppler blood flows are based.
32. Define the principles of operation for non-invasive Doppler echocardiography used to determine flow and or cardiac structures.
33. Define principles of operation for measurement of pH, pCO<sub>2</sub>, and pO<sub>2</sub> associated with blood gas analysis.
34. Identify the electrical biopotential and pressure monitoring system performance requirements for measurement of cardiac parameters relative to electrical filtering and system acoustics.
35. Identify measurement errors when the placement of a transducer is changed relative to the zero position, for a patient or mechanical circulatory assist.

36. Identify errors in the reported measurement with an error in transducer placement relative to the point of measurement, for a patient or mechanical circulatory assist device. (this is different than #35)
37. Identify and explain the importance of various derived indices of cardiac performance.
38. Identify and explain the importance of various derived indices of mechanical circulatory assist performance.
39. List components needed to assemble a sterile disposable and/or non-disposable functional system for monitoring electrical biopotentials and physiological pressures, not limited to blood pressure, for a patient or mechanical circulatory assist device.
40. Troubleshoot an inoperative cardiovascular measurement system, for biopotentials or pressures. Design a redundancy (making use of alternative available monitoring equipment, mechanical or electrical) protocol to verify system function. Design a protocol for corrective action. Applicable to a patient or mechanical circulatory assist device.
41. Critically review the scientific literature for appropriate research design, methodology and statistical interpretation.
42. Describe how ventricular function can be assessed by both invasive and non-invasive methods.
43. Define a trending device compared to a device that gives reportable measurements relative to calibration and quality control.
44. Identify proper techniques for acquiring a blood gas sample and/or a coagulation sample, pre-, peri- and post- operatively.
45. Assess saturation levels and accuracy of trending devices during all stages of extracorporeal circulation.
46. Derive vascular resistance when provided the necessary parameters for calculation. Interpret changes in vascular resistance given a specific set of events and the resulting outcome.
47. Identify and define cardiac chamber pressures for normal and disease states, both pediatric and adult.
48. Identify and define blood chemistry, cell count and coagulation normal values and values for specific disease states or treatment protocols.
49. Monitoring should include, and is inclusive of both the patient and mechanical circulatory assist:
50. Noninvasive: ECG, blood pressure cuff, capnography, pulse oximetry, temperature, blood chemistry, coagulation status.
51. Invasive: EKG, pulse oximetry, temperature, arterial, left atrial line, and right atrial line, transthoracic pulmonary artery catheter, compartmental pressures.

52. Define macroshock and microshock including hazards and risks.

## BLOOD MANAGEMENT

1. Discuss the hazards associated with the administration of homologous blood and components.
2. Discuss the relationships between vascular volume, blood pressure, organ perfusion, metabolic considerations and hemodilution of autologous blood and constituents.
3. Demonstrate knowledge of autologous blood conservation techniques including:
  - a. pre-operative phlebotomy
  - b. intra-operative hemodilution
  - c. intra-operative autologous blood collection, salvage, and transfusion (intra-operative autotransfusion)
  - d. post-operative autologous blood collection, salvage, and transfusion
4. Discuss the differences, advantages and disadvantages between "whole-blood" and "cell-saving" techniques
5. Describe the requirements for anticoagulation in autotransfusion procedures
6. Discuss the impact of "massive" blood loss in autologous blood salvage techniques employed and anticoagulation considerations.
7. List "approaches" to and the general merits and contraindications for each in autotransfusion. These approaches include
  - a. regional anticoagulation with heparin
  - b. systemic heparinization
  - c. citrate based anticoagulation
8. Identify and describe the relative contraindications for intra-operative and post-operative autotransfusion
9. Describe the usefulness of autotransfusion procedures for patients of certain religious beliefs who refuse homologous blood.
10. Identify good autotransfusion practices including:
  - a. labeling
  - b. "wash" volumes in cell-saving techniques
  - c. the processing of autologous blood containing certain biologic fluids, hemostatic agents, antibiotics, and irrigating solutions
  - d. appropriate pump and centrifuge speeds for various applications storage time(s)
  - e. filtration
11. Identify and contrast the types of autotransfusion techniques and approaches for elective vs. emergency surgery
12. Identify certain risks in autologous transfusion and describe methods which may be employed by the "autotransfusionist" to limit these risks.
13. Assemble and demonstrate your knowledge of the operation of an autotransfusion system.
14. Discuss the role of hypothermia in massive volume loss and replacement in terms of
  - a. oxygen delivery
  - b. pH disturbances
  - c. cardiac implications
  - d. coagulation
  - e. effecting reversal (i.e. re-warming)
15. Recognize the importance of intrinsic "pro-coagulant" vs. "anticoagulant" factors in autologous transfusion therapy.
16. Identify and describe at least two commercially available autotransfusion systems for each situation
  - a. intra-operative autotransfusion

- b. post-operative autologous blood salvage
17. Assemble and operate an autotransfusion system under supervision and demonstrate clinical competency in the operative room.

## PACEMAKER ANALYSIS

1. Describe the ideal goals of pacing intervention.
2. Describe and identify the electrical anatomy and physiology of the heart.
3. Describe and identify the electrical pathophysiologies of the heart.
4. Assess electrocardiograms and relate basic information contained therein.
5. Describe and calculate basic electrical aspects of the pacing system, both independently and as it interacts with the patient.
6. Classify pacing systems by standard nomenclature and identify their functions.
7. Discuss the programmable parameters of the pacing system.
8. Describe unipolar and bipolar systems, including advantages and disadvantages.
9. List the available vascular access choices for pacing leads.
10. Describe the sequence of percutaneous placement of a pacing system (permanent and temporary).
11. Describe the non-percutaneous placement of a pacing system (permanent and temporary).
12. Describe the proper placement of an endocardial and epicardial lead (atrial and ventricular).
13. Assemble the system and discuss the procedures for lead placement assessment, including acceptable values.
14. Discuss the procedures for reprogramming pacing generators.
15. Assemble and initiate a temporary nonimplantable pacing system.
16. Trouble-shoot pacing problems.
17. Discuss indications for and placement of implantable cardiac defibrillators (AICD).

## PHARMACOLOGY

1. Ability to reference material and access information about medications which are new or unfamiliar in the patient history and apply this information to the use of extracorporeal perfusion, cell processing, mechanical assist, monitoring, pacemaker analysis and cardiac pathologies.
2. Understand the importance of patient drug history in making decisions concerning pharmacologic agents used in extracorporeal perfusion, cell processing, mechanical assist, monitoring, pacemaker analysis and cardiac pathologies.
3. Knowledge of anticoagulation for extracorporeal perfusion, cell processing, mechanical assist, monitoring, pacemaker analysis and cardiac pathologies.
4. Knowledge of contra-indicated medications for use during extracorporeal perfusion, cell processing, mechanical assist, monitoring, pacemaker analysis and cardiac pathologies.
5. Understand and apply considerations of drug choice for common cardiac drugs, common anesthetics, and common anti-coagulants and reversing agents, and crystalloid fluids, based on:
  - a. How supplied
  - b. Available delivery routes
  - c. Mechanism of action (including onset and duration)
  - d. Drug effect
  - e. Absorption
  - f. Distribution
  - g. Metabolism and Excretion
  - h. Indications and Dosages
  - i. Interactions with other agents
  - j. Adverse or Toxic reactions
  - k. Contraindications(i.e. pregnancy)
6. Knowledge of the coagulation system, complement system and autonomic nervous system and transmembrane potentials
7. Knowledge of cardioplegia formulas, delivery routes and methods, and dosage calculations for different ratios of blood and cardioplegia

## ANATOMY AND PHYSIOLOGY

1. Describe the external features of the heart including but not limited to the pericardium, chamber identification, great vessel identification, and sulci.
2. Describe the internal and external features of each chamber and great vessel of the heart (i.e. vena cavae, right atrium, right ventricle, pulmonary artery and branches, left atrium, left ventricle, ascending aorta and arch branches).
3. Describe the origin and course of each major coronary artery, each major coronary vein, and major branches of each.
4. Describe the features of each valve apparatus in the heart.
5. Describe the origin and course of each major artery and vein located in the neck, head, thorax, abdomen, arm, and leg.
6. Describe the circuitry of the cardiovascular system with emphasis on how pressure, surface area, velocity, and blood volume changes as the blood moves from major arteries to capillaries to major veins.
7. Describe the electrical activity of the heart and how we use the biopotentials to record the electrocardiogram. Discussion includes but is not limited to the myocardial action potential, the pacemaker action potential, the anatomy of the conduction system, ECG leads, and the derivations of dysrhythmias.
8. Describe the hemodynamics associated with the cardiovascular system. Discussion includes but is not limited to concepts of flow, pressure, resistance, velocity, cardiac output, shear, and rheology.
9. Describe the excitation-contraction relationship and the heart as a pump. Discussion includes but is not limited to the structure of the sarcomere, the events associated with contraction, the cardiac cycle, and heart sounds.
10. Describe the physiology of the vascular system to include (but not limited to) concepts related to hydraulics, elasticity, determinants and features of arterial and venous blood pressure, and the control of the microcirculation.
11. Describe the intrinsic and extrinsic control of the heart and peripheral circulation including (but not limited to) the autonomic nervous system, hormones, and reflexes.
12. Describe the features and regulation of specific circulation paths in the body including (but not limited to) the coronary, skin, muscle, cerebral, renal, and splanchnic circulations.

## PATHOLOGY AND SURGERY

1. Describe the definition, etiology, pathophysiology, clinical presentation, and diagnostic features associated with a variety of acquired pathologies including but not limited to:
  - a. cardiac and vascular aneurysms
  - b. cardiac tumors
  - c. cardiac valvular disease
  - d. cardiomyopathies
  - e. endocarditis
  - f. heart failure
  - g. ischemic heart disease
  - h. pericarditis
2. Describe the definition, etiology, pathophysiology, clinical presentation, and diagnostic features associated with a variety of congenital pathologies including but not limited to:
  - a. aortopulmonary window
  - b. atrial septal defect
  - c. coarctation of the aorta
  - d. cor triatriatum
  - e. corrected transposition of the great arteries
  - f. dextrocardia
  - g. Ebstein's anomaly
  - h. endocardial cushion defect
  - i. fistulas
  - j. hypoplastic left heart syndrome
  - k. left ventricular outflow obstructions
  - l. patent ductus arteriosus
  - m. persistent left superior vena cava
  - n. pulmonary atresia
  - o. right ventricular outflow obstructions
  - p. single ventricle
  - q. tetralogy of Fallot
  - r. total anomalous pulmonary venous return
  - s. transposition of the great arteries
  - t. tricuspid atresia
  - u. truncus arteriosus
  - v. vascular ring anomalies
  - w. ventricular septal defect
3. Categorize congenital pathologies as being primarily obstructive, cyanotic, and/or acyanotic in character.
4. Describe the surgical objectives, indications, contraindications, techniques, and CPB requirements associated with the variety of acquired pathologies listed in objective #1. Procedures to be described include but are not limited to the aneurysmectomy, mammary graft, partial left ventriculectomy, pericardectomy, Ross, saphenous vein graft, and valve replacement.
5. Discuss the characteristics of the ideal prosthetic valve, categories and types of prosthetic valves available, criteria for selection, and details of use.
6. Describe the palliative surgical objectives, indications, contraindications, techniques, and CPB requirements associated with the variety of congenital pathologies listed in objective #2. Procedures to be described include but are not limited to the Blalock-Hanlon, Blalock-Tausig, Brock, central shunt, Glenn, PA banding, Rashkind, and Waterston.
7. Describe the corrective surgical objectives, indications, contraindications, techniques, and CPB requirements associated with the variety of congenital pathologies listed in objective #2. Procedures to be described include but are not limited to the Fontan, Jatene,