Master of Science in Cardiovascular Perfusion Program Handbook

2024 - 2025

University of Utah, School of Medicine
Division of Cardiothoracic Surgery
HELIX Tower
30 N Mario Capecchi Dr
4th Floor North, 4N124
Salt Lake City, Utah 84112
P: 801.581.4222, F: 801.585.3936
https://medicine.utah.edu/surgery/cardiothoracic/perfusion-studies/

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Program Overview

The University of Utah Cardiovascular Perfusion Program is designed to educate students and prepare them with the knowledge, skills, and expertise necessary to graduate as licensed cardiovascular perfusionists. These individuals are vital members of the cardiovascular surgical team as they are responsible for running the heart-lung (cardiopulmonary bypass) machine and are heavily relied on by surgeons. During surgery, they utilize the appropriate equipment to maintain blood flow to the body's tissues and regulate levels of oxygen and carbon dioxide in the blood. Perfusionists are also responsible for measuring selected laboratory values and monitoring circulation. They also administer medicines through the cardiopulmonary bypass circuit, among other responsibilities in the surgical setting. Our program graduates will meet the requirements necessary to succeed in a field where surgical techniques, cardiopulmonary bypass techniques, and new technologies are constantly changing the way we practice medicine.

The Cardiovascular Perfusion Program is intended to attract current allied health professionals, recent baccalaureate graduates, and qualified individuals to learn the advanced perfusion techniques needed for successful careers in cardiovascular surgery. The CVP is a 24-month (6 semester) post-baccalaureate degree that begins with three semesters (48 credit hours) of full time didactic and laboratory education, with students also doing clinical observations at the University of Utah hospital. The didactic portion of the curriculum for this program includes: Master's level anatomy, physiology, pharmacology, perfusion technology, laboratory, research methods, and a masters project. The last three semesters (34 credit hours) will comprise of a clinical phase which includes full-time clinical rotations under the direct supervision of a preceptor at the University of Utah, Primary Children's, Utah and Intermountain West hospitals and other approved hospitals in the United States. All program requirements are aligned with the external accrediting body for the field which falls under the Commission on Accreditation of Allied Health Education Programs who has an Accreditation Committee on Perfusion Education.

This program was unanimously approved by the University of Utah, Board of Trustees on December 12, 2019.

This program was awarded Initial Accreditation by the Commission on Accreditation of Allied Health Education Programs (CAAHEP) on January 20, 2022.

The accreditation standards are established by CAAHEP, AC-PE, American Academy of Cardiovascular Perfusion (AACP), American Association for Thoracic Surgery (AATS), American Board of Cardiovascular Perfusion (ABCP), American Society of ExtraCorporeal Technology (AmSect), Perfusion Program Directors' Council (PPDC), Society of Cardiovascular Anesthesiologists (SCA) and Society of Thoracic Surgeons (STS).

Program Instructors and Staff

Kirk Bingham, CCP	Perfusionist, CVP Program Director, Instructor
Jessica Russ, CCP	Perfusionist, Clinical Rotation Director
Craig Selzman, MD	Cardiothoracic Surgery Division Chief
Chris Blaylock, CCP	Perfusionist, Instructor
Sam Harman, CCP	Perfusionist, Instructor
Paul Matlin, CCP	Perfusionist, Instructor
Brandon Tomecek, CCP	Perfusionist, Instructor
Jake Weston, CCP	Perfusionist, Instructor
Ben Lewis, CCP	Perfusionist, Instructor
Jordan Hendricks, CCP	Perfusionist
Ed Harman, MS, CCP	Clinical Manager Pediatric Perfusion
Dustin Goodrich, CCP	Pediatric Perfusion
Douglas Smego, MD	Medical Advisor, Instructor
Heather Clark, RN, MBA	Cardiothoracic Surgery Division Director
Lauren Budinger, MPA	Population Health Sciences, Division Manager
Shawnda Gillespie	Program Administrator
Taylor Ruckle	Perfustionist
Christine Toone	Pediatric Perfusionist
Garret Borchert	Perfusionist

Classes by Semester

YEAR ONE

Summer Semester			**16 credits**
CVP 6001	Perfusion Science 1		3 credits
CVP 6010	Perfusion Lab 1		2 credits
CVP 6071	Perfusion Pharmacology		2 credits
CVP 6100	Introduction to Hospital Environments		1 credit
CVP 6403	Hemodynamic Monitoring		3 credits
CVP 6501	Interdisciplinary Healthcare 1		.5 credit
CVP 6620	Applied Anatomy		3 credits
CVP 6630	Medical Physiology 1		1.5 credits

Fall Semester			**16 credits**
CVP 6002	Perfusion Science 2		3 credits
CVP 6020	Perfusion Lab 2		2 credits
CVP 6031	Medical Physiology 2		1.5 credits
CVP 6198	Introduction to Biostatistics		2 credits
CVP 6200	Research Methodologies		1 credit
CVP 6201	Masters Project 1		1 credit
CVP 6301	Procedure Observations & Lectureships 1		1.5 credit
CVP 6401	Perfusion Anatomy, Physiology, and Surgical Repair		3 credits
CVP 6502	Interdisciplinary Healthcare 2		1 credit

Spring Semester			**16 credits**
CVP 6003	Perfusion Science 3		3 credits
CVP 6030	Perfusion Lab 3		3 credits
CVP 6202	Masters Project II		1 credit
CVP 6203	Perfusion Standards and Liability Management		2 credits
CVP 6302	Procedure Observations & Lectureships 2		2 credits
CVP 6402	Pediatric Perfusion		3 credits
CVP 6550	Mechanical Circulatory Support		2 credits

YEAR TWO

Summer Semester			**8 credits**
CVP 6701	Clinical Rotation 1	6 weeks	4 credits
CVP 6702	Clinical Rotation 2	6 weeks	4 credits

Fall Semester			**13 credits**
CVP 6703	Clinical Rotation 3	6 weeks	4 credits
CVP 6704	Clinical Rotation 4	6 weeks	4 credits
CVP 6705	Clinical Rotation 5	6 weeks	4 credits
CVP 6721	Advanced Topics in Perfusion		1 credit

Spring Semester			**13 credits**
CVP 6706	Clinical Rotation 6	6 weeks	4 credits
CVP 6707	Clinical Rotation 7	6 weeks	4 credits
CVP 6708	Clinical Rotation 8	6 weeks	4 credits
CVP 6722	Board Certification Prep		1 credit

Cardiovascular Perfusion Program Technical Standards
Qualifications for Medical School Admission, Continuation, and Graduation

Prior to matriculation, all incoming students must read the Qualification Admissions, Continuation, and Graduation below.

The Cardiovascular Perfusion Program does not exactly follow the University of Utah main campus academic calendar, Academic Calendar - Office of the Registrar - The University of Utah.
Most classes will follow the outlined dates, however, many of the classes will change their set schedule/time as needed to properly cover all required didactics and training.

This may include:

1. Time outside of an average work/class day, 8:00am-5:00pm
2. Time a student may want to utilize the simulation lab.
3. Clinical rotatations do not follow a set day or time of the week.
4. Offsite rotations, including orientation day, will follow the schedule as set by the site preceptor. Students will follow this schedule.
5. Observation class times will be determined by the preceptor. Students may be required to stay in the OR outside of normal class time.

Introduction
The Liaison Committee on Medical Education, which accredits the School of Medicine, has recommended that all medical schools develop technical standards to assist them in determining whether applicants for admission to the School of Medicine or candidates seeking the degree of Doctor of Medicine are qualified to pursue a career in medicine. This document, "Qualifications for Medical School Admission, Continuation and Graduation" (Qualifications), contains the technical standards of the University of Utah, School of Medicine and the procedures a candidate must follow to establish the existence of a disability and to request reasonable accommodation from the School of Medicine. The technical standards are based on guidelines produced by the Association of American Medical Colleges. This document is also published in the Student Handbook and is available to all medical students. All School of Medicine applicants who reach the interview stage are required to read the Qualifications and attest that to the best of their knowledge they are able to meet these standards, with or without reasonable accommodation, if they were to become a candidate at the University of Utah, School of Medicine. The signed citation is kept as a permanent part of the record of all matriculating candidates. **The University of Utah Master of Science in Cardiovascular Perfusion program, as a part of the School of Medicine, requires that perfusion students meet the same technical standards.**

Policy Statement
The School of Medicine has determined that a broad-based, undifferentiated and patient-oriented curriculum is critical for developing the knowledge and skills of future perfusionists. The School of Medicine seeks to graduate students with the tools necessary to function in a broad variety of clinical settings and the ability to render a wide spectrum of patient care.
Medicine is a physically and mentally demanding profession in which practitioners are asked to place the interests of their patients above their own. It requires commitment to a life of service and dedication to continuous learning. The rigorous cardiovascular perfusion curriculum is where candidates begin to develop the qualities necessary for the practice of medicine. It is during this period of undergraduate medical education that the candidate acquires the foundation of knowledge, attitudes, skills and behaviors that he or she will need throughout his or her professional career. During this period, it is critical for the School of Medicine to evaluate whether the candidate is qualified to receive the degree of Master

of Science in Cardiovascular Perfusion (CVP). The School of Medicine has a responsibility to society to train perfusionists competent to care for their patients with critical judgment, broadly based knowledge and well-honed technical skills. The abilities that perfusionists must possess to practice safely are reflected in the technical standards that follow. Thus, applicants and candidates must be able to meet these standards and successfully complete all identified requirements to be admitted to the School of Medicine, to progress through the curriculum and ultimately, to receive the CVP degree from the University of Utah School of Medicine.

The School of Medicine is supportive of the philosophy underlying Section 504 of the 1973 Vocational Rehabilitation Act, as amended, and the Americans with Disabilities Act of 2008 (collectively referred to as the "ADA"), and seeks to provide opportunities for qualified individuals with disabilities.

Microsoft Word - FS - Rights Under 504 - English - Revised 2006.doc (hhs.gov)
Faculty & Staff - Center for Disability Services - The University of Utah

In order to be a qualified applicant or candidate an individual must meet these technical standards with or without reasonable accommodation. The standards have been established to ensure that an applicant or candidate has the ability to perform the requirements of the School of Medicine academic curriculum and to practice medicine safely and responsibly.

Technical Standards
Candidates for the degree of Master of Science in Cardiovascular Perfusion must be capable of performing in five areas: Observation; Communication; Motor Skills; Intellectual-Conceptual, Integrative and Quantitative Abilities, and Behavioral and Social Abilities. Students must also successfully meet curricular requirements, pass tests and evaluations, and successfully participate in clinical experiences, with or without reasonable accommodation. Faculty has the right to assess any student at any time. Students must be able to demonstrate they can perform the technical standards upon matriculation through graduation from Perfusion school. Any student claiming a disability and seeking an academic adjustment or reasonable accommodation must follow the procedures outlined below.

Procedures
In order to establish the existence of a disability and to request a reasonable accommodation, candidates must contact the University's Center for Disability and Access ("CDA") (801-581-5020), info@disability.utah.edu. The candidate must then follow the procedures of the CDA to document the existence and nature of the disability. The CDA will interact with the SOM regarding possible accommodations but will not share the student/candidate's information with SOM faculty or administration.
Once the need for reasonable accommodations has been established, the CDA, in consultation with the candidate and the SOM, will determine the appropriate accommodations and these accommodations will be specified in a written document, signed by all parties. Documents relating to the candidate's disability will be placed in a confidential file separate from his/her academic records. The School of Medicine will then direct the appropriate course masters to provide the accommodation.

Candidate's Request for Accommodations
1. If a candidate refuses a reasonable accommodation that is offered through this procedure and subsequently experiences academic difficulty, the candidate will be treated as any other candidate who experiences academic difficulty.
2. A candidate may seek to establish a disability and request reasonable accommodation at any time before or after matriculation.

3. A candidate should claim and establish the existence of a disability prior to the onset of academic problems. The School of Medicine shall have no obligation to remediate an academic failure resulting from a claimed disability that was not brought to the attention of the School of Medicine and addressed in a timely fashion.
4. University policy and state and federal law prohibit retaliation against an individual for requesting an accommodation for a disability.
5. All claims and proceedings under this provision will be kept confidential to the extent provided by law and University policies. Dissemination of information related to the existence of a disability will be restricted to University administrators with a legitimate need to know this information; except as provided by law, no mention of the candidate's disability will appear in any School of Medicine correspondence with external agencies unless the candidate specifically requests such disclosure in writing.

The University of Utah has designated the following individual as its ADA/Section 504 Coordinator:

Office of Equal Opportunity, Affirmative Action and Title IX
383 South University Street, Level 1 OEO Suite
Salt Lake City, UT 84112
Telephone: (801)581-8365
Email: oeo@utah.edu
Disability Access & Accommodation - Office of Equal Opportunity & Affirmative Action - The University of Utah

If you have questions regarding this policy or University nondiscrimination policies, please contact the Office of Equal Opportunity/Affirmative Action at 801.581.8365.

Seeking Accommodations for a Disability
The School of Medicine seeks to educate students with the foundation of knowledge, attitudes, skills and behaviors so that they can render a wide spectrum of patient care and can function in a broad variety of clinical settings. The abilities that medical students must possess are defined in the Qualifications for Medical School Admission, Continuations and Graduation/Technical Standards above and course and course-specific technical standards published in the syllabi. Medical students must be able to meet these standards and successfully complete all curricular requirements and receive the degree of Master of Science in Cardiovascular Perfusion Studies.

Students seeking accommodations for a disability must contact the University's Center for Disability and Access (CDA). The student must follow the procedures of the CDA to document the existence and nature of the disability and to request accommodations.

Center for Disability Services - The University of Utah

Observation
Candidates must be able to observe and participate in all activities assigned during didactic and clinical activities.

In order to make proper clinical decisions, candidates must be able to observe a patient accurately. Candidates must be able to acquire information from electronic media, written documents, and discussions with hospital staff (including surgeons, anesthesiologists, nurses, physician assistants, etc.) to determine the correct plan of action for each patient.

Candidates must also be able to observe and make sound corrections to all perfusion equipment including but not limited to: heart lung machines, cell savers, CDI equipment, cardioplegia (CPG) equipment, PRP equipment, ACT equipment, ECMO equipment, HIPEC equipment, heater coolers, and anesthesia equipment (NIRS equipment and BIS readings). Candidates must also be able to observe patient hemodynamics and make corrective actions as is safe and necessary for any patient they are assigned to take care of. Thus, functional use of vision, receptive communication and sensation is necessary.

Communication
Candidates must be able to communicate effectively and sensitively with patients and family as is directed by a physician (MD). This is particularly important in situations where you are in direct care of patients in the cardiac ICU involving patients on balloon pumps, VAD's, and ECMO equipment. Candidates must also be able to communicate effectively and efficiently with other members of the health care team. Communication includes not only speech or face-to-face communication but reading and writing. In emergency situations, candidates must be able to understand and convey information essential for the safe and effective care of patients in a clear, unambiguous and rapid fashion. In addition, candidates must have the ability to relate information to and receive information from patients in a caring and confidential manner. Since the health care team communicates in English, the candidate must be able to communicate effectively and efficiently in English, in speech or other face-to-face communication, reading and writing.

Motor Skills
Candidates must possess the motor skills necessary to perform cardiopulmonary bypass techniques and all other perfusion skills assigned of them. Candidates must be able to execute motor movements reasonably required to provide general and emergency medical care to all types of patient populations. In addition to general and emergency care, different types of specific medical procedures and treatments must be performed depending on the course or clinical rotation, and candidates are expected to perform all of the procedures and treatments as may be required by a particular course or clinical rotation. These skills require coordination of both gross and fine muscular movements, equilibrium and integrated use of the senses of touch and vision. In addition, these skills often require a candidate to maneuver his or her own body in different ways to move heavy equipment, set up equipment, manage cardiopulmonary bypass, manage ECMO, and other perfusion related services.

Intellectual-Conceptual, Integrative and Quantitative Abilities
In order to effectively solve clinical problems, candidates must be able to measure, calculate, reason, analyze, integrate and synthesize in a timely fashion. In addition, they must be able to comprehend three-dimensional relationships and to understand the spatial relationships of structures. Candidates must have the ability to remain awake and alert at all times.

Behavioral and Social Abilities
Candidates must possess the emotional health required for the full utilization of their intellectual abilities, for the exercise of good judgment, for the prompt completion of all responsibility's attendant to the diagnosis and care of patients, and for the development of effective relationships with patients and colleagues. Candidates must possess qualities of compassion, integrity, concern for others, commitment and motivation. Candidates must develop mature, sensitive and professional and effective relationships with patients of all genders, ages, races, lifestyles, sexual orientations, religious beliefs or practices, and cultural backgrounds, as well as with their families, with other health care providers, and with all members of the learning and working community. Candidates are expected to accept and assimilate appropriate suggestions and criticism and, if necessary, respond by modifying their behavior.

The unpredictable needs of patients are at the heart of becoming a cardiovascular perfusionist. Academic and clinical responsibilities of students may require their presence during day and evening hours, any day of the week, at unpredictable times and for unpredictable durations of time. Candidates must be able to tolerate physically and mentally taxing workloads and function effectively under stress. They must be able to adapt to changing environments, display flexibility and learn to function in the face of uncertainties inherent in the clinical problems of patients.

Curriculum Requirements
In addition to the abilities specified above, candidates must be able to successfully complete, with or without reasonable accommodation, all required components of the curriculum. Candidates are expected to attend and participate in all learning experiences in classroom, hospital, clinic and community settings.

Tests and Assessments
In order to evaluate the competence and quality of candidates, the School of Medicine employs periodic assessments as an essential component of the CVP program curriculum. Successful completion of these assessments is required of all candidates as a condition for continued progress through the curriculum. If required by the ADA, reasonable accommodation will be made in the administration of these assessments.

Clinical Assessments
Demonstration of clinical competence is of fundamental importance to the career and curriculum progression of the candidates. Therefore, the process of faculty assessment of the clinical performance of candidates is an integral and essential part of the curriculum. If required by the ADA, reasonable accommodation will be made, however, participation in clinical experiences and the evaluation of that participation is required.

Disability, Inclusion and Accommodations
The University of Utah is fully committed to policies of equal opportunity and nondiscrimination. University policy prohibits any form of discrimination, harassment, or prejudicial treatment on the basis of age, race, sex, sexual orientation, gender identity/expression, color, national origin, religion, status as a person with a disability, or status as a veteran.

Definitions and Procedures
The following are the procedures of the University of Utah, School of Medicine for a candidate or student to identify a disability and seek a reasonable accommodation. In compliance with the ADA, information about an individual's disability and request for accommodation will be kept confidential and shared only as necessary to process the accommodation request. Retaliation against an individual for requesting a reasonable accommodation for a disability or for engaging in the accommodation process is strictly prohibited. The program can only accommodate students that have followed the outlined procedures to qualify for accommodations.

Definitions
For purposes of this policy, a matriculated candidate becomes a medical student on the first day of class. The first day of Orientation Week is the first day of class.

The definition of disability can be located in the Americans with Disabilities Act of 2008, with the exclusions as referenced in the Act. That definition is as follows, "an individual is disabled if he or she, 1) has a physical or mental impairment that substantially limits one or more of the individual's major life activities; or 2) has a record of such an impairment; or 3) is regarded as having such an impairment."

University of Utah Policies

The Americans with Disabilities Act. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to plan for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.
Center for Disability Services - The University of Utah

Addressing Sexual Misconduct. Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).
OEO/TITLE IX PROCESS (utah.edu)

Wellness: Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc. can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness.
Center for Student Wellness (utah.edu) or 801-581-7776.

Veterans Center: If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F, 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources.
Veterans Support Center (utah.edu)

LGBT Resource Center:
The LGBT Resource Center at the University of Utah supports the success of lesbian, gay, bisexual, transgender, queer, questioning, intersex, asexual/aromantic (LGBTQIA+) students as well as providing educational and cultural events for the entire campus. The LGBT RC was formally dedicated in April of 2002. The center was a result of a concerted student initiative that was supported by faculty and university administration, which resulted in the establishment of an office on campus permanently located within the Student Union. The LGBT RC is part of both the Division of Student Affairs and Equity, Diversity, & Inclusion (utah.edu).
LGBT Resource Center - The University of Utah

Attendance & Punctuality:

1. Attendance, including prompt timeliness and participation is expected in accordance with the CVP Didactic Policy on Attendance, Timeliness, and Participation. In the event of an absence, you are responsible for learning the material through require readings, watching pertinent videos, etc. Review the CVP Didactic Policy on Student Assessment for information on excused and unexcused absences.
2. Be prepared for each scheduled learning activity – lecture, lab, team-based – by completing the assigned readings and/or preparation in advance of the activity.
3. Assignments must be submitted by their designated due dates. No credit will be awarded for late assignments.
4. You are expected to maintain professional behavior in the classroom setting, according to the University's Policy 6-400: Code of Student Rights and Responsibilities ("Student Code") - Regulations Library - The University of Utah.
   The Code specifies prescribed conduct that involves items such as cheating on tests or quizzes, plagiarism, and/or collusion, as well as fraud, and theft. Students should read and know they are responsible for the content of Student Responsibilities.
5. Academic dishonesty/misconduct includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information, as defined in Policy 6-400: Code of Student Rights and Responsibilities ("Student Code").
6. Plagiarism is not allowed. Plagiarism is defined as the intentional or unintentional use by paraphrase or direct quotation of another author, including a peer, without full and clear acknowledgment or representation of the original authors work.
7. Additional assignments, when required by the instructor may be added throughout the semester. All additional assignments will be made known to the student in a timely manner and with a due date.

Food & Drink: Food and drink is allowed in class as long as it does not distract from the teaching of the professor or the learning of the other students.

***The Physician Assistant (PA) Program, of which you join for the Anatomy class, may have different requirements. Please follow all PA program rules for their didactic courses.**

Electronic Devices in Class: Electronic devices are only allowed if they are being used for learning in class. Use of electronics during class for social media, texting, making phone calls, etc. will result in the electronic device being taken away. If use of electronic devices occurs on a regular basis, you will be subject to class discipline.

Canvas: The CVP uses Canvas, an online Instructure Inc. platform, to distribute course/class content including learning exercises, classroom presentations, assignments, skills exercise, quizzes, orientation content and communication.

Academic Standards and Progression

Background and Purpose:

The purpose of this policy is to provide clear expectations on requirements and procedures related to academic standards and progression.

Policy Statement:

Academic Standards and Progression Criteria

1. At the conclusion of each semester, you must be recommended for progression to the next semester by CVP faculty and staff. To maintain the academic standards set forth by the CVP Program, and be eligible for progression without stipulations, you must accomplish the following:
    a. Complete each semester with an average GPA of 3.0 (also a Graduate School requirement).
    b. Successfully pass each course and/or course block with a 70%. A score of 69.50%- 69.99% will round up to a 70%.
    c. Meet all Behavioral Standards and Technical Standards as outlined in this handbook.
        i. If the behavioral and technical standards are not being met by a student at any time, the program may consider dismissing the student from the program.
    d. Successfully remediate any failed assessments, as outlined below.
    e. To progress to the clinical year, a 3.0 cumulative GPA is required by the graduate school.

Failure to meet any of the above criteria may result in an CVP Advisory Committee meeting and lead to academic sanctions including but not limited to academic probation or dismissal from the Program.

Remediation

It is the responsibility of the Program to evaluate each student's understanding of the content taught during the didactic year. Student progress is monitored and documented in a manner that promptly identifies deficiencies in knowledge, skills, or professionalism, and establishes means for remediation as described below:

1. Remediation is required for any failed written examination (<70%) or skills assessment (course and/or course block specific) included in the didactic curriculum. Remediation includes the following:

    a. If students receive <70% on an examination, they will receive a list of exam content objectives missed. Students must then review and study the content missed and be prepared to take a remediation exam.
    b. Students must complete remediation according to the policy and schedule set by the didactic team. It is the student's responsibility to be prepared to take the exam by the date scheduled. Exceptions regarding the timing of remediation exams must be approved by the Director of CVP studies and the course Instructor.
    c. Failing to appear for a remediation exam without prior approval will result in a meeting with faculty. Students are still required to take the remediation exam, but the original test score will be the final grade.
    d. Students are allowed one attempt at retake exams and must score at least a 70% to pass. Regardless of how high the remediation exam score is, the highest grade attainable on a retake exam is a 70%. Failure of a retake exam will necessitate an CVP faculty meeting, and in these cases, the highest grade attainable would be the highest score achieved from the two exams.
    e. Remediation of practical exams will be determined by Course Instructors, as outlined in the course and/or course block syllabus.
2. Remediation may also be required of students who fail to meet the Program's Behavioral Standards. Breaches of behavioral standards are considered academic deficiencies. Appropriate remediation or sanctions are determined by the CVP faculty and staff.
3. A formal remediation plan may be required if a faculty member identifies a significant deficiency in knowledge, skills and/or professional behavior, despite passing exams. This may be demonstrated by

consistently poor performance on assessments, or other identified deficiencies in knowledge, skills and/or professional behavior.

4. In these cases, specific remediation plans will be developed by the Director, in conjunction with a Course Director/Faculty Mentor/Faculty Member, and may include but are not limited to the **examples** below. This list will not be the only standards and requirements, but is a guideline as student remediation plans will vary.

    - Reading assignments
    - Written completion of selected course and/or course block learning objectives with reference citations
    - Written response to selected exam items
    - Problem-based learning exercises focused on area(s) of weakness
    - Written self-reflection exercises
    - Individual faculty-led tutoring

5. Completion of a remediation plan does not imply that a student has met a particular course and/or course block or program outcome.
6. During the remediation process:
    a. The student will make up any missed class time.
    b. The student will make up any missed assignments.
    c. The student will continue attending all required classes.
    d. The student will pass all class assignments and quizzes each week
    e. If these conditions are not met, the student may face dismissal from the program.
7. In circumstances where it is statistically impossible for a student to pass a course and/or course block, remediation will not be required and the original examination, evaluation and/or assessment scores will be utilized to calculate final course and/or course block scores.
8. In circumstances where it is statistically impossible for a student to have a 3.0 GPA to enter the clinical year, the CVP Advisory Committee will meet to discuss remediation and/or dismissal from the program.

Failure to Meet Academic Standards

As described above, students who demonstrate academic or professionalism deficiency, will be called before by the CVP Advisory Committee. The Committee may recommend no accommodations, accommodations without probation, academic probation with or without stipulations, or dismissal. The student has the right to appeal decisions made by the CVP Advisory Committee. The decision options and appeals process are described below.

Academic Remediation with or without Accommodation.

Procedure for regaining good standing following placement on Academic Probation:

1. In order to return to good standing following placement on Academic Probation during the didactic year semesters, students must meet all stipulations of their academic probation for an entire semester following probation. Failure to meet all stipulations will result in continued probation, or possible deceleration or dismissal from the program.
2. Students who demonstrate a deficiency warranting academic probation during the final didactic semester will not proceed to the clinical year until the stipulations surrounding probation have been met. This may require deceleration, and failure to meet stipulations may result in dismissal from the program.
3. Students may be placed on probation in the clinical year. Deceleration or dismissal may be recommended by the CVP Advisory Committee if the student is unable to maintain a 3.0 GPA, fails a clinical rotation, or demonstrates behaviors that are incompatible with the practice of medicine.

Dismissal

The faculty do not take the decision to dismiss a student lightly, but the inability to meet the academic standards listed above may result in dismissal from the program.

Additional Information

University of Utah policy states that financial aid may be adversely affected by poor academic performance. Specifically, if your GPA drops below a 2.0 and you are still enrolled in the Program, you risk losing your financial assistance.

A course is defined as a subject listed in the University Course Catalog under a specific name and number with a specific number of credit hours for which registration will be allowed; a course may stand as an independent entity or be comprised of several course blocks.

A student cannot, without written permission from the Program Director, withdraw from any course and/or course block in the Program curriculum. Likewise, a student may not opt to take an incomplete in a course and/or course block without permission from the Program Director.

LETTER GRADE PERCENTAGE

The Program utilizes the following grading scale for all exams and courses and/or Course Block; unless otherwise noted within each individual syllabus.

This Grading Scale may be altered at the discretion of each professor. Please check each syllabus for changes to this grading scale.

Grade	Percentage
A	**95-100**
A-	**90-94**
B+	**86-89**
B	**80-85**
B-	**76-79**
C+	**72-75**
C	**70-71**
Below C	**<69 Fail**
	Scores will be rounded up
	Example: 94.4 = 94
	94.5 = 95

A breach in this policy may result in a CVP Advisory Committee Meeting, where academic remediation may be imposed, up to and including automatic and immediate dismissal from the Program.

Student Assessment

Purpose:
Student assessment is an integral part of both didactic and supervised clinical education, ensuring that students adequately meet program expectations and have the knowledge, skills, and attitudes needed for entry-level perfusion practice.
The purpose of this policy is to define the assessment policy for the University of Utah Master of Science in Cardiovascular Perfusion program.

Policy Statement

Successful Completion of Assessments

1. You must show competency in courses and pass all exams. No exceptions will be made to this grading rule. Competency is defined as the ability to do something successfully or efficiently.

Formative Exams

1. Passing is defined as a minimum score of 70%. Failure to achieve a 70% will mandate remediation (refer to the Remediation section of the Academic Performance and Progression Policy).

Lab Assessments

1. Lab instructors will define a passing score for lab assessments. Requirements will be published in the Course Syllabus. Failure to pass a lab assessment could require further training beyond normally scheduled class time. If progression is not noted from assessment to assessment than possible failure of the lab portion of didactic training may occur.
2. When a score ends with a 0.50% or higher, the score will be rounded up. If a score ends with a 0.49% or lower, the score will be rounded down.

Exam Protocol and Academic Integrity

1. The Program complies with all recommendations provided by the University's Center for Disability Services. If a student has a college or university approved testing accommodation, it is the student's responsibility to notify the academic coordinator upon matriculation and prior to each semester.
2. You are expected to arrive at least 15 minutes prior to the scheduled start time of an examination to set up for your exam. When the exam commences you must be in your seat ready for examination. **Exams will begin on time and end on time**.
3. During exams, all personal items, including notes, backpacks, and electronic devices/cell phones, must remain outside of the classroom. Hats must be removed. Food is not allowed in the classroom during exams; drinks in non-disruptive containers are permitted.
4. When an exam is given electronically, no other windows may be open simultaneously. The testing screen must be fully maximized.
5. All discussion will cease at the time the exam is provided.
6. To maintain exam validity and academic integrity, you may not make inquiry about exam items or content during the administration of the assessment. If you perceive or identify an issue with a question or want to challenge a question, tag it for faculty review after the exam is completed. The only exception is if you encounter problems related to exam administration (technical issues). In this case, notify the examination proctor immediately.
7. If you absolutely have to leave the room during an exam, you must leave all testing materials in the exam room. Exam time will continue to count-down.
8. Once leaving the classroom (unless it is to use the restroom), you are not permitted to re-enter until all exam takers are finished.
9. Do not congregate in the hallway outside of the classroom following an examination.
10. Refer to the Behavioral Standards policy regarding cheating or plagiarism.

11. Recurrent disruption or inappropriate behavior during exams is considered unprofessional and may result in an CVP faculty meeting. In case of an illness or unforeseen emergency, the student must contact the Course Instructor as early as possible, at least 1 hour prior to the assessment to request an excused absence. The student is then responsible for rescheduling the assessment as described under "missed assessments" below. Please see the Attendance, Timeliness, and Participation for definitions of what constitutes an "excused absence".

Tardiness for an examination or timed assessment

1. If you arrive after an examination has begun, you will be allowed to take the examination, but no additional time beyond the scheduled conclusion of the examination will be allowed.
2. Recurrent tardiness to exams is considered unprofessional, may result in a CVP Advisory Committee meeting to discuss this behavior and possible remediation.

Missed Assessments

1. In order to be eligible to make-up a missed assessment, the absence must be excused, as outlined in the Attendance, Timeliness, and Participation. Unexcused absence from an examination may result in a grade of zero (0) on that exam.
2. If you miss an exam due to an excused absence, you must be prepared to take the exam on the day you return to classes, but will take the make-up exam when scheduled by the Director of the CVP program and the Class instructor.
3. If you miss a quiz or group activity due to an excused absence, as outlined in the Attendance, Timeliness, and Participation, make-up of the work will be at the discretion of the Course Instructor. Refer to Course Syllabi for specific course requirements.
4. If you miss an exam, quiz, or in-class assignment due to an unexcused absence, as outlined in the Attendance, Timeliness, and Participation, you will not be permitted to make up the work and will receive a grade of zero (0) for that assessment.

Grading

1. Grading for each assessment will be described in the specific course syllabus.
2. Formative assessments will be graded and disbursed at the discretion of the course instructor.
3. Final Exam grades will be disbursed after the exam has been reviewed for validity and course evaluations have been completed by students.

Behavioral Standards

Background and Purpose

The Master of Science in Cardiovascular Perfusion Program is dedicated to training students to function as respected healthcare professionals. As such, students should understand how to behave and present themselves in a manner befitting a future medical provider.

The purpose of this policy is to outline acceptable behavioral standards for students in the University of Utah Master of Science in Cardiovascular Perfusion Program (CVP)

Policy Statement

CVP believes strongly that perfusionists, as well as those training to be perfusionists, should demonstrate professionalism at all times, including good judgment, high motivation, high moral and ethical character, honesty, and integrity.

1. You are expected to display the highest ethical standards commensurate with work as a health-care professional.
2. CVP adheres to the Code of Ethics published by AmSECT, https://www.amsect.org/Policy-Practice/Code-of-Ethics
3. You are expected to report any illegal or unethical activity to program faculty.
4. You will not accept gifts or gratuities from patients or families.
5. Breaches in confidentiality, falsification of records, misuse of medications, and sexual relationships with patients, preceptors, instructors etc. will not be tolerated.
6. You must have a strict knowledge of limitations, which will be paramount when working on a healthcare team upon entering the workforce.
7. Faculty assessment of professional behavior will be routinely performed throughout the program. Assessment and grades for professionalism will be reflected in all didactic and clinical courses, but professionalism can be evaluated any time a faculty member observes professional/ unprofessional behavior(s). During the didactic phase of training, scores for professional behavior will fall into one of the following categories:

    E = Exceeds Expectations
    A = Acceptable
    NI = Needs improvement
    U = Unacceptable

At the end of each semester, letter scores will be converted to numerical values which will be used in the calculation of grades for this course.

Using a Professionalism Grading Rubric, students will be evaluated and graded in the following areas:

Category 1: ALTRUISM

- Sensitive/responsive to needs of others
- Sensitive/responsive to others' culture, age, gender and disabilities
- Puts others interests before own
- Provides assistance/comfort to others

Category 2: DUTY / INTEGRITY

- Attends required activities/arrives on time
- Reliable, dependable, completes tasks fully and in timely manner
- Accepts appropriate share of teamwork
- Self-motivated, organized, and prepared
- Accountable to patients, society, and the profession

Category 3: EXCELLENCE

- Commitment to excellence and on-going professional development
- Positive attitude, displays enthusiasm and attentiveness
- Self-reflection, critical curiosity and initiative
- Recognizes limitations, seeks, accepts and incorporates constructive feedback
- Adapts well to stressful/changing circumstances

Category 4: INTERPERSONAL SKILLS / RELATIONSHIPS

- Respectful, cooperative (team player), builds atmosphere conducive to learning
- Acknowledges and values diversity, talents, skills, contributions of others
- Communicates effectively (verbal and written)
- Good interpersonal skills (develops appropriate professional relationships with peers, faculty, physician supervisors and other health-care providers)
- Recognizes/maintains appropriate boundaries
- Displays tact and self-control

Category 5: HONOR / INTEGRITY / CODE of CONDUCT

- Accurately portrays personal qualifications
- Displays professional presentation (dress appropriately and good personal hygiene)
- Performs in accordance with regulatory and legal requirements (follow the rules), as well as the appropriate role of the Perfusionist.
- Committed to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, informed consent, and business practices
- Behaves honestly/appears trustworthy

Academic Integrity

Part of professionalism is demonstrating academic integrity; you are required to adhere to the Policy 6-400: Code of Student Rights and Responsibilities ("Student Code") - Regulations Library - The University of Utah

1. Infractions such as forgery, plagiarism, stealing/copying tests, and cheating on examinations will not be tolerated.
2. Any incidence or suspicion of academic dishonesty will necessitate a CVP faculty meeting and sanctions may include automatic and immediate dismissal from the Program.

Respect

1. You must demonstrate the ability and willingness to live and work among ethnically and culturally diverse populations.
2. You will treat all staff, faculty, patients, their families and friends, clinical preceptors, health care workers, and fellow students with dignity and respect.
3. You are expected to resolve conflicts in a diplomatic, reasoned manner. If you are unable to resolve a conflict, a meeting with core faculty can be arranged to mediate and resolve any remaining issues.
4. You will be sensitive to, and tolerant of, diversity in the student population.
5. Perfusion education involves a close working environment with other students and includes physical examination of fellow students as well as discussion groups that may reveal personal information. You are expected to approach these situations with respect for privacy, confidentiality, and feelings of fellow students.
6. You will offer criticism or suggestions in a thoughtful and reasoned manner that fosters respect and trust. Displays of anger, including demeaning, offensive, argumentative, threatening

language/behavior, or language that is insensitive to race, gender, ethnicity, religion, and sexual orientation will not be tolerated.

7. Displays of disruptive, obstructive, or disrespectful behavior in the classroom or clinical sites will not be tolerated.
8. You are expected to demonstrate exceptional interpersonal and communication skills -- including written, verbal, and nonverbal -- with faculty, staff, and classmates, as well as patients, their families and all members of the healthcare team. See the next section for Technology Requirements and Etiquette expectations regarding online communication, including emails. Examples of student behaviors that would be inconsistent with the Program's academic standards, include but are not limited to:

    a. Behavior which compromises or interferes with the classroom learning environment;
    b. Behavior which compromises or interferes with the delivery of safe patient care in the clinical setting;
    c. Procurement, distribution, or use of illegal substances;
    d. Inappropriate student-patient / faculty / preceptor relationships;
    e. Failing to report errors and accidents;
    f. Cheating on tests or plagiarism on papers or other assignments;
    g. Criminal behavior, felony/misdemeanor;
    h. Deliberate dishonesty, falsifying reports, or withholding pertinent information;
    i. Rendering patient care while impaired (i.e., under the influence of alcohol, prescribed, or illegal substances)

There will be zero tolerance for breach of any of the behavioral standards outlined above. Any behavior that casts doubt on your ability to perform as a successful practitioner will necessitate a CVP Advisory Committee meeting, where you may face academic sanctions up to and including automatic and immediate dismissal from the Program.

Technology Requirements and Etiquette

Background and Purpose

The medical industry relies heavily on technology and on practitioners who are proficient in utilizing technology. As a result, the University of Utah Cardiovascular Perfusion Program requires extensive utilization of electronic devices and various software's throughout the curriculum.
The purpose of this policy is two-fold:

1. To define minimum technology requirements for students to ensure they are equipped with the hardware and software necessary to facilitate their participation and success in all facets of the program.
2. To communicate digital etiquette expectations related to utilizing technology in the classroom and in others areas of the program.

Policy Statement

Technology Requirements

1. You are required to secure a laptop computer for classroom material management, note-taking, assignment submission, and exams.
2. The laptop computer may be either a Mac or a PC as long as it adheres to the following specifications:

    - **Processor:** Intel Core i5 or better (at least 2.8 GHz)
    - **RAM:** 8 GB or more
    - **Storage:** 256 GB or more
    - **Display:** 13 inches or larger

3. You may use iPads for taking notes, however, an iPad may not serve as a replacement for a laptop and cannot be used to take exams.
4. You are responsible for maintaining the proper space for testing downloads, and amend anti-virus settings as needed, to accommodate exams.
5. CVP utilizes **CANVAS** as its Learning Management System. All syllabi, PowerPoint presentations, notes, etc. are provided electronically in Canvas; paper copies may only be provided in certain situations.
6. CVP does not provide student technical support; you can obtain technology support from the following University resources:
    Campus Help Desk - 801-581-4000
    Marriott Library (on Main Campus) - can provide in-person assistance
8. The University of Utah provides many digital resources. Please review the guide for important information including University Wi-Fi networks, Campus Information Systems, UMail, Learning Management Systems, MobileU, Free and Discounted Software, Grammarly Access, Duo Security, Campus Alert and Help Desk, Phishing Emails, Computer Labs, RedPrint, Tech Equipment Checkout, Libraries, Digital Learning, Exam Services, Xfinity on Campus, Campus Maps, Student Profile, UIT News and Information Resources and IT Policies.

    University Information Technology - New Student Guide to Digital Resources - University Information Technology - The University of Utah

Digital Etiquette

1. The University of Utah CVP Program is committed to providing an optimal learning environment for all students. The use of electronic devices, such as cell phones, tablets, or laptop computers in the classroom during scheduled class time is discouraged, unless the activity relates directly to the class being taught. In order to mitigate potential distractions, and to facilitate increased individual

participation and overall class engagement, the use of electronic devices for the following purposes is discouraged during formal learning experiences:

a. Conducting personal business (e.g. email, text messaging, etc.)
b. Engaging in social media and playing video games.
c. Any other activities that may interfere with an optimal learning environment.

2. **Mobile Devices:** Mobile devices should remain off or engaged with settings where they will not cause distractions for students and instructors. You should only use mobile devices in the classroom when directed by faculty for specific learning experiences or when there is a need to research information pertinent to current subject matter. **Cell phones are not permitted in the classroom during exams**.

    a. Talking on a cell phone or texting during classroom teaching activities is not appropriate and considered unprofessional. If personal circumstances require you to take a call or text during class time, please inform the instructor in advance of the class that you may be stepping out during the lecture.
    b. **Recording:** If you intend to record lectures with a personal device, **permission must be obtained from the instructor prior to recording.**

3. **Emails and Online Communication**: When communicating online, you are expected to include content, including greeting and sign-off, that is consistent with the level of respect and formality of the person you are communicating with.

    a. Emails should include subject line, appropriate salutation, clear message, and signature. At the same time, they should not include emoticons, slang, nuance, cursing, or sarcasm.
    b. There are many online sites that provide guidance regarding etiquette pertaining to email communication. Here are just a few that you may find helpful:

        Netiquette, http://www.albion.com/netiquette/corerules.html

        How to Write and Send Professional Email Messages
        https://www.thebalancecareers.com/how-to-write-and-send-professional-email-messages-2061892

        10 Professional Email Tips
        https://www.fastweb.com/student-news/articles/the-10-professional-email-tips

If you repeatedly disrupt instructors and/or fellow students, your privileges to use such devices may be limited or terminated. Digital etiquette violations are considered unprofessional and may result in a CVP Advisory Committee meeting.

Student Attendance, Timeliness, and Participation

Background and Purpose:
Due to the rigorous nature of Perfusion education, all academic activities are an important aspect of the educational experience. Consistent attendance, punctuality, and participation also reflects a student's professionalism. However, there may be circumstances when a student is not able to attend a required activity.
This policy defines the expectations for attendance, timeliness, and participation.

Policy Statement:
It is expected that each student arrives to all didactic and clinical activities prepared, engaged, and ready to participate. Arriving late, not participating, or absence from didactic activities is considered unprofessional and may lead to a meeting with the CVP Advisory Committee.

Attendance and Timeliness

1. Consistent attendance is a component of professional behavior. As such, attendance is expected for all program activities.
2. Attendance at all assessments (exams, quizzes, labs, rotations, etc.) and didactic/clinical hands on activities is mandatory. (see the Student Assessment Policy)
3. It is expected that you arrive to lecture, lab, rotation, or any off-site hands-on activity on time and ready to participate.
4. If you have to be late for class or a rotation, pre-approval from your instructor or preceptor is required. If an emergency occurs during class and you need to leave, be considerate to your classmates, didactic instructor, or clinical instructor by keeping disruptions to a minimum.

Tardiness and Absence
It is recognized that from time to time you may need to arrive late or be absent from class. Faculty expect you to use good judgment when taking an absence.

1. **If you must be absent or tardy for any reason, you must personally notify - by email and/or by phone call - the Director of the CVP program, the program administrator, and the Course Director prior to the scheduled activity.**
2. When snow, power outages, or similar events force closing of the University or postponement of classes, you will receive a text notification from the University of Utah with instructions.
3. In the event that program activities are being held, students should not attempt to travel under unsafe conditions or to take unnecessary risk due to inclement weather. As with any absence, notify the Didactic Team as described above and the Course Director if you are unable to attend class or other activities due to weather.
    1. Please remember, that as a student you have free access to the UTA TRAX system which runs to the University multiple times per hour throughout the day.
    University of Utah (rideuta.com)
4. If you have a long commute, it is your responsibility to leave early enough to allow time for unforeseen traffic, accidents, weather, etc. If you know the weather is going to be bad, consider staying in the city closer to campus.

The following guidelines have been established to make provisions for student absences.

EXCUSED and UNEXCUSED ABSENCES
1. An EXCUSED absence at CVP is defined as any of the following:
    - Serious illness
    - Serious illness or death of an immediate family member
    - University related trip
    - Major religious holiday

- Other circumstances defined by the CVP Advisory Committee in which a student is found to fit the definition of "reasonable cause for nonattendance".
- Absences for reasons not listed above will be evaluated by the CVP Advisory Committee on a case-by-case basis. Consideration will be given to academic and professional standing within the Program.
- Patterns of behavior, where students are missing multiple classes, may lead to disciplinary action.

2. An EXCUSED absence is required any time a student misses an assignment or assessment of any kind for any reason. To be considered excused, the student must submit appropriate documentation (i.e., health provider's excuse, obituary, etc.) to the Director of the CVP program and Program Administrator as soon as the documentation is received by the student. This excuse will be required BEFORE the student can make up any assignments or exams, which will ultimately be up to the discretion of the Course Director and the CVP Director. Please note that just having acceptable documentation does not guarantee you an excused absence.
3. An UNEXCUSED absence means the student has not received preapproval from the Program Director and Program Administrator for any absence from any CVP class. An UNEXCUSED absence is considered unprofessional and may result in formal evaluation of your professionalism and remediation. A student will not be permitted to make up work and exams missed due to an unexcused absence. Examples of occurrences when an absence may not be excused:

    - Vacation
    - Employment
    - Family obligations
    - Travel
    - Previous plans

4. Special circumstances will be reviewed by the faculty on a case-by-case basis, and must be approved before the absence is considered excused. Faculty will take into consideration factors such as academic standing, probation status, professionalism history, etc., to make its decision.
5. For tardiness or absences related to assessments, please refer to the Student Assessment Policy.

Participation

1. The Cardiovascular Perfusion Program believes that you learn from interacting with your future colleagues and our program instructors.
2. Multiple modalities are utilized by the program to ensure program outcomes are being met. To maximize learning, you must actively participate in all learning activities, such as required readings and other preparation needed before class, class discussions, class assignments, and laboratory skill sessions. Failure to actively participate in program requirements is considered unprofessional behavior, and in some courses, it can negatively affect your grade

A breach of these policies may result in a disciplinary meeting, where academic sanctions may be imposed, up to and including automatic and immediate dismissal from the CVP program.

University of Utah Academic Calendar, Student Holidays and Vacation Policy

The Cardiovascular Perfusion Program utilizes the University of Utah Academic Calendar as outlined below:

FIRST YEAR STUDENTS

1. The first year student class schedule will follow the University of Utah Academic Calendar.
    a. The calendar will be posted in the CVP Canvas course and is also available here, Academic Calendar - Office of the Registrar - The University of Utah
    b. First year students will have the posted University Holidays off.

SECOND YEAR STUDENTS

1. As the Cardiovascular Perfusion Program is a rolling 2-year program, second year students will NOT follow the University of Utah Academic Calendar.
2. Students transitioning from the first didactic year to the second clinical rotation year, will have two weeks for time off and travel time (if attending an off-site rotation) to prepare for their second clinical year.
3. If students are participating with an offsite rotation, the student is required to follow the work schedule of that institution.

Textbooks and Electronic Resources

Textbooks
It is recommended that students purchase "The Manual of Clinical Perfusion", Second Edition Update; Bryan Lichee, D. Mark Brown, ISBN: 0-9753396-0-5 at perfusion.com for $36.50.

This manual is a must have for anyone studying perfusion and is used in several of the University of Utah CVP courses. It is one of the best overall reviews of the perfusion practice. Our perfusion team uses this book every day and studies it thoroughly for board exams.

Many of the Textbooks needed for the Cardiovascular Perfusion Program are available free through the University of Utah Library System, Usearch.

1. Log into your Campus Information Services Page, https://portal.app.utah.edu/
2. Search for Library Usearch Catalog
3. Click on this resource and then search for the Textbook within catalog.
4. You must be logged into the University system to access these resources.

The Eccles Health Sciences Library System has a helpful link to online Health Science resources, http://campusguides.lib.utah.edu/ebooksHealthSciences

The following books may be found through the USearch and the ULibraries:

Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; Lippincott Williams & Wilkins; 2008.
(ISBN: 978-0-7817-6815-3)

A Practical Approach to Cardiac Anesthesia, 5th Edition; Frederick A. Hensley, Jr., Donald E. Martin, Glenn P. Gravlee; Lippincott Williams & Wilkins; 2012. (ISBN: 978-1451137446)

Manual of Perioperative Care in Adult Cardiac Surgery, 5th Edition; Robert M. Bojar; Blackwell Publishing; 2011. (ISBN: 978-1444331431)

Cardiopulmonary Bypass; S. Ghosh, F. Falter, D.J. Cook; Cambridge University Press; 2009. (ISBN: 978-0521721998)

Hemodynamic Monitoring Made Incredibly Visual, 4th Edition, Rose Knapp

ECG Interpretation Made Incredible Easy! 5th ed; Lippincott Williams & Wilkins, 2011
Hemodynamic Monitoring, Invasive and Noninvasive Clinical Application, 3rd ed.; G.O.Darovic, Saunders 2002. ISBN (10): 0-7216-9293-1

Introduction to the Operating Room. Cochran, Amalia, and Ruth Braga. McGraw-Hill Education, 2017.

Digital Resources

The University of Utah provides many digital resources. Please review the guide for important information including University Wi-Fi networks, Campus Information Systems, UMail, Learning Management Systems, MobileU, Free and Discounted Software, Grammarly Access, Duo Security, Campus Alert and Help Desk, Phishing Emails, Computer Labs, RedPrint, Tech Equipment Checkout, Libraries, Digital Learning, Exam Services, Xfinity on Campus, Campus Maps, Student Profile, UIT News and Information Resources and IT Policies.

University Information Technology - New Student Guide to Digital Resources - University Information Technology - The University of Utah

Perfusion Curriculum and Policies

Year One
Summer Semester

CVP 6001 - Perfusion Science 1

Summer Semester

Instructor: Chris Blaylock
Email: chris.blaylock@hsc.utah.edu
Phone Number: 1-801-678-0425
Office Hours: By Appointment

Summary: Three (3) credits; Lecture, First year, Summer Semester

Prerequisites for this course are as follows: Admittance into the CVP program.

Required Materials

- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; Lippincott Williams & Wilkins; 2008. (ISBN: 978-0-7817-6815-3)
- A Practical Approach to Cardiac Anesthesia, 5th Edition; Frederick A. Hensley, Jr., Donald E. Martin, Glenn P. Gravlee; Lippincott Williams & Wilkins; 2012. (ISBN: 978-1451137446)
- Manual of Perioperative Care in Adult Cardiac Surgery, 5th Edition; Robert M. Bojar; Blackwell Publishing; 2011. (ISBN: 978-1444331431)
- The Manual of Clinical Perfusion, Second Edition Updated; Bryan Lich, D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5)
- Cardiopulmonary Bypass; S. Ghosh, F. Falter, D.J. Cook; Cambridge University Press; 2009. (ISBN: 978-0521721998)

Course Description
This course will be a broad overview/ introduction to all thing's pertaining to cardiovascular perfusion. You will learn the function of the bypass circuit, its components and their purpose. This will also cover normal physiologic values, perfusion math, and how to maintain these values while on CPB. You will learn the function of the blood and how to maintain it properly while on CPB. AC-PE pages 41-45, 46-52, 54-55, 73, 83, 84, and 85

Course Outcomes
Upon completion of this unit the student will be able to:

1. Describe the relationship between velocity, acceleration and motion in one or more dimensions;
2. Describe the relationship between temperature of an object and the average kinetic energy of the atoms and molecules composing the object; and
3. Apply the laws of mechanics to viscous and non-viscous fluids.
4. Describe various properties of aqueous solutions; and
5. Discuss amino acids, lipids, active transport and enzymes as they relate to cellular physiology.
6. Describe the basis of each calculation; and
7. Apply the formulas to clinical scenarios.
8. Describe the pathways that contribute to inflammation following blood contact with artificial materials; and
9. Identify the pathways that can be modulated to reduce induction of these immune pathways.
10. Describe when reperfusion injury may occur;
11. Describe the immunological basis of reperfusion injury; and

12. Identify the pharmacological agents that may reduce reperfusion injury.
13. Describe the characteristics of the components of a perfusion circuit;
14. Describe all of the safety devices for the perfusion circuit; and
15. Discuss how all of the above fit together for a safe and controllable system.
16. Describe the types of extracorporeal tubing used in the past and present;
17. Define spallation;
18. State the volumes contained per foot of common tubing sizes;
19. Define durometer;
20. Describe methods for sterilizing extracorporeal circuitry; and
21. Discuss surface modified tubing and its clinical application.
22. Identify the different types of pumps used during CPB and explain their function; and
23. Discuss safety concerns and methods of servo regulating each type of pump.
24. Describe the different types of filtering technology used during CPB; and
25. Discuss the characteristics of individual filter types used during CPB.
26. Describe the characteristics of an ideal oxygenator;
27. Discuss the historical development of oxygenator techniques;
28. Describe different types of membrane oxygenators; and
29. Discuss the oxygen characteristics of different membrane oxygenators.
30. Describe the design characteristics of heat exchangers; and
31. Discuss the placement of heat exchangers in the CPB circuit.
32. Describe the difference between a reservoir and a cardiotomy;
33. Describe different reservoir technologies and configurations;
34. Describe internal filtering systems found in cardiotomy systems; and
35. Discuss safety issues as they relate to reservoir.
36. Describe and discuss the actions necessary prior to surgery;
37. Describe a method of initiating CPB;
38. Describe the parameters monitored during maintenance of CPB; and
39. Describe a method for weaning from CPB.
40. Describe cannulation as it relates to the CPB patient; and
41. Describe the methods of physiologic monitoring for the CPB patient.
42. Discuss the rationale for using assisted venous return;
43. Compare VAVD with KAVD; and
44. Describe the equipment required for each system.
45. Describe the purpose of laboratory testing in different patient populations;
46. Define the predictive value of positive and negative test results and how they vary with changes in the prevalence of disease; and
47. Relate patient factors that alter test results such as age, sex, habits, and underlying disease.
48. Define methodology utilized in blood gas analysis; and
49. Describe quality control procedures required to ensure adequacy of results.
50. Define laboratory test utilized in the determination of renal function;
51. Define laboratory test utilized in the diagnosis of cardiac disease; and
52. Define laboratory test utilized in the evaluation of liver function.

Teaching and Learning Methods

Lectures will run for approximately 3 hours per week and provide roughly 9 hours of at home study materials per week. Lectures taught will cover all required materials listed by the AC-PE. Each lecture for this course will be done in-person using in class slides with possible displays of equipment and disposables for visual reference. Quizzes will also be incorporated into this course and will be given on paper during class periods. These quizzes will count towards your final/overall grade. A single class assignment will also be required and will be discussed in detail in the beginning of the semester. This large assignment is required to be finished two weeks prior to the final examination. Exams will make up a large portion of your overall grade and will be issued in testing centers at various times during the semester. These times and subjects covering the exams will be outlined below.

EXAM Schedule

Item	Description	Percent
Exam 1	This examination covers Lectures 1-4	22.5%
Exam 2	This examination covers Lectures 5-8	22.5%
Exam 3	This examination covers Lectures 9-12	22.5%
Final Exam	This examination covers all Lectures 1-12	22.5%
Quizzes/Assignments	This covers all quizzes and assignments covered throughout the semester	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Exam 1	30%	Grade	%	Grade	%
Exam 2	30%	A	95-100	B-	76-79
		A-	90-94	C+	72-75
		B+	86-89	C	70-71
Final Exam (Comprehensive)	20%	B	80-85	Below C	Course Fail
Quizzes/Assignments	20%		*Scores will be rounded up:*		
			Example: 94.4 = 94		
			94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6010 - Perfusion Laboratory 1

Summer Semester

Instructor: Samuel Harman, Jessica Russ
Email: sam.harman@hsc.utah.edu, jessica.russ@hsc.utah.edu
Phone Number: Sam: 1-801-897-6709, Jessica 928-368-7497
Office Hours: By Appointment
Office Location: Building 379, 27 S. Mario Capecchi Dr., SLC, UT 84113

Summary: Two (2) credits, Pass/Fail, First Year, Summer Semester

Prerequisites for this course are as follows: Admittance into the CVP program.

Required Materials
Materials for this course will be provided in class.

Course Description
This course is the first in a three-part laboratory course. This will provide experiences with the Heart Lung machine and all extracorporeal circuit components. This course will also provide experiences with designing and assembling an extracorporeal circuit used for cardiopulmonary bypass. This course will also provide experience in priming the extracorporeal circuit.

Course Outcomes
By the end of this course, you will be able to:

- Identify components of an extracorporeal circuit
- Design an extracorporeal circuit
- Understand the operation of a Heart-Lung machine
- Assemble and prime and extracorporeal circuit
- Have a basic understanding of the Heart-Lung machine
- Use proper sterile technique
- Use basic perfusion skills
- Understand and explain information contained in the manufactures Instructions for Use
- Understand the different types of capital equipment and the related disposable equipment used for cardiopulmonary bypass
- Understand but not limited to tubing connections, pressure transducers, stopcocks, setting pump occlusions and other skills as it relates to the Heart-Lung machine
- Understand and practice tubing management while setting up and priming the extracorporeal circuit

Teaching and Learning Methods
Lectures will run for approximately 2 hours per week. It is recommended that students spend 6 hours of personal time in the lab and studying materials that will be provided in this class. All lab lectures will be done in person and will be hands on instruction. Pump setup and a final pump practical will count toward the student's final grade. Each student will have time on their own to setup and prime the extracorporeal circuit and will be expected to use personal time to improve on lab skills.

Participation: All lectures will be done in class and students will be expected to attend and participate in lab.

Assignments

Students will begin setting up and priming the extracorporeal circuit beginning on week 6. Faculty will give a live demonstration prior to week 6. Students will have 1 hour to complete pump setup and priming of circuit. Each student will be given time to debrief and provided feedback after each setup.

Grading Policy (Evaluation Methods & Criteria)
All pump set ups and pump practical will be given equal percentage towards student's final grade. This course will be a **Pass/Fail** course. Students must earn a **70%** or greater to pass this course.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6071 - Perfusion Pharmacology

Summer Semester

Instructor: Brandon Tomecek
Email: brandon.tomecek@hsc.utah.edu
Phone Number: 623-302-1730
Office Hours: By Appointment
Required Materials

- A Practical Approach to Cardiac Anesthesia, 5th Edition; Frederick A.
  - Hensley, Jr., Donald E. Martin, Glenn P. Gravlee; Lippincott Williams & Wilkins; 2012. (ISBN: 978-1451137446)
- The Manual of Clinical Perfusion, Second Edition Updated; Bryan Lich,
  - D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5)
- Lippincott's Illustrated Reviews-Pharmacology, 6thEdition, Ed.: Karen Whalen, et al, Lippincott Williams, & Wilkins, 2014, ISBN: 978-1-4511-9177-6
- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; 2008 Lippincott Williams & Wilkins, Philadelphia, PA. ISBN: 0-7817-681502 (C)(Required)

Summary: One (1) credit; Lecture, First year, Summer Semester

Course Description
This course covers pharmacodynamics, pharmacokinetics, anesthetic agents, anti-arrhythmic pharmacology, inotropic/vasopressor pharmacology, vasodilators, pharmacological treatment of congestive heart failure, antimicrobial agents/antibiotics, anticoagulants, heparin induced thrombocytopenia, antithrombin III deficiency, chemotherapeutic agents, immunosuppressive agents, cancer treatment medications, diabetic agents, and pharmacological measurements and mathematics. Medications specific to perfusion/pump practice will also be covered in this course.

Course Outcomes
By the end of this course, you will be able to:

- Master pharmacodynamics and pharmacokinetics
- Understand and solve pharmacological measurements
- Understand and solve pharmacological mathematics
- Memorize and understand different pharmacological medications
- Master the medications used specifically for perfusion practice

Assignment
Pharmacology Assignment
DUE: Two weeks prior to the final exam.
This assignment will cover research that each of you will do individually on medications affecting different organ systems in the body. Each of you will be assigned an organ system to study and the medications used to treat certain conditions within that particular organ system. You will write up a PowerPoint presentation on this organ system and the medications used to treat certain organ system failures of your choosing and you will present them in class before the final exam.
Below are listed diseases that will be assigned to you:

- Liver disease/failure
- Congestive heart failure
- Kidney/Renal failure
- Pulmonary/Respiratory disease/failure

EXAM Schedule

Item	Description	Percent
Exam 1	This examination covers Lectures 1-4	18%
Exam 2	This examination covers Lectures 5-8	18%
Exam 3	This examination covers Lectures 9-12	18%
Exam 4	This examination covers Lectures 13-16	18%
Final Exam	This examination covers all Lectures 1-16	18%
Quizzes/Assignments	This covers all quizzes and assignments covered throughout the semester	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Exam 1	18%	Grade	%	Grade	%
Exam 2	18%	A	95-100	B-	76-79
Exam 3	18%	A-	90-94	C+	72-75
Exam 4	18%	B+	86-89	C	70-71
Final Exam (Comprehensive)	18%	B	80-85	Below C	Course Fail
Quizzes/Assignments	10%		*Scores will be rounded up:* *Example: 94.4 = 94* *94.5 = 95*		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6100 - Introduction to Hospital Environments

Summer Semester

Instructor: Kirk R. Bingham
Email: kirk.bingham@hsc.utah.edu
Phone Number: 435-512-2784
Office Hours: By appointment

Required Materials

- Cochran, Amalia, and Ruth Braga. Introduction to the Operating Room. McGraw-Hill Education, 2017.
- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravle, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; 2008 Lippincott Williams & Wilkins, Philadelphia, PA. ISBN: 0-7817-681502 (C)(Required)
- Something the Lord Made; made-for-television biographical drama film about cardiac pioneer Vivient Thomas and his complex partnership with surgeon Alfred Blalock; 30 May 2004; Biography Drama.
    - PubMed link: https://pubmed.ncbi.nlm.nih.gov/17454391/

Summary: One (1) credits; Grade; Lecture, First year, Summer Semester

Prerequisites: Admittance into the CVP Program

Course Description

In this course you will be taken through an introduction to the OR environment, proper aseptic techniques, history of cardiac surgery, history/development of cardiopulmonary bypass, cardiac surgery steps, and cardiac instrumentation.

Course Outcomes

By the end of this course, you will have a sound understanding of the following:

- Operating Room Basics
- Aseptic Techniques
- History of Cardiac Surgery
- History of Cardiopulmonary Bypass (CPB)
- Cardiac Instrumentation
- Cardiac Surgery
- What I wish I'd known!

Teaching and Learning Methods

Lectures will run for approximately 1 hour per week. Each lecture for this course will be done in-person using in class slides with possible displays of equipment and disposables for visual reference. Quizzes will also be incorporated into this course and will be given on paper during class periods. These quizzes will count towards your final/overall grade. These times and subjects covering the quizzes will be outlined below.

Quiz Schedule

Item	Description	Percent
Quiz 1	Quiz covers Operating Room Basics 1 & 2	10%
Quiz 2	Quiz covers Aseptic Techniques/Operating Room Basics	10%
Quiz 3	Quiz covers Cardiac Surgery	10%
Quiz 4	Quiz covers Cardiac Instrumentation	10%
Class Participation	This section covers student participation in class during scheduled class times	60%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Quiz 1	10%	Grade	%	Grade	%
Quiz 2	10%	A	92-100	B-	76-79
Quiz 3	10%	A-	89-91	C+	72-75
Quiz 4	10%	B+	86-88	C	70-71
Class Participation	60%	B	80-85	Below C	Course Fail
			Scores will be rounded up:		
			Example: 94.4 = 94		
			94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6403 – HEMODYNAMIC MONITORING

Summer Semester

Instructor: Paul Matlin
Email: pm13@utah.edu
Phone Number: 801-558-4624
Office Hours: By appointment

Required Materials

- Hemodynamic Monitoring Made Incredibly Visual, 2nd ed; Lippincott Willams & Wilkins, 2011. ISBN (10): 1-60831-340-9
- ECG Interpretation Made Incredible Easy!, 5th ed; Lippincott Williams & Wilkins, 2011.
- ISBN (10) 1-60831-289-5
- Hemodynamic Monitoring, Invasive and Noninvasive Clinical Application, 3rd ed; G.O.Darovic, Saunders 2002. ISBN (10): 0-7216-9293-1

Summary: Three (3) credits; Lecture, First year, Summer Semester

Prerequisites for this course are as follows: Admittance into the CVP program.

Course Description
This course will introduce the fundamentals of hemodynamic monitoring, as well as provide the biomedical framework necessary for understanding the equipment used in monitoring the cardiothoracic patient. Significant attention will be paid to establishing the connection between general biomedical principles of measurement and how they translate to patient safety inside the operating room. This course is 3 credit hours, and has no prerequisites (except you must be an accepted student into the CVP program.

Course Outcomes
By the end of this course, you will be able to:

- Compare and contrast patient monitoring systems used in extracorporeal circulation
- Describe the technical aspects of hemodynamic monitoring
- Discuss the relationship of EKG, blood pressure, blood gas and chemistry, and temperature to patient status
- Describe the basics of electrical theory, its corollaries to fluid dynamics, and its relevance to cardiovascular physiology and perfusion
- Recognize monitoring equipment and identify its function in and around a CV operating room;
- Describe the various biopotentials emitted by the body, and their source;
- Discuss how a physiological signal is transduced, processed, and displayed;
- Identify potential sources of error in signal processing and display
- Explain the concept of "faithful reproduction of an event"
- Recognize common EKG tracings, and interpret the rhythm as it relates to the patient and cardiopulmonary bypass

Teaching and Learning Methods
The course is separated into 4 modules, and each module will span 3 meetings. There will be a paper slide-deck for each module, which will also be accessible online. Associated readings, handouts, and links for digital articles/media will also be made accessible as we progress through the course.

Module 1 - Electricity/Fluid Dynamics
Module 2 – Biomedical Topics
Module 3 – Patient Monitoring

Module 4 – EKG and Imaging

It is the intent of the instructor to make the content reasonable, the assignments manageable, and the exams fair. This is a Master's level course for a high-stakes profession, therefore mastery of the course material is the only acceptable outcome. The content of this course is required by the AC-PE, and is fair game for the ABCP boards.

Assignments
Details about assignments will be available in class, handouts, and in Canvas.

Grading Policy (Evaluation Methods & Criteria)

Item	Description	Points
In Class Assignment	Field Trip to CV OR, in-class written assignment	50
HW 1	Handout – Electricity, Flow, Ohm's Law, Safety	25
QUIZ Module 1	Take home quiz, covering material from Module 1.	50
QUIZ Module 2	Take home quiz, covering material from Module 2.	50
EXAM 1	Covers Material from Modules 1 and 2. This will be a written exam, consisting of multiple choice, T/F, Matching, short answer, and essay questions.	100
HW 2	Handout - TBD	25
QUIZ Module 3	Take home quiz, covering material from Module 3.	50
QUIZ Module 4	Take home quiz, covering material from Module 4.	50
EXAM 2	Covers Material from Modules 1, 2, 3, and 4 – Emphasis on Module 3 and 4. This will be a written exam, consisting of multiple choice, T/F, Matching, short answer, and essay questions.	100
	Total points	500

Grades			
Grade	%	Grade	%
A	95-100	B-	76-79
A-	90-94	C+	72-75
B+	86-89	C	70-71
B	80-85	Below C	Course Fail
	Scores will be rounded up:		
	Example: 94.4 = 94		
	94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

Sample Course Schedule

WEEK	MODULE	TOPIC	AC/PE	SUGGESTED READING	ASSIGNMENTS
Week 1:		**Overview of Patient Monitoring**		-	-
Week 2:	**Module 1**	**Electrical Theory, Ohms Law**	**87 - 5.A.1.a, b**	**HANDOUT**	**HW 1 (Handout)**
Week 3:	**Module 1**	**Fluid Dynamics, Heat Transfer**	**5.B.1,2, 5.C**	**HANDOUT**	
Week 4:	**Module 1**	**Electrical Safety**		**HANDOUT**	
Week 5:	**Module 2**	**Bio-potentials, sensors**	**87- 5.A.2.a, b**	**HANDOUT**	
Week 6:	**Module 2**	**Digital signal processing**	**87, 5.4, 5. A.5**	**V: CH 2**	
Week 7:	**Module 2 Start Module 3**	**Biomedical Instrumentation & Pressures (Cardiac, Art, Ven, PA)**		**HM: CH 6, 7, 9, 10**	**EXAM 1 HW 2 (Handout)**
Week 8:	**NO CLASS**	**NO CLASS**	**NO CLASS**	**NO CLASS**	
Week 9:	**Module 3**	**CO, Temp, Coagulation**	**2.J.5**	**HM: CH 11**	
Week 10:	**Module 3 Start Module 4**	**ABG, Oximetry, BIS** **Medical Imaging**	**2.J.3,4**	**HM: CH 12** **HANDOUT**	
Week 11:	**Module 4**	**EKG** **EKG, Pacemakers**	**87, 5.1.**	**V: CH 2-9**	
Week 12: Finals Week	**FINAL: EXAM 2**				**EXAM 2**

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6501 - Interdisciplinary Healthcare 1

Summer Semester

Instructor: Kirk R. Bingham, MS, CCP
Email: Kirk.bingham@hsc.utah.edu
Phone Number: 435-512-2784
Office Hours: By Appointment

Required Materials
Materials for this course will be provided in class.

Summary: One (1) credit; Lecture, Grade, First Year, Summer Semester

Prerequisites for this course: Admittance into the CVP Program

Course Description
This course will help the student understand how to apply standard precautions, protect from blood borne pathogens, understand HIPAA law, know the proper personal protective equipment, understand medical ethics, and many other hospital-based procedures/protocols.

Course Outcomes
By the end of this course, you will be able to:

- Apply standard precautions
- Understand and protect from blood borne pathogens
- Understand HIPAA law
- Know the proper personal protective equipment (PPE)
- Understand safe handling of hazardous drugs
- Understand fire safety and emergency management
- Understand fraud, waste, and abuse in the healthcare environments
- Sexual harassment training
- Know the regulatory agencies for and the function of each agency
- Understand medical ethics
- Understand the importance of emergency preparedness in the healthcare setting

Teaching and Learning Methods
This class will be a mix between online and in class presentations. This class will also be taught be invited guest to present their specific role in cardiac surgery.

Assignments: Consist of turning in certificates each week that are provided through the CIS portal once a module has been completed.

EXAM Schedule

Item	Description	Percent
Exam 1	This examination covers Weeks 1-3	20%
Exam 2	This examination covers Weeks 5-6	20%
Exam 3	This examination covers Weeks 7-10	20%
Final Exam	NONE	

Assignments	This covers all assignments covered throughout the semester	40%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Exam 1	20%	Grade	%	Grade	%
Exam 2	20%	A	88-100	B-	73-76
Exam 3	20%	A-	84-87	C+	70-72
		B+	80-83	C	65-69
Final Exam	N/A	B	77-79	Below C	Course Fail
Assignments	40%		*Scores will be rounded up:*		
			Example: 94.4 = 94		
			94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 65% or higher. Final grade is reported as a whole number.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6620 – Applied Anatomy

Summer Semester

Course Director: Chaz Whitbeck, MMSc, PA-C
Chaz.whitbeck@utah.edu
Assistant Professor
Clinical Coordinator
University of Utah Physician Assistant Program

Instructor: David A. Morton PhD
David.morton@hsc.utah.edu
Professor, Vice-Chair of Medical and Dental Education
Department of Neurobiology and Anatomy

Anatomy Laboratory Director: Geoff Dorius
doriusg@gmail.com
Anatomy Laboratory Director
Department of Neurobiology
University of Utah School of Medicine

Phone Number: 801-581-3385
Office Hours: By appointment

TEACHING ASSISTANTS
You will have teaching assistants who will help you during anatomy labs and in tutoring sessions.

COURSE DESCRIPTION
This course provides clinical applications of human anatomy, and integrates anatomical terminology, organ systems, regional anatomy, and imaging anatomy. The flipped classroom approach provides a dynamic medical context for anatomy through pre-work, classroom lecture, and functional laboratory time.

COURSE GOAL(S)
Students will come to understand human anatomy in a clinical context using cadavers, images and illustrations.

INSTRUCTIONAL DESIGN
Each topic for gross anatomy is covered in a flipped-classroom approach. You are expected to complete "Student pre-work", which prepares you for the "Functional anatomy lab", which provides you further preparation for "large classroom" time.

STUDENT PRE-WORK: Go to the calendar on Canvas; for each anatomy session you will find links to YouTube video tutorials and an associated workbook.

- Download the **WORKBOOK**, which contains the learning objectives, links to the YouTube videos and an outline of the video tutorials in illustrations and text.
- View the **VIDEO TUTORIALS** (5-12 minutes in length) and complete the workbook by coloring and annotating the images and taking notes while watching the videos. Helpful hints from fellow students include the following:

- Print out the Workbook PDF and record notes via pencil crayons and pencil. Others use software programs to digitally record notes. It does not matter how you record your notes only that you find a system that works for you.
- "Pause" and/or "rewind" parts to ensure your notes are accurate and complete. Or, "play at double-speed" for material that is more familiar to you.
- For convenience, video tutorials reside on YouTube; subscribe to the channel, "The Noted Anatomist" to make it easier accessing the video tutorials.

o Complete the Workbook the day before lab (research shows that staggered studying helps in storing and retrieving newly learned information.

IN-CLASS WORK: Used to work through a series of problems aimed at synthesizing the learning objectives covered in the video tutorials and activities in functional anatomy labs. Documents containing the in-class activities will be posted to Canvas prior to class.
A common format adopted for classroom activities is the "**think-pair-share**" model.

- **THINK** - A problem is posed to the class and each student "thinks" through a solution on their own.
- **PAIR** - The class is then instructed to "pair" with a neighbor to discuss solutions and evidence to defend their answer.
- **SHARE** - After a designated period of time students are selected to "share" their discussion with the class.

This lecture and question format are repeated throughout the session.

ANATOMY LAB SESSIONS

1. There will be 6 anatomy lab sessions throughout the course. The main goal for each session is to review the anatomy covered in the previous week and in some cases preview the material for next week.
2. At the conclusion of each lab session, a group quiz consisting of 10 questions will be administered orally by the anatomy laboratory instructors.
3. Each laboratory session will have videos that teach the anatomy using bones and cadaver prosections. Please view these videos prior to lab.
4. Lab sessions will also review anatomy using radiographs.
5. Sharing of videos is not allowed anywhere at any time.

REVIEW SESSIONS

1. Review sessions with Geoff Dorius occur most Wednesdays from 3:00-5:00 PM.

COURSE REQUIREMENTS

1. Attendance, (including being on time), and participation is expected in accordance with the UPAP Didactic Policy on Attendance, Timeliness, and Participation. In the event of an absence, you are responsible for learning the material through required readings, watching pertinent videos, etc. Review the UPAP Didactic Policy on Student Assessment for information on excused and unexcused absences.
2. BE PREPARED for each scheduled learning activity -- lecture, lab, team-based -- by completing the assigned readings and/or preparation *in advance* of the activity.
3. Assignments must be submitted by their designated due dates. No credit will be awarded for late assignments.
4. Additional assignments, when required by the instructor

EDUCATIONAL RESOURCES

TEXTBOOK(S)

- THE NOTED ANATOMIST: (YouTube channel - links are included below under each topic)) (REQUIRED)
- *Gross Anatomy: The Big Picture*. (Morton, Foreman, Albertine) 1st edition. Lange, McGraw Hill, 2011 (available online through Access Medicine).

    - + Provides a textual overview of the anatomy covered in the YouTube video tutorials; concise text and beautiful images.
    - - There are few practice questions and no radiographic images.
    - The book is available for free through our library, however you must be on campus or login with the VPN web access as the book access is only for U of U faculty/students.
- To access the **Big Picture Book** (available online through Access Medicine)

- **ANATOMY ATLAS**

  Students have found it helpful to have an anatomy atlas to reference throughout the course (and PA program… and career). I recommend any one of the following:

  ***Atlas of Human Anatomy 5th Edition*. (Netter, F.H.) Saunders, Elsevier, 2011.**
    - The most famous anatomy atlas worldwide; beautiful illustrations; has some radiographs.
    - With so many labels and lead lines it can be difficult to see the image; not textual descriptions.

  Atlas of Anatomy 2nd Edition. (Gilroy, MacPherson, Ross) Thieme, 2012.
    - Beautiful illustrations; has some radiographic images and text boxes.
    - With so many labels and lead lines it can be difficult to see the image.
- Complete Anatomy - advanced 3D anatomy platform (3d4medical.com)
    - Incredible images that can be rotated around in all dimensions; labels can be turned on or off.
    - Subscription model so you will not have this forever.

ONLINE SYSTEMS

- **ExamSoft** - unless otherwise specified, used to administer exams and quizzes
- **Canvas** - used to distribute course content including learning exercises, copies of classroom presentations, assignments, skills exercises, etc. and to submit completed assignments for evaluation.

COURSE POLICIES

1. Only registered students may attend class. Family members and friends may not attend.
2. You are expected to maintain professional behavior in the classroom setting, according to the University's Student Code. The Code specifies proscribed conduct that involves items such as cheating on tests or quizzes, plagiarism, and/or collusion, as well as fraud, theft. Students should read and know they are responsible for the content of the Code.
3. Plagiarism is defined as the intentional or unintentional use by paraphrase or direct quotation of another author, including a peer, without full and clear acknowledgement or representation of the original author's work.

COURSE LEARNING OUTCOMES

- Identify and differentiate normal, normal variant, and abnormal features of human anatomy.
- Correctly locate and identify anatomical structures.
- Locate surface anatomy landmarks.
- Synthesize and apply the clinical implications related to human anatomy.
- Select and interpret appropriate imaging studies to visualize internal human anatomy.

COURSE LEARNING OBJECTIVES

Upon completion of the class and assignments, you should be able to:

1 Lecture	INTRODUCTION TO ANATOMY/CV SYSTEM **1. Introduction to anatomy** ● Demonstrate proficiency in describing locations of anatomical structures using proper anatomical terms: superior, inferior, cranial, caudal, ventral (anterior), dorsal (posterior), medial, lateral, proximal, distal, superficial (external), deep (internal), ipsilateral, contralateral ● Identify and describe the planes of sections used in anatomy and radiographic imaging: sagittal, coronal (frontal) and transverse (horizontal, x-section, axial section) ● Describe the anatomical position **2. Cardiovascular system** ● Identify the following and describe the functions: 4 chambers of the heart, 2 AV valves, 2 semilunar valves and great vessels (SVC, IVC, pulmonary arteries, pulmonary veins, aorta) ● Define pulmonary, systemic and coronary circulations ● Identify the right and left coronary arteries and their major branches (including distribution) and cardiac veins ● Describe the innervation of the heart (sympathetic and parasympathetic) and the conduction system of the heart ● Identify the primary systemic arteries and veins in the body (taught in class)	Video Tutorials: TheNotedAnatomi st on YouTube HEART (2 Videos) Suggested Reading: The Big Picture: Gross Anatomy (Ch 4 HEART. pp 52-61)

2	HISTOLOGY	

Lecture	**Histology** • Identify, classify, and describe diverse types of epithelia based upon layers (simple or stratified), cell shape (squamous, cuboidal, columnar), and specialization (cilia, keratin) • Identify, classify and describe the four common types of connective tissues (CT proper, cartilage, bone, blood) • Identify, classify and describe the 3 types of muscle tissue (skeletal, cardiac, smooth) • Identify, classify and describe nervous tissue including the parts of a neuron and functions of each glial cell.	Video Tutorials: TheNotedAnatomi st on YouTube Introduction to Histology

3 Lecture	RESPIRATORY SYSTEM • Describe the gross structure of the parietal pleura, pleural space and visceral pleura. • Contrast the innervation of the parietal pleura and visceral pleura. • Describe the gross structure, and function of the trachea, bronchial tree and alveolar sacs. • Detail the branching of the trachea into primary, secondary and tertiary segments and how they relate to lungs, lobes and bronchopulmonary segments. • Compare and contrast effect parasympathetic and sympathetic innervation of the respiratory system. • Describe the attachments, innervation and function of the diaphragm. • Detail the motor and sensory components of the phrenic nerve.	THORACIC Video Tutorial: TheNotedAnatomi st on YouTube ANTERIOR THORACIC WALL (5 Videos) Suggested Reading: The Big Picture: Gross Anatomy (Ch 3 LUNGS. pp 42- 49)

4 Lecture	SPINAL CORD and SPINAL NERVES • Identify the 3 meninges surrounding the spinal cord (dura, arachnoid and pia mater) and their associated spaces • Describe the topography, measurements and segmental organization of the spinal cord in longitudinal and x-section view • Using the spinal cord, spinal nerves and vertebral column as examples define vertebrosegmental discrepancy • Compare and contrast spinal cord gray matter (ventral, lateral and dorsal horns and cervical/lumbar enlargements) and white matter (topography, tract/funiculus) • Define the following: dorsal root, ventral root, spinal nerve trunk, dorsal ramus, and ventral ramus • Define dermatome; identify the key dermatomes in the body (C2, C5-T1, T4, T10, L1, L4-S2, S4) and best way to tests them • Define myotome; identify the key myotomes in the body (C5-T1, L2-S1) and the actions to best test them	Video Tutorials: TheNotedAnatomist on YouTube SPINAL CORD and NERVES (6 Videos) Suggested Reading: The Big Picture: Gross Anatomy (Ch 1 Back. pp 12-17)
5 Lecture	AUTONOMIC NERVOUS SYSTEM (ANS) **A. Overview of ANS** • Outline the 2-neuron pattern for the ANS • Describe how the embryological development of the ANS helps to explain pre and post-ganglionic locations and pathways **B. Sympathetics** • Describe the functions of sympathetic innervation to the abdominopelvic organs. • Identify the origin of pre-ganglionic and post-ganglionic sympathetic pathways **C. Parasympathetics** • Describe the functions of parasympathetic innervation to the abdominopelvic organs. • Identify the origin of pre-ganglionic and post-ganglionic parasympathetic pathways	Video Tutorials: TheNotedAnatomist on YouTube ANS (9 Videos) Suggested Reading: The Big Picture: Gross Anatomy (Ch 5 Superior and Posterior mediastina pp 66-67) Note: Unfortunately the textbook does not have a strong systemic overview of the ANS.

6 Lecture	VERTEBRAL COLUMN / BACK MUSCLES **Vertebral column.** • Compare and contrast regions, numbers and types (C, T, L, S) of vertebrae within the vertebral column as well as curvatures within each region • Identify the major landmarks on a typical vertebra: spinous process, transverse process, lamina, pedicle, intervertebral (neural) foramen, superior articular facet, inferior articular facet, facet joint, pars interarticularis, vertebral body, vertebral arch, intervertebral disc, vertebral foramen and vertebral canal **Superficial back muscles.** • Identify the following muscles including names, innervation, actions and topography: Trapezius, rhomboid major and minor, levator scapulae and latissimus dorsi. **Deep back muscles.** • Identify the following deep back muscles including names, innervation, actions and topography: Splenius muscles, Erector spinae muscles (iliocostalis, longissimus, spinalis) and Transversospinalis muscles (semispinalis, multifidus, rotatores)	Video Tutorials: TheNotedAnatomi st on YouTube BACK (4 Videos) Suggested Reading: The Big Picture: Gross Anatomy (Ch 1 Back. pp 4-11)

	EXAM 1 - Lectures 1-6	

7 Lecture	TRUNK WALL **Trunk Wall**. ● Describe the thoracic skeleton (true ribs, false ribs, floating ribs, costal cartilage, parts of the sternum) ● Describe the tissue layers of the thoracic wall including the primary muscles (actions and innervation) ● Describe the tissue layers of the abdominal wall including the primary muscles (actions and innervation) ● Identify the intercostal VAN and describe their topography. ● Identify intercostal veins (including their tributaries), intercostal arteries (including origin) and intercostal nerves (including motor and sensory distribution) ● Identify the 5 umbilical folds and describe what each contain ● Describe the inguinal canal, superficial and deep inguinal rings and their contents	Video Tutorials: TheNotedAnatomi st on YouTube Thoracic and Abdominal wall

8 Lecture	SKULL and BRAIN ● Identify the principal bones, sutures and openings of the skull ● Identify the meningeal layers and associated structures: ○ Dura mater. periosteal dura, meningeal dura, falx cerebri, tentorium cerebelli, falx cerebelli ○ Arachnoid mater. subarachnoid space, arachnoid villi, arteries and veins in the subarachnoid space ○ Pia mater. ● Identify the dural venous sinuses: superior and inferior sagittal sinuses, straight sinus, occipital sinus, transverse sinus, sigmoid sinus, confluence of sinuses, superior and inferior petrosal sinuses, IJV ● Identify the following parts of the brain: ○ Cerebellum, brain stem (midbrain, pons, medulla), diencephalon (thalamus, hypothalamus, pineal gland), corpus callosum pituitary gland ○ Ventricular system (lateral ventricles, 3rd ventricle, cerebral aqueduct, 4th ventricle, aperture) ○ CSF (choroid plexus, flow of CSF, arachnoid villi) Identify the primary arteries of the brain and their branches	Video tutorials: TheNotedAnatomist on YouTube HEAD and BRAIN Suggested reading: The Big Picture: Gross Anatomy (Chapters 15-16. pages 172-187)

9 Lecture	CRANIAL NERVES I-VI 1. Describe 3 modalities of sensory and 3 modalities of motor neurons within cranial nerves (CN's). ● Why are some skeletal muscles innervated by branchial motor nerves and other from somatic motor nerves in the head? Can a cranial nerve possess both branchial motor and somatic motor neurons? Why or why not? ● Why are there extra sensory neuron modalities in addition to "general sensory" for CN's when compared to spinal nerves? ● What does "transduction" mean and how is it related to sensory neurons? 2. Know the following for CN I to CN VI: ● The name, number and Roman numeral. ● CNS (forebrain or diencephalon) or Brainstem (midbrain, pons or medulla) origin ● Principle foramina traversed to exit the skull. ● Sensory and/or motor modalities and primary function(s) ● Clinical testing and findings	Video Tutorials: TheNotedAnatom ist on YouTube CRANIAL NERVES (10 Videos) Suggested reading: The Big Picture: Gross Anatomy (Ch 17 CRANIAL NERVES. pp 190-207)

10 Lecture	CRANIAL NERVES VII-XII 1. Know the following for CN VII to CN XII: ● The name, number and Roman numeral. ● Brainstem origin (midbrain, pons or medulla) ● Principle foramina traversed to exit the skull. ● Sensory and/or motor modalities and primary function(s) ● Clinical testing and findings 2. Describe the parasympathetic and sympathetic innervation of the head. ● Where do all pre-ganglionic sympathetic neurons originate? What is their course to head tissues? ● What are the principal clinical effector tissues for sympathetic innervation of the head? What neurotransmitter is used at the post-ganglionic sympathetic synapse? ● What cranial nerves house visceral motor (parasympathetic) neurons? What peripheral ganglia do they synapse in? What neurotransmitter is used at the post-ganglionic parasympathetic synapse?	Video Tutorials: TheNotedAnatom ist on YouTube CRANIAL NERVES (10 Videos) Suggested reading: The Big Picture: Gross Anatomy (Ch 17 CRANIAL NERVES. pp 190-195)

11 Lecture	UPPER LIMB • Describe the bones of the UL including primary landmarks (clavicle, scapula, humerus, radius, ulna, hand) • Describe the AC, glenohumeral, elbow (hinge and pivot), wrist, MCP, PIP and DIP joints • Identify the following muscles and describe their primary actions and innervation (you do not need to know attachments): ○ Scapulothoracic muscles. Trapezius, levator scapulae, rhomboids, serratus anterior, pectoralis minor ○ Glenohumeral muscles. Pectoralis major, latissimus dorsi, deltoid, rotator cuff (supraspinatus, infraspinatus, teres minor, subscapularis) ○ Elbow muscles. Biceps brachii, brachialis, triceps brachii, brachioradialis ○ Wrist muscles. Forearm extensors. Lateral epicondyle and flexors. Medial epicondyle ○ Hand muscles. PADs and DABs • Identify the following components of the brachial plexus: ○ Roots, Trunks, Divisions, Cords, Branches ○ Dorsal scapular, suprascapular, long thoracic, lateral pectoral, medial pectoral, upper and lower subscapular, thoracodorsal, medial cutaneous nerve of arm and forearm, axillary, radial, musculocutaneous, median, ulnar (know if a branch is motor only, sensory only or both) • Identify the primary arteries (subclavian, axillary, brachial, radial, ulnar) of the upper limb • Identify the primary superficial veins (cephalic, median cubital, basilic) and deep veins (radial, ulnar, brachial, subclavian) of the upper limb	Video tutorials: TheNotedAnatom ist on YouTube UPPER LIMB (12 Videos) Suggested reading: The Big Picture: Gross Anatomy (Ch 30-31-32-33. pp 330-335, 344-347, 352-337, 368-373)

12 Lecture	LOWER LIMB ● Describe the bones of the LL including primary landmarks (Os coxa, femur, patella, tibia, fibula, foot) ● Describe the following joints including structure, supporting ligaments and movements: SI, hip, knee, tibiotalar, subtalar ● Identify the compartment, associated muscles, action(s), innervation and arterial supply for the following : ○ Gluteal muscles. Gluteus maximus, gluteus medius, gluteus minimus, TFL ○ Hip flexors. Iliopsoas muscle ○ Thigh: Anterior, medial and posterior compartments ○ Leg: Anterior, lateral and posterior compartments ● Describe the motor distribution of the following nerves: ○ Lumbar plexus. Lateral femoral cutaneous, femoral, obturator ○ Sacral plexus. Tibial, common peroneal (superficial peroneal, deep peroneal) ● Identify the primary arteries (femoral, popliteal, anterior tibial, posterior tibial) ● Identify the primary superficial veins (greater saphenous, lesser saphenous) and deep veins (anterior tibial, posterior tibial, popliteal, femoral)	

	EXAM 2	

13 Lecture	DIGESTIVE SYSTEM ● Identify the primary organs of the digestive system including its parts and major functions ● Identify each of the following accessory digestive organs and describe their location and major function: Liver, GB, Pancreas and Spleen ● Identify the organs that comprise the foregut, midgut and hindgut and describe how this knowledge helps you to understand the arterial supply, venous drainage, lymphatic drainage and innervation of the digestive system. ● Hepatic portal system ● What is a portocaval anastomosis? ● Describe how esophageal varices, hemorrhoids and caput medusa form based upon your understanding of portocaval anastomoses	Video Tutorials: TheNotedAnatom ist on YouTube Digestive system Suggested reading: The Big Picture: Gross Anatomy Chapters on Foregut, Midgut and Hindgut

14 Lecture	URINARY SYSTEM **Kidney** ● Identify and describe the function and topography of the kidneys ● Describe the renal cortex, renal medulla, major and minor calyces, renal pelvis ● Trace the sympathetic innervation of the kidneys **Ureter, Bladder and Urethra** ● Ureter. Identify and describe the function and topography of the ureter ● Bladder. Identify and describe the function and topography of the bladder ● Urethra. Identify and describe the function and topography of the male/female urethra **The Nephron** ● Identify the parts of the nephron (renal corpuscle and renal tubules) ● Describe the key processes of the nephron (filtration, reabsorption, secretion and excretion) ● Define fluids associated with the nephron (plasma, filtrate, interstitial fluid and urine) ● Identify the features of renal corpuscle and describe the primary functions: ○ Bowman's capsule. Parietal and Visceral cells (podocytes with filtration slits), Bowman's (urinary) space, Vascular and urinary poles ○ Glomerulus. AGA, Glomerular capillary, EGA and Mesangial cells ● Identify the parts of the renal tubules and describe their primary functions: ○ Proximal convoluted tubule (PCT), Loop of Henle (DTL, ATL, TAL), Distal convoluted tubule (DCT), Collecting ducts ● Identify the following parts of the juxtaglomerular apparatus (JGA) and describe their primary role in regulating filtrate formation: ○ Juxtaglomerular cells, macula densa cells, extra-glomerular mesangial cells ● Describe the two different types of nephrons (Cortical nephron and juxtaglomerular nephron)	Video Tutorials: TheNotedAnatom ist on YouTube Urinary system

15 Lecture	REPRODUCTIVE SYSTEM Male reproductive system • Identify the organs of the male reproductive system, describe their topography and list their major functions: penis, testes, epididymis, ductus deferens, ejaculatory ducts, seminal vesicles, prostate gland, bulbourethral glands • Identify the male perineal muscles (ischiocavernosus, bulbospongiosus) including their topography, function and innervation • Describe the fascial planes of the penis (superficial penile fascia, deep penile fascia, tunica albuginea) • Describe the vascular supply of the male perineum (internal pudendal a., deep penile a., dorsal penile a., dorsal penile v.) • Describe the motor and sensory distribution of the pudendal nerve including its spinal cord origin Female reproductive system • Identify the pelvic organs of the female reproductive system, describe their topography and list their major functions: ovaries, uterine tubes, uterus, vagina • Define the borders of the perineum and subdivisions (UG triangle, ischioanal triangle) • Identify the structures of female perineum and describe their topography : mons pubis, labia majora, labia minora, vestibule, greater vestibular glands • Identify the clitoris and describe its sub-divisions (glans, corpora cavernosa, crus, bulb of the vestibule) • Define erectile tissue • Identify the female perineal muscles (ischiocavernosus, bulbospongiosus, superficial transverse perineal) including their topography, function and innervation • Identify the perineal body and describe its anatomical significance • Identify the internal pudendal a. and describe its distribution • Describe the motor and sensory distribution of the pudendal nerve including its spinal cord origin	Video Tutorials: TheNotedAnatom ist on YouTube Female reproductive system Male reproductive system

	EXAM 3 - Comprehensive

EVALUATION SCHEME:

Evaluation Method	% of Grade		GRADES			
Quizzes	10%		Grade	%	Grade	%
Exam 1	25%		A	95-100	C-	70-72
Exam 2	25%		A-	90-94	D+	67-69
Final Exam	40%		B+	86-89	D	64-66
			B	82-85	D-	60-63
			B-	79-81	E	Below 60
			C+	76-78	*Scores will be rounded up: Example: 94.4 = 94 or 94.5=95*	
			C	73-75		

UNIVERSITY of UTAH CENTER for DISABILITY SERVICES (CDS)
The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 801-581-5020. CDS will work with you and the instructor to plan for accommodations.

All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

ADDRESSING SEXUAL MISCONDUCT
Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066.

For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677 (COPS).

PREFERRED NAME
Class rosters are provided to the instructor with the student's legal name as well as "Preferred first

name" (if previously entered by you in the Student Profile section of your CIS account). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class, on papers, exams, group projects, etc. Please advise me of any name or pronoun changes (and update CIS) so I can help create a learning environment in which you, your name, and your pronoun will be respected. If you need assistance getting your preferred name on your UID card, please visit the LGBT Resource Center Room 409 in the Olpin Union Building, or email bpeacock@sa.utah.edu to schedule a time to drop by. The LGBT Resource Center hours are M-F 8am-5pm, and 8am-6pm on Tuesdays.
All written information in this course can be made available in alternative format with prior notification to the Center for Disability Services.

Every attempt is made to provide a complete syllabus that provides an accurate overview of the course. However, circumstances and events may make it necessary for the instructor to modify the Syllabus during the semester. This may depend, in part, on the progress, needs and experiences of the students. Please continually check the CVP 6620 Anatomy Syllabus Canvas page for class schedule changes.

CVP 6630 - Medical Physiology I

Summer Semester

Instructor: Ben Lewis
Email: ben.lewis@hsc.utah.edu
Phone Number: 801-916-1131
Office Hours: By appointment

Required Materials

- Hall, John E. *Guyton and Hall Textbook of Medical Physiology*. 13th ed., W B Saunders, 2015.
- *Ganong's Review of Medical Physiology, 26e* Eds. Kim E. Barrett, et al. McGraw Hill, 2019.
- *Cardiovascular Physiology, 9e* Eds. David E. Mohrman, and Lois Jane Heller. McGraw Hill, 2018
- Gravlee, Glenn P., et al. *Cardiopulmonary Bypass and Mechanical Support : Principles and Practice*, Wolters Kluwer, 2015.
- The Manual of Clinical Perfusion, Second Edition Updated; Bryan Lich, D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5)

Course Description

This course covers physiology of various organ systems including cardiac, pulmonary, renal, endocrine, gastrointestinal, vasculature of the body and its blood components. In addition, the effects of cardiopulmonary bypass on these organ systems will also be covered.

Summary: 1.5 credits; Graded; Lecture, First year, Summer Semester

Course Outcomes

By the end of this course, you will be able to:

- Understand the heart as a pump, including heart physiology, determinants of blood flow, cardiac cycle, action potentials, determinants of blood pressure, pressure and volume loops, hemodynamic principles and the circulatory system.
- Describe renal physiology including basic functions of the kidney, management of various ions, proteins and sugars by kidneys; endocrine regulation of blood pressure.
- Define role of pulmonary system with ventilation, oxygenation, and gas exchange; basic functions of the lungs, and interactions with the cardiovascular system.
- Discuss the components of the blood including cellular elements, plasma proteins, transfusion products and blood banking practices.
- Describe the process of hemostasis and the coagulation cascade, coagulation disorders and treatments.
- How cardiopulmonary bypass effects various physiological systems including cardiac, pulmonary, renal, cerebral blood flow, circulatory hemodynamics, and blood components.

Teaching and Learning Methods

This course will be taught over the summer semester. Lectures will run for approximately 1.5 hours per week. Each lecture for this course will be done in-person using in class slides. Any information presented in class will be a compilation of this information and not be all inclusive. Please use the information presented in class for all exams, quizzes, and discussions and note that this information may be slightly different than what is presented to you by individual perfusionists in the field.

Quizzes will also be incorporated into this course and will be given on paper (unless Covid restrictions occur; quizzes will then be given via canvas/examsoft) during class periods. These quizzes will count towards your final/overall grade. Quizzes will consist of 5-10 questions and will be given before class (in-between exam weeks with a couple of exceptions when they will not be given) (See schedule below). Quiz questions may also be found on your exams, but be sure to understand the concepts behind the questions and not just memorize the question itself (as they might change slightly from a given quiz and a subsequent exam).

Exams will make up a large portion of your overall grade and will be issued via paper or examsoft at various times during the semester. These times and subjects covering the exams will be outlined below. All exams will be administered in Board format (unless otherwise noted) and will have one question and four possible answers. Questions may require you to critically think through what you've learned and/or to do math problems to come up with the correct answer(s). Extra credit questions on exams may be administered at the discretion of the professor.

University Policies

1. ***The Americans with Disabilities Act***. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.
2. ***Addressing Sexual Misconduct***. Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).
3. ***Wellness:*** Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc. can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.
4. ***Veterans Center:*** If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F, 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/. Please also let me know if you need any additional support in this class for any reason.
5. ***LGBT Resource Center:*** The LGBT Resource Center offers Gender and Sexuality (formerly Safe Zone) trainings for faculty, staff and instructors at the U. You can also schedule one for your office or Department. The aim of the training is to promote inclusive teaching and foster a respectful, social environment for lesbian, gay, bisexual, transgender, queer and questioning individuals in our classrooms. For more information about trainings/workshops, panels and suggesting on how to ask about personal pronouns and preferred student names please to http://lgbt.utah.edu/lgbtrc-programs/trainings.php.

Attendance & Punctuality:

1. Attendance, (including being on time), and participation is expected in accordance with the CVP Didactic Policy on Attendance, Timeliness, and Participation. In the event of an absence, you are responsible for learning the material through require readings, watching pertinent videos, etc. Review of the CVP Didactic Policy on Student Assessment for information on excused and unexcused absences.
2. BE PREPARED for each scheduled learning activity – lecture, lab, team-based – by completing the assigned readings and/or preparation in advance of the activity.
3. Assignments must be submitted by their designated due dates. No credit will be awarded for late assignments.
4. You are expected to maintain professional behavior in the classroom setting, according to the University's Student Code. The Code specifies prescribed conduct that involves items such as cheating on tests or quizzes, plagiarism, and/or collusion, as well as fraud, and theft. Students should read and know they are responsible for the content of the Code.
5. Academic dishonesty/misconduct includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information, as defined in Policy 6-400: Code of Student Rights and Responsibilities ("Student Code").
6. Plagiarism is not allowed! Plagiarism is defined as the intentional or un-intentional use by paraphrase or direct quotation of another author, including a peer, without full and clear acknowledgment or representation of the original authors work.
7. Additional assignments, when required by the instructor may be added throughout the semester. All additional assignments will be made known to you and scheduled dates will be established for you to turn them in.

Food & Drink: Food and drink is allowed in class as long as it does not distract from the teaching of the professor or the learning of the other students.

Electronic Devices in Class: Electronic devices are only allowed IF they are being used for learning in class. Use of electronics for social media, texting, making phone calls, etc. will result in the electronic device being taken away. If use of electronic devices occurs on a regular basis, you will be subject to class discipline.

Canvas: Used to distribute course content including learning exercises, copies of classroom presentations, assignments, skills exercise, etc. and to possibly submit completed assignments for evaluation.

EXAM Schedule

Item	Description	Percent
Exam 1	This examination covers Lectures 1-5	30%
Exam 2	This examination covers Lectures 6-8	30%
Final Exam	This examination covers all Lectures 9-12 (60%) and comprehensive (40%)	30%
Quizzes/Assignments	This covers all quizzes and assignments covered throughout the semester	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Exam 1	30%	Grade	%	Grade	%
Exam 2	30%	A	95-100	B-	76-79
Final Exam (Comprehensive)	30%	A-	90-94	C+	72-75
Quizzes/Assignments	10%	B+	86-89	C	70-71
		B	80-85	Below C	Course Fail
			Scores will be rounded up:		
			Example: 94.4 = 94		
			94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

Course Schedule

Week	Topic
1	Syllabus, Class Expectations, Heart Anatomy
2	Heart Anatomy, Physiology
3	Heart Physiology Cont.
4	Blood Pressure, Circulation
5	Cardiac Cycle, Wigger's Diagram
6	***Exam 1***, Cardiac Action Potential, EKGs, Arrythmias
7	Nervous System Effects on Heart & Circulation
8	CPB Effects on Heart
9	***Exam 2***, Lung Anatomy
10	Pulmonary Physiology, Circulation
11	Gas Exchange, Acid-Base Balance

12	CPB Effects on Lungs	
13	**Final Exam**	

Note: This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas under Announcements.

Year One
Fall Semester

CVP 6002 - Perfusion Science 2

Fall Semester

Instructor: Jessica Russ
Email: jessica.russ@hsc.utah.edu
Phone Number: 928-368-7497
Office Hours: By Appointment

Required Materials

- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; Lippincott Williams & Wilkins; 2008. (ISBN: 978-0-7817-6815-3)
- A Practical Approach to Cardiac Anesthesia, 5th Edition; Frederick A. Hensley, Jr., Donald E. Martin, Glenn P. Gravlee; Lippincott Williams & Wilkins; 2012. (ISBN: 978-1451137446)
- Manual of Perioperative Care in Adult Cardiac Surgery, 5th Edition; Robert M. Bojar; Blackwell Publishing; 2011. (ISBN: 978-1444331431)
- The Manual of Clinical Perfusion, Second Edition Updated; Bryan Lich, D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5)
- Cardiopulmonary Bypass; S. Ghosh, F. Falter, D.J. Cook; Cambridge University Press; 2009. (ISBN: 978-0521721998)

Summary: Three (3) credits; Lecture, First year, Fall Semester

Prerequisites for this course are as follows:
CVP 6001 Perfusion Science 1
CVP 6010 Perfusion Lab1
CVP 6071 Perfusion Pharmacology
CVP 6100 Introduction to Hospital Environments
CVP 6403 Hemodynamic Monitoring
CVP 6501 Interdisciplinary Healthcare 1
CVP 6620 Applied Anatomy
CVP 6630 Medical Physiology 1

Course Description
This course will be an extension of the materials taught in Perfusion Science 1. We will look at the function of the human body as well as how to maintain normal parameters while on CPB. This course will cover anticoagulation as well as its reversal, blood interactions, and hypothermia on CPB. AC-PE pages, 43, 44-45, 54-55, 57-59, 60, 72, 86

Course Outcomes

1. Describe the basis of each calculation; and
2. Apply the formulas to clinical scenarios.
3. Describe the pathways that contribute to inflammation following blood contact with artificial materials; and
4. Identify the pathways that can be modulated to reduce induction of these immune pathways.

5. Describe when reperfusion injury may occur;
6. Describe the immunological basis of reperfusion injury; and
7. Identify the pharmacological agents that may reduce reperfusion injury.
8. Describe and discuss the actions necessary prior to surgery;
9. Describe a method of initiating CPB;
10. Describe the parameters monitored during maintenance of CPB; and
11. Describe a method for weaning from CPB.
12. Describe cannulation as it relates to the CPB patient; and
13. Describe the methods of physiologic monitoring for the CPB patient.
14. Describe the physiology of myocardial preservation;
15. Discuss the determinants of appropriate myocardial preservation techniques; and
16. Discuss the technical details related to cardioplegia administration.
17. Describe the desired characteristics of cardioplegia solutions;
18. Discuss the role of each component used to achieve this ideal solution; and
19. Recognize optional pharmacological agents and explain their purpose.
20. Describe the physiology of systemic hypothermia; and
21. Discuss application of systemic hypothermia to specific surgical procedures.
22. Discuss the potential for a catastrophe; and
23. Describe the proper responses and actions to a catastrophe.
24. List methods of testing the coagulation system; and
25. Relate clinical history to coagulation status.

Teaching and Learning Methods

Lectures will run for approximately 3 hours per week and provide roughly 9 hours of at home study materials per week. Lectures taught will cover all required materials listed by the AC-PE. Each lecture for this course will be done in-person using in class slides with possible displays of equipment and disposables for visual reference. Quizzes will also be incorporated into this course and will be given on paper during class periods. These quizzes will count towards your final/overall grade. Exams will make up a large portion of your overall grade and will be issued in testing centers at various times during the semester. These times and subjects covering the exams will be outlined below.

EXAM Schedule

Item	Description	Percent
Exam 1	This examination covers Lectures 1-4	18%
Exam 2	This examination covers Lectures 5-8	18%
Exam 3	This examination covers Lectures 9-12	18%
Exam 4	This examination covers Lectures 13-16	18%
Final Exam	This examination covers all Lectures 1-16	18%
Quizzes/Assignments	This covers all quizzes and assignments covered throughout the semester	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Exam 1	18%	Grade	%	Grade	%
Exam 2	18%	A	95-100	B-	76-79
Exam 3	18%	A-	90-94	C+	72-75
Exam 4	18%	B+	86-89	C	70-71
Final Exam (Comprehensive)	18%	B	80-85	Below C	Course Fail
Quizzes/Assignments	10%		*Scores will be rounded up.* *Example: 94.4 = 94*		

			94.5 = 95

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6020 - Perfusion Laboratory 2

Fall Semester

Instructor: Samuel Harman
Email: sam.harman@hsc.utah.edu
Phone Number: 801-897-6709
Office Hours: By Appointment

Required Materials
Materials for this course will provided in class.

Prerequisites for this course are as follows:
CVP 6001 Perfusion Science 1
CVP 6010 Perfusion Lab1
CVP 6071 Perfusion Pharmacology
CVP 6100 Introduction to Hospital Environments
CVP 6403 Hemodynamic Monitoring
CVP 6501 Interdisciplinary Healthcare 1
CVP 6620 Applied Anatomy
CVP 6630 Medical Physiology 1

Course Description
This course is the second in a three-part laboratory course. This course will continue hands-on experiences with setting up and priming the extracorporeal circuit, but will also introduce the conduct of cardiopulmonary bypass. This will be done through weekly simulations. Students will start to learn how to manage patients on cardiopulmonary bypass. Students will learn how to initiate and terminate cardiopulmonary bypass, manage the patient's anticoagulation status, patient management while on cardiopulmonary bypass, setup and prime a cardioplegia system, manage and maintain a cardioplegia system and effective communication while in the operating room.

Course Outcomes
By the end of this course, you will be able to:

- Setup and prime an extracorporeal circuit
- Setup and prime a cardioplegia circuit
- Setting up a perfusion management plan
- Reading a patient's chart
- Initiation and termination of cardiopulmonary bypass
- Calculations related to perfusion management
- Management of patients while on cardiopulmonary bypass
- Delivery and management of cardioplegia
- Management of patient's hemodynamics while on cardiopulmonary bypass
- Manage the patients cardiac and respiratory status while on cardiopulmonary bypass
- Manage vents and pump suckers while on cardiopulmonary bypass
- Manage the blood temperature while on cardiopulmonary bypass
- Manage vacuum assisted venous drainage
- Manage the patient's blood gases while on cardiopulmonary bypass
- Effectively communicate with all members the cardiac team
- Patient charting
- Manage other equipment related to cardiopulmonary bypass

Teaching and Learning Methods
Lectures will run for approximately 2 hours per week. It is recommended that students spend 6 hours of personal time in the lab and studying materials that will be provided in this class. Material taught will cover all required topics listed by the AC-PE. All lab lectures will be done in person and will be hands on instruction. Pump setup and pump simulation will count toward the student's final grade. Each student will have time on their own to setup and prime the extracorporeal circuit and will be expected to use personal time to improve on lab skills.

Extremely Important

Students will be required to successfully complete lab each week. If the student is unable to do this, the student has one opportunity to successfully makeup the lab. If the student does not successfully complete the lab each week, the student will fail this course and be dismissed from the program.

Assignments
Students will continue to setup and prime the extracorporeal circuit. Simulation will be introduced during this course. Faculty will give a live demonstration of how the simulator works and the expectations of the students. Starting week 5, students will begin to use the simulator. The simulator will create the operating room environment and give the student the opportunity to manage cardiopulmonary bypass. Each student will be given time to debrief and provided feedback after each simulation.

Grading Policy (Evaluation Methods & Criteria)
All pump setups and simulations will count toward the student's final grade. Setups will count for 30% of the final. Simulation will count for 70% of the final. This course will be a **Pass/Fail** course. Students must earn a **70%** or greater to pass this course.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6200 - Research Methodologies

Fall Semester

Instructor: Douglas Smego, MD
Email: douglas.smego@hsc.utah.edu
Phone Number: 773-329-5452
Office Hours: By Appointment

Required Materials

- Patten, Mildred L., and Michelle Newhart. Understanding Research Methods an Overview of the Essentials. 10th ed., Routledge, 2018.
- Users Guides to the Medical Literature, Essentials of Evidence-Based Clinical Practice, 2nd Edition; Gordon Guyatt, Drummond Rennie, Maureen O. Meade, Deborah J. Cook; McGraw Hill Medical; 2008. (ISBN: 978-0-07-159040-2)
- Petrie, Aviva, and Caroline Sabin. *Medical Statistics at a Glance*. Oxford: Blackwell Science, 2000. (ISBN: 978-1405180511)

Summary: One (1) credit; Lecture, First year, Fall Semester

Prerequisites for this course are as follows:
CVP 6001 Perfusion Science 1
CVP 6010 Perfusion Lab 1
CVP 6071 Perfusion Pharmacology
CVP 6100 Introduction to Hospital Environments
CVP 6403 Hemodynamic Monitoring
CVP 6501 Interdisciplinary Healthcare 1
CVP 6620 Applied Anatomy
CVP 6630 Medical Physiology 1

Course Description

This course introduces the foundational knowledge base for research methodology in the biological sciences. Students will be taught how to understand research methodologies by understanding hypothesis' for biological research, analyzing and designing biological research, reading/understanding research papers, and presenting the results of biological research. This course will also support your foundational knowledge in research methods to help you develop, write, and present your masters project. Students will also be assigned weekly presentation topics in which they will research and present particular perfusion-based topics throughout the Fall semester.

Course Outcomes

By the end of this course, you will be able to:

- Describe hypothesis for biological research
- Describe experimental design and data analysis for biological research
- Reading and understanding biological research
- Understand various methods of presenting the results of biological research
- Master the ability to present research

Teaching and Learning Methods
Lectures will run for approximately 1-2 hours per week. Each lecture for this course will be done in-person using in class slides and reading assignments. Presentation assignments will also be incorporated into this course and students will be required to present in front of the class multiple times throughout the semester. These assignments/presentations will count towards your final/overall grade. Exams/quizzes will not be given for this class. The times and subjects covering the assignments/presentations will be outlined below.

Assignments

Presentation Assignments

Each week, starting week 5, students will be assigned topics to present in front of class. Each week 2 students will present for 20-30 minutes each discussing/debating the topics assigned to them. The job of the presenters is to compare and contrast the topics assigned them from the list below:

1. Vacuum assisted venous drainage versus gravity drainage
2. Pulsatile flow versus continuous flow
3. Centrifugal pump versus roller pump
4. Internal mammary artery versus saphenous vein conduit
5. HMS versus ACT
6. Antegrade versus retrograde cardioplegia
7. Blood cardioplegia versus crystalloid cardioplegia
8. CO2 flushing versus non-CO2 flushing
9. Beating heart bypass surgery versus arrested heart bypass surgery
10. Cerebral saturation monitoring versus not monitoring
11. TAVR versus open sternotomy AVR
12. Platelet gel versus no platelet gel

The two presenters will each be given a side to debate and will need to create a PowerPoint presentation explaining why they believe their side is the best. At the end of the presentations, classmates and faculty will discuss and debate why they feel one side is better than the other. Each presenter will be graded on accuracy of information presented, PowerPoint presentation set up, presentation preparedness (clear, concise, to the point, etc.), professional dress, and knowledge of presented topic. Those not presenting will be graded upon questions asked following presenters' presentations and participation during/after the presentations.

Presentation Schedule

Item	Description	Percent
Presentation 1	1st Presentation	10%
Presentation 2	2nd Presentation	20%
Presentation 3	3rd Presentation	20%
Presentation 4	4th Presentation	20%
Presentation 5	5th Presentation	20%
Attendance/Assignments	Participation in Classroom Presentations	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Presentation 1	10%	Grade	%	Grade	%
Presentation 2	20%	A	95-100	B-	76-79
Presentation 3	20%	A-	90-94	C+	72-75
Presentation 4	20%	B+	86-89	C	70-71

Presentation 5	20%	B	80-85	Below C	Course Fail
Attendance/Assignments	10%		*Scores will be rounded up:* *Example: 94.4 = 94* *94.5 = 95*		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6201 - Masters Project 1

Fall Semester

Instructor: Douglas Smego, MD
Email: douglas.smego@hsc.utah.edu
Phone Number: 773-329-5452
Office Hours: By Appointment

Required Materials and Student Resources

- Users Guides to the Medical Literature, Essentials of Evidence-Based Clinical Practice. 2nd Edition; Gordon Guyatt, Drummond Rennie, Maureen O. Meade, Deborah J. Cook; McGraw Hill Medical; 2008. (ISBN: 978-0-07-159040-2)
    - Library link: https://jamaevidence-mhmedical-com.ezproxy.lib.utah.edu/book.aspx?bookID=847&TopLevelContentDisplayName=Books
- Gibaldi, Joseph, and Modern Language Association of America. MLA Handbook for Writers of Research Papers. 7th ed., 2009.
    - https://catalog.hathitrust.org/Record/005962415?
- University of Utah Annotated Bibliography Guide: Home
    - https://campusguides.lib.utah.edu/c.php?g=160354&p=1051883
- EBSCOhost Research Database
    - https://www.ebsco.com/products/research-databases
- PubMed Link: http://www.ncbi.nlm.nih.gov/pubmed/?otool=uutahlib
- UofU Textbook Lookup: https://ebookcentral-proquest-com.ezproxy.lib.utah.edu/lib/utah/search.action
- University of Utah Research Links
    - https://lib.utah.edu/research/
    - https://library.med.utah.edu
    - https://library.med.utah.edu/or/rise.php
- University of Utah Research Guides
    - https://campusguides.lib.utah.edu/index.php?b=s
        - Medicine tab will provide you the best overall guides for your projects
- University of Utah Knowledge Commons
    - https://lib.utah.edu/services/research-consultation.php
    - This is a great resource for requesting research consultations through the Marriott Library. They have multiple "Subject Specialists" who can help you with your individual projects.
- CITI training: https://www.citiprogram.org/index.cfm?pageID=154&icat=0&clear=1
    - If doing direct patient research and you need IRB Approvals

Summary: One (1) credit; Lecture, first year, Fall Semester

Prerequisites for this course are as follows:
CVP 6001 Perfusion Science 1
CVP 6010 Perfusion Lab 1
CVP 6071 Perfusion Pharmacology
CVP 6100 Introduction to Hospital Environments
CVP 6403 Hemodynamic Monitoring
CVP 6501 Interdisciplinary Healthcare 1
CVP 6620 Applied Anatomy
CVP 6630 Medical Physiology 1

Course Description

This course covers the beginning stages of your master's project (part 1 of 2). This is the first of two semesters covering a large masters project in which you'll be required to do extensive research and

then write a paper(s) to publish. Topics of research interest will be discussed and students will be allowed to choose a project they would like to do. This will include: research, case report(s), review articles, or technique research/article. The sole objective of this course is to prepare the students to learn the research method and writing publishable papers for the perfusion and medical

communities. At the end of your master's courses, you will be **required** to present your findings at the University of Utah Rumel (research) conference. This conference is held by the University of Utah School of Medicine and your research will be among multiple medical disciplines projects. The presentation will be 8-10 minutes and will be followed by panel questions for you to defend your research. If timing does not permit to present at this conference an alternate time and location will be scheduled for you to present your findings to the Supervisory Committee and the public.

Course Outcomes
By the end of this course, you will:

- Determine a masters project (Research based, Case Report(s), Review Article(s), or Technique(s))
- Determine which resources you will need to complete your project
- Determine which individuals you will need to include to complete your project
- Write a timeline to complete your masters project
- Begin doing research for your project
- Write an annotated bibliography following standard MLA format for all citations
- Begin writing your paper

Teaching and Learning Methods
Lectures/discussions will run for approximately 60 minutes per week and provide the knowledge and materials needed to complete your individual research projects. Most weekly lectures will be time for the instructor and students to cover what help they need in completing their masters project and to review the progress of each student's project. No quizzes or exams will be given in this course. Assignments MAY be given week-to-week to ensure that students keep on track with completing the research needed for their particular self-assigned projects.

Assignment(s)

CITI Training (IF doing direct patient research and need IRB approvals):
This course takes roughly 4-6 hours and will cover important topics in the ethics of research. This course is required by the University for you to do research especially if you are going to use patient data for your projects. This must be completed by week 4. This will count as 5% of your total grade if it needs to be completed. Otherwise, this 5% will be part of your overall weekly research updates.
CITI training: https://www.citiprogram.org/index.cfm?pageID=154&icat=0&clear=1

Register under the University of Utah and create an account. Enter that you are a Graduate Researcher.

The two courses you are required to take are:
1. Group 1. Biomedical Research Investigators and Key Personnel
2. Good Clinical Practice Course (US FDA Focus)

Projects:
Each of you will have three weeks to pick a project(s) to research and write a paper(s) on. The topic of research must be chosen and submitted for approval by week 3 of the semester. Your topic will be reviewed and discussed with you by the class instructor and/or research mentor.

Timeline:
Once a project(s) has been chosen and approved by the class instructor/research mentors, you will be required to write up the best timeline you can for completion of your research and paper. This may be a difficult task to determine for research-based projects but a rough timeline of how you plan to complete your project will be required. Failure to provide a timeline by the required date will result in a 5% deduction from your final grade.

Annotated bibliography:
For each of your projects an annotated bibliography will be required to be turned in by the end of the semester (week before finals). This bibliography must be written in MLA format and must be in alphabetical order. If you choose to do shorter case report projects and written papers, you must write a separate annotated bibliography for each paper. This annotated bibliography will help you with writing your references page for your final paper(s).

Weekly research updates & Weekly attendance:
Each week we will meet (unless otherwise discussed/noted) and discuss each students' projects. We will discuss how the research is going and if any help is needed in completing the projects. We will also discuss ideas of bettering your research and papers being written. Each week the students will be required to show what work is being done to complete their projects.

It is required that each student attend the weekly project discussions (when assigned). It is also required that each student be prepared to discuss their particular projects and how they are progressing. Failure to share or discuss advances in the individual project will result in a 1% drop (for each occurrence) in the weekly attendance/discussions final score.

Student Presentations:
At the end of the semester (week 15) students will be required to do a 15-minute presentation on the research they have done so far. This presentation will be given via Zoom (Covid restrictions) and must be prepared and given via PowerPoint presentation. Many projects will still be in the process of research/writing, but the presentation will be a compilation of what you have learned so far. This presentation will make up 5% of your overall total weekly attendance grade.

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	**% of Grade**	**Grades**			
Project(s) Chosen (40 pts)	10%	Grade	%	Grade	%
Project Timeline (80 pts)	20%	A	95-100	B-	76-79
Annotated Bibliography (100 pts)	25%	A-	90-94	C+	72-75
Weekly Research Updates (80 pts)	20%	B+	86-89	C	70-71
Weekly Attendance (Student Presentations 5%) (80 pts)	20%	B	80-85	Below C	Course Fail
CITI Training (20 pts) (If Needed)	5%		*Scores will be rounded up:*		
Total: 400 points			*Example: 94.4 = 94*		
			94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

This syllabus is meant to serve as an outline and guide for the course. Please note that it may be modified with reasonable notice to you and also to accommodate the needs of the class. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6301 - Procedure Observations & Lectureships 1

Fall Semester

Instructor: Shawnda Gillespie
Email: shawnda.gillespie@hsc.utah.edu
Phone Number: 801-300-7719
Office Hours: Monday-Thursday, 10:00 am-6:00 pm
Office Location: HELIX Tower 30 North Mario Capecchi Dr.
4 Floor North, 4N124
Preferred method of contact: Phone, 801-300-7719

Required Materials

- The Manual of Clinical Perfusion, Second Edition Updated; Bryan V. Lich and D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5) (If Desired).
- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; 2008 Lippincott Williams; Wilkins, Philadelphia, PA. ISBN: 0-7817-681502 (If Desired)
  - Library Link: https://login.ezproxy.lib.utah.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&AN=1473204
    - You may download a copy of this textbook for up to two weeks.

Summary: 1.5 credits; Pass/Fail, First Year, Fall Semester

Prerequisites for this course are as follows:
CVP 6001 Perfusion Science 1
CVP 6010 Perfusion Lab 1
CVP 6071 Perfusion Pharmacology
CVP 6100 Introduction to Hospital Environments
CVP 6403 Hemodynamic Monitoring
CVP 6501 Interdisciplinary Healthcare 1
CVP 6620 Applied Anatomy
CVP 6630 Medical Physiology 1

Course Description

This course provides students the opportunity to observe medical procedures in which a certified clinical perfusionist may participate in, including, but not limited to:

- Coronary artery bypass grafting
- Heart valve procedures
- Complex aortic procedures
- Heart failure interventions
- Placement of mechanical circulatory support devices
- TAVR procedures
- HIPEC procedures
- Pacemaker lead extractions
- Catheterization lab procedures
- ICU

Procedure observations will occur in operating rooms, cardiac catheterization labs, or the cardiovascular ICU located in the University of Utah Hospital and Huntsman Cancer Hospital. Students will learn to identify the role each discipline plays in each setting and creating a successful, multidisciplinary team.

In addition to observing various procedures, students will attend a series of lectureships presented by the Division of Cardiothoracic Surgery. These lectures will present disease processes and associated surgical interventions for each topic; along with current studies and trends related to each lectureship.

Course Outcomes
By the end of this course you will be able to:
- Identify capital equipment used by perfusionists at the University of Utah Hospital
- Identify disposable equipment used, including arterial cannulas, venous cannulas, tubing connectors, other ancillary pertinent items and understand the rationale for each selection
- Identify various procedures in which a perfusionist may be involved in and techniques used during each procedure
- Identify the primary roles of each individual working in the operating room, the importance of each interaction, and how each individual, in each roll, can perform successfully as a team.
- Be familiar with how to run tests performed by perfusionists during a cardiac procedure
- Identify pertinent information from patient history related to cardiac surgery
- Build confidence in discussing patient care with physicians, nurses, and other members of the cardiac team
- Be familiar with the sterile field and technique
- Help the student experience the role of a perfusionist and the pace of the profession

Teaching and Learning Methods
This course will enable the student to observe a plethora of procedures, varying in procedure type. Students will be assigned procedures based on procedure occurrence, student schedule availability and by previous observational experience. They may also be required to complete an assignment after each OR case, with an emphasis on a different facet of the surgical procedure. This will provide the student with specific questions to ask or will be given tasks to identify important parts to the surgical procedure; to provide a targeted learning opportunity.

In addition to OR observation of procedures, each Tuesday evening from 5:15-6:15 pm, the Division of Cardiothoracic Surgery will present various topics in a case presentation series. These lectureships provide a unique opportunity to learn about different surgical interventions, why those are performed in relation to the patient's disease, and hear discussion amongst interdisciplinary team members regarding surgical considerations, current trends and studies. This will enable students to gain a well-rounded perspective and help them to understand more from each team member's perspective. We ask that the CVP Students attend at least Five Educational Conferences throughout the Fall Semester. The CVP Students may attend every Tuesday Educational Conference if they so choose.

Assignments
The student is required to complete a Cardiopulmonary Bypass Record while observing in the OR. This completed form will be given to Shawnda Gillespie at the conclusion of each observation day.

Grading Policy
Failure to complete assignments following a scheduled observation or lectureship will result in a fail for that associated observation or lectureship. Failure of more than 4 observations or lectureships will result in a failure in the course. 70% or higher to Pass.

Finals Week: No Final Exam

CVP 6401 - Perfusion Anatomy, Physiology, and Surgical Repair

Fall Semester

Instructor: Paul Matlin
Email: pm13@utah.edu
Phone Number: 801-558-4624
Office Hours: Appointment only

Required Materials

- Guyton and Hall Textbook of Medical Physiology, 12th Edition; John E. Hall; Saunders Elsevier, 2011. ISBN: 978-1-4160-4574-8
- Cardiovascular Physiology, 8th Edition; David E. Mohrman, Lois Jane Heller; McGraw Hill Lange, 2014. ISBN: 978-0-07-179311-7

Summary: Three (3) credits; Lecture, First year, Fall Semester

Prerequisites for this course are as follows:
CVP 6001 Perfusion Sciences 1
CVP 6010 Perfusion Lab 1
CVP 6071 Perfusion Pharmacology
CVP 6403 Hemodynamic Monitoring
CVP 6620 Applied Anatomy

Course Description

This course covers an in-depth look at the Anatomy, Physiology, and Surgical repair of many of the major organ systems of the human body. Emphasis will be on the cardiac, pulmonary, and renal systems and the surgical approaches to repairing/transplanting these organ systems. There will also be a pig heart anatomy lab where you will learn the anatomical structures of the heart and how to repair/replace valves in the heart.

Course Outcomes

During this course you will gain a better understanding of the following and how they relate to the world of perfusion (not in this particular order though):

- Thorax and Mediastinum
- External Anatomy of the Heart and Coronary Anatomy
- Internal Anatomy of the Heart
- Conduction System of the Heart/Myocardial Cell Structure
- Overview of the Cardiovascular System (Major Arteries, Veins, and Microcirculation)
- Aorta and Neck Vascular Anatomy
- Respiratory Anatomy
- Thoracic and Aortic Surgery (ex. Perfusion techniques for cannulation of thoracic and thoracoabdominal cases)
- The Cardiac Cycle
- Cannulation strategies for different cardiac cases (CABG vs TVR vs Minimally invasive)
- Pulmonary Circulation (ventilation, oxygenation, respiration)
- Aortic Valve Anatomy & Surgery
- Mitral Valve Anatomy & Surgery
- Heart Valve Defects
- Cardiac Failure (surgical and medicinal therapies)
- Ischemic Heart Disease
- Control of Cardiac Output
- Renal anatomy and physiology

- Pulmonary Ventilation
- Aortic & Thoracic Surgery
- Transplants (Heart, Lung, Kidney, Liver)
- Ventilation, oxygenation and respiration

Teaching and Learning Methods

Lectures will be presented and discussed in depth until the material is understood in its role for board examination preparation and their real-world applications in perfusion.
Lectures will run for approximately 3 hours per week and provide roughly 9 hours of at home study materials per week. Each lecture for this course will be done in-person using in class slides with possible displays of equipment and disposables for visual reference. Quizzes will also be incorporated into this course and will be given on paper during class periods. These quizzes will count towards your final/overall grade. Exams will make up a large portion of your overall grade and will be issued in testing centers at various times during the semester. These times and subjects covering the exams will be outlined below.

EXAM Schedule

Item	Description	Percent
Exam 1	This examination covers Lectures 1-4	18%
Exam 2	This examination covers Lectures 5-8	18%
Exam 3	This examination covers Lectures 9-12	18%
Exam 4	This examination covers Lectures 13-16	18%
Final Exam	This examination covers all Lectures 1-16	18%
Quizzes/Assignments	This covers all quizzes and assignments covered throughout the semester	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Exam 1	18%	Grade	%	Grade	%
Exam 2	18%	A	95-100	B-	76-79
Exam 3	18%	A-	90-94	C+	72-75
Exam 4	18%	B+	86-89	C	70-71
Final Exam (Comprehensive)	18%	B	80-85	Below C	Course Fail
Quizzes/Assignments	10%		*Scores will be rounded up:* *Example: 94.4 = 94* *94.5 = 95*		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

CVP 6502 - Interdisciplinary Healthcare 2

Fall Semester

Instructor: Jake Weston
Email: jacob.weston@hsc.utah.edu
Phone Number: 801-712-3687
Office Hours: Appointment Only

Summary: One (1) credit; Lecture, Pass/Fail, First Year, Fall Semester

Prerequisites for this course:
CVP 6501 Interdisciplinary Healthcare 1
CVP 6001 Perfusion Science 1
CVP 6010 Perfusion Lab 1
CVP 6071 Perfusion Pharmacology
CVP 6403 Hemodynamic Monitoring
CVP 6100 Introduction to Hospital Environments
CVP 6620 Applied Anatomy
CVP 6630 Medical Physiology 1

Course Description
This course is the second in a two-part course. In this course students will have to opportunity to hear from and interact with other disciplines as it relates to cardiac surgery. They will have opportunity see how different roles function in the operating room.

Course Outcomes
By the end of this course, you will be able to:

- Understand the role of the Anesthesiologist in cardiac surgery
- Understand the role of the Cardiothoracic Surgeon in cardiac surgery
- Understand the role of the Circulating Nurse in cardiac surgery
- Understand the role of the Surgical Technician in cardiac surgery
- Understand the role pf the Physician Assistant in cardiac surgery
- Understand the role of the Intensivist in cardiac surgery
- Understand the role of the intensive care unit Nurse in cardiac surgery

Teaching and Learning Methods
This class will be taught by invited guest lectures to present their specific role in cardiac surgery.

CVP 6631 - Medical Physiology 2

Fall Semester

Instructor: Ben Lewis
Email: Benjamin.lewis@hsc.utah.edu
Phone Number: (801) 916-1131
Office Hours: Appointment

Required Materials

- Hall, John E. *Guyton and Hall Textbook of Medical Physiology*. 13th ed., W B Saunders, 2015.
- *Ganong's Review of Medical Physiology, 26e* Eds. Kim E. Barrett, et al. McGraw Hill, 2019, https://accessmedicine.mhmedical.com/content.aspx?bookid=2525&sectionid=204289956. *Cardiovascular Physiology, 9e* Eds. David E. Mohrman, and Lois Jane Heller. McGraw Hill, 2018, https://accessmedicine.mhmedical.com/content.aspx?bookid=2432&sectionid=19080031
- 5. Gravlee, Glenn P., et al. *Cardiopulmonary Bypass and Mechanical Support : Principles and Practice*, Wolters Kluwer, 2015. *ProQuest Ebook Central*, https://ebookcentral-proquest-com.ezproxy.lib.utah.edu/lib/utah/detail.action?docID=4786269.
- The Manual of Clinical Perfusion, Second Edition Updated; Bryan Lich, D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5)

Course Description

This course covers physiology of various organ systems including cardiac, pulmonary, renal, endocrine, gastrointestinal, vasculature of the body and its blood components. In addition, the effects of cardiopulmonary bypass on these organ systems will also be covered.

Summary: 1.5 credits; Graded; Lecture, First year, Fall Semester

Course Outcomes

By the end of this course, you will be able to:

- Understand the heart as a pump, including heart physiology, determinants of blood flow, cardiac cycle, action potentials, determinants of blood pressure, pressure and volume loops, hemodynamic principles and the circulatory system.
- Describe renal physiology including basic functions of the kidney, management of various ions, proteins and sugars by kidneys; endocrine regulation of blood pressure.
- Define role of pulmonary system with ventilation, oxygenation, and gas exchange; basic functions of the lungs, and interactions with the cardiovascular system.
- Discuss the components of the blood including cellular elements, plasma proteins, transfusion products and blood banking practices.
- Describe the process of hemostasis and the coagulation cascade, coagulation disorders and treatments.
- How cardiopulmonary bypass effects various physiological systems including cardiac, pulmonary, renal, cerebral blood flow, circulatory hemodynamics, and blood components.

Teaching and Learning Methods

This course will be taught over the summer semester. Lectures will run for approximately 1.5 hours per week. Each lecture for this course will be done in-person using in class slides. Any information presented in class will be a compilation of this information and not be all inclusive. Please use the

information presented in class for all exams, quizzes, and discussions and note that this information may be slightly different than what is presented to you by individual perfusionists in the field.

Quizzes will also be incorporated into this course and will be given on paper (unless Covid restrictions occur; quizzes will then be given via canvas/examsoft) during class periods. These quizzes will count towards your final/overall grade. Quizzes will consist of 5-10 questions and will be given before class (in-between exam weeks with a couple of exceptions when they will not be given) (See schedule below). Quiz questions may also be found on your exams but be sure to understand the concepts behind the questions and not just memorize the question itself (as they might change slightly from a given quiz and a subsequent exam).

Exams will make up a large portion of your overall grade and will be issued via paper or examsoft at various times during the semester. These times and subjects covering the exams will be outlined below. All exams will be administered in Board format (unless otherwise noted) and will have one question and four possible answers. Questions may require you to critically think through what you've learned and/or to do math problems to come up with the correct answer(s). Extra credit questions on exams may be administered at the discretion of the professor.

University Policies

The Americans with Disabilities Act. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

Addressing Sexual Misconduct. Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

Wellness: Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc. can interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

Veterans Center: If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F, 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/. Please also let me know if you need any additional support in this class for any reason.

LGBT Resource Center: The LGBT Resource Center offers Gender and Sexuality (formerly Safe Zone) trainings for faculty, staff and instructors at the U. You can also schedule one for your office or Department. The aim of the training is to promote inclusive teaching and foster a respectful, social environment for lesbian, gay, bisexual, transgender, queer and questioning individuals in our

classrooms. For more information about trainings/workshops, panels and suggesting on how to ask about personal pronouns and preferred student names please to http://lgbt.utah.edu/lgbtrc-programs/trainings.php.

Attendance & Punctuality

- Attendance, (including being on time), and participation is expected in accordance with the CVP Didactic Policy on Attendance, Timeliness, and Participation. In the event of an absence, you are responsible for learning the material through require readings, watching pertinent videos, etc. Review of the CVP Didactic Policy on Student Assessment for information on excused and unexcused absences.
- BE PREPARED for each scheduled learning activity – lecture, lab, team-based – by completing the assigned readings and/or preparation in advance of the activity.
- Assignments must be submitted by their designated due dates. No credit will be awarded for late assignments.
- You are expected to maintain professional behavior in the classroom setting, according to the University's Student Code. The Code specifies prescribed conduct that involves items such as cheating on tests or quizzes, plagiarism, and/or collusion, as well as fraud, and theft. Students should read and know they are responsible for the content of the Code.
- Academic dishonesty/misconduct includes, but is not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information, as defined in Policy 6-400: Code of Student Rights and Responsibilities ("Student Code").
- Plagiarism is not allowed! Plagiarism is defined as the intentional or un-intentional use by paraphrase or direct quotation of another author, including a peer, without full and clear acknowledgment or representation of the original authors work.
- Additional assignments, when required by the instructor may be added throughout the semester. All additional assignments will be made known to you and scheduled dates will be established for you to turn them in.

Food & Drink: Food and drink is allowed in class as long as it does not distract from the teaching of the professor or the learning of the other students.

Electronic Devices in Class: Electronic devices are only allowed IF they are being used for learning in class. Use of electronics for social media, texting, making phone calls, etc. will result in the electronic device being taken away. If use of electronic devices occurs on a regular basis, you will be subject to class discipline.

Canvas: Used to distribute course content including learning exercises, copies of classroom presentations, assignments, skills exercise, etc. and to possibly submit completed assignments for evaluation.

EXAM Schedule

Item	**Description**	**Percent**
Exam 1	This examination covers Lectures 1-4	22.5%
Exam 2	This examination covers Lectures 5-9	22.5%
Exam 3	This examination covers Lectures 10-13	22.5%

Final Exam	This examination covers all Lectures 14-16 (60%) and comprehensive (40%)	22.5%
Quizzes/Assignments	This covers all quizzes and assignments covered throughout the semester	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Exam 1	22.5%	Grade	%	Grade	%
Exam 2	22.5%	A	95-100	B-	76-79
Exam 3	22.5%	A-	90-94	C+	72-75
Final Exam (Comprehensive)	22.5%	B+	86-89	C	70-71
Quizzes/Assignments	10%	B	80-85	Below C	Course Fail
			Scores will be rounded up:		
			Example: 94.4 = 94		
			94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

Course Schedule

Note: This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted in Canvas under Announcements.

Week	Topic
1	Syllabus Review, Circulation
2	Blood Components, Blood Types
3	Hemostasis and Coagulation Cascade
4	CPB Effects on Blood Components
5	***Exam 1***, Renal Anatomy
6	Renal Physiology
7	Renal Filtration/Reabsorption
8	Fluid Compartments, Body Volume Regulation
9	Urinary Tract, CPB Effects on Kidneys
10	***Exam 2,*** Endocrine System
11	Adrenal Cortex, Pancreas, Thyroid
12	Anterior Pituitary, Parathyroid, Growth Hormones
13	Posterior Pituitary
14	***Exam 3***, Gastrointestinal Anatomy
15	GI Motility & Secretory Function,
16	Digestion, Absorption, Liver Function
17	**Final Exam**

Year One
Spring Semester

CVP 6003 - Perfusion Science 3

Spring Semester

Instructor: Jordan Hendricks
Email: Jordan.hendricks@hsc.utah.edu
Phone Number: 801-455-1290
Office Hours: Appointment

Required Materials

- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; Lippincott Williams & Wilkins; 2008. (ISBN: 978-0-7817-6815-3)
- A Practical Approach to Cardiac Anesthesia, 5th Edition; Frederick A. Hensley, Jr., Donald E. Martin, Glenn P. Gravlee; Lippincott Williams & Wilkins; 2012. (ISBN: 978-1451137446)
- Manual of Perioperative Care in Adult Cardiac Surgery, 5th Edition; Robert M. Bojar; Blackwell Publishing; 2011. (ISBN: 978-1444331431)
- The Manual of Clinical Perfusion, Second Edition Updated; Bryan Lich, D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5)
- Cardiopulmonary Bypass; S. Ghosh, F. Falter, D.J. Cook; Cambridge University Press; 2009. (ISBN: 978-0521721998)

Summary: Three (3) credits; Lecture, First year, Spring Semester

Prerequisites for this course are as follows: Acceptance into University of Utah Perfusion program, passing all classes in the Summer and Fall semesters.

Course Description

This course will be an extension of the materials taught in Perfusion Science 1 and 2. We will discuss transplants, autotransfusion, TEG, ultrafiltration/dialysis, embolic events, alternative approaches to CPB, and the different responses of the body to CPB.

Course Outcomes

1. Upon completion of this unit the student will be able to:
2. Describe the basis of each calculation; and
3. Apply the formulas to clinical scenarios.
4. Describe the different types of ultrafiltrators;
5. Describe the operational characteristics of ultrafilters;
6. Discuss the impact of hemoconcentration of circulating concentrations of drugs and ions; and
7. Describe the use of the hemoconcentration before, during and after CPB.
8. Understand and apply the requirements of the AABB Standards for
9. Perioperative Autologous Blood Collection and Administration.
10. Describe the effects of hemodilution on the rheology of blood;
11. Discuss how hemodilution changes the oxygen content and colloid osmotic pressure; and
12. Apply the formulas to calculate the hematocrit and colloid osmotic pressure after hemodilution.
13. Describe the indications for cell washing;
14. Describe the contraindications for autotransfusion;
15. Describe the general operation of the appropriate cell saving device;

16. Discuss proper procedure for storage reinfusion and discard of end product; and
17. Discuss record keeping preventive maintenance and quality control.
18. Describe how using a full size Autotransfusion device may be employed as a cell separator for packed Red Blood, Concentrated Platelets and Plasma;
19. Describe the technique required for the production of Platelet Gel.
20. Describe how low volume Platelet Concentration systems operate;
21. Describe the technique required for the production of Platelet Gel.
22. Describe the different types of ultrafiltrators;
23. Describe the operational characteristics of ultrafilters;
24. Discuss the impact of hemoconcentration of circulating concentrations of drugs and ions; and
25. Describe the use of the hemoconcentration during CPB to control hematocrit.
26. Describe the actions of the various drugs available to reduce the amount of blood loss during and after cardiac surgery;
27. Describe the indications and contraindications for each of the drugs; and
28. Discuss dosing and CPB considerations for each drug.
29. Discuss the potential for a catastrophe; and
30. Describe the proper responses and actions to a catastrophe.
31. Describe the indications for this technique;
32. Discuss the perfusion circuit; temperatures; pressures; and flows used with the technique; and
33. Discuss the outcomes of the technique compared to only profound hypothermic circulatory arrest.

Teaching and Learning Methods

Lectures will run for approximately 3 hours per week and provide roughly 9 hours of at home study materials per week. Lectures taught will cover all required materials listed by the AC-PE. Each lecture for this course will be done in-person using in class slides with possible displays of equipment and disposables for visual reference. Quizzes will also be incorporated into this course and will be given on paper during class periods. These quizzes will count towards your final/overall grade. Exams will make up a large portion of your overall grade and will be issued in testing centers at various times during the semester. These times and subjects covering the exams will be outlined below.

EXAM Schedule

Item	Description	Percent
Exam 1	This examination covers Lectures 1-4	18%
Exam 2	This examination covers Lectures 5-8	18%
Exam 3	This examination covers Lectures 9-12	18%
Exam 4	This examination covers Lectures 13-16	18%
Final Exam	This examination covers all Lectures 1-16	18%
Quizzes/Assignments	This covers all quizzes and assignments covered throughout the semester	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Exam 1	18%	Grade	%	Grade	%
Exam 2	18%	A	95-100	B-	76-79
Exam 3	18%	A-	90-94	C+	72-75
Exam 4	18%	B+	86-89	C	70-71
Final Exam (Comprehensive)	18%	B	80-85	Below C	Course Fail
Quizzes/Assignments	10%		*Scores will be rounded up: Example: 94.4 = 94*		

	94.5 = 95

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

CVP 6030 - Perfusion Laboratory 3

Spring Semester

Instructor: Samuel Harman and Jessica Russ
Email: sam.harman@hsc.utah.edu, jessica.russ@hsc.utah.edu
Phone Number: 801-897-6709, 928-368-7497
Office Hours: Appointment

Required Materials
Materials for this course will be provided in class.

Course Description
This course is the third in a three-part laboratory course. This course will continue hands-on experience with setting up and priming the extracorporeal circuit. This this course will continue to learn how to manage patients on cardiopulmonary bypass. Students will continue weekly simulations as well as setting up and priming the extracorporeal circuit. This course will also cover other equipment related to perfusion technology. There will also be classes set aside for troubleshooting and correction of the extracorporeal circuit and other related perfusion equipment. This course will also simulate crisis that may arise on bypass and how to effectively handle them.

Course Outcomes
By the end of this course, you will be able to:

- Setup and prime an extracorporeal circuit
- Initiation and termination of cardiopulmonary bypass
- Delivery and management of cardioplegia
- Manage vents and pump suckers on cardiopulmonary bypass
- Setup, manage and troubleshoot cell saving devices
- Setup, manage and troubleshoot anticoagulation measurement devices
- Setup, manage and troubleshoot intra-aortic balloon pump
- Setup and prime an extracorporeal membrane oxygenation (ECMO) circuit
- Manage patients on ECMO
- Troubleshoot and correct issues with ECMO
- Troubleshoot the heart lung machine
- Troubleshoot and correct issues that arise with the extracorporeal circuit
- Manage a crisis situation during cardiopulmonary bypass
- Recognize and respond to problems that occur during cardiopulmonary bypass
- Management of normothermic blood gases
- Management of hypothermic blood gases
- Patient Charting

Teaching and Learning Methods
Lectures will run for approximately 2 hours per week. It is recommended that students spend 6 hours of personal time in the lab and studying materials that will be provided in this class. Material taught will cover all the required topics listed by the AC-PE. All lab lectures will be done in person and will be hands on instruction. Pump setup and pump simulation will count toward the student's final grade. Each student will have time on their own to setup and prime the extracorporeal circuit and will be expected to use personal time to improve on lab skills.

Assignments
Students will continue to setup and prime the extracorporeal circuit. Simulation will also continue during this class. There will be other perfusion equipment that will be introduced during this course. Students will have the opportunity to use the new equipment that will be introduced. Each student will be given time to debrief and provided feedback after each simulation.

Grading Policy (Evaluation Methods & Criteria)
All pump setups and simulation will count toward students' final grade. Setups will count for 20% of the final grade. Simulation and other assignments will count for 80% of the final grade. This course will be a **Pass/Fail** course. Students must earn a **70%** or greater to pass this course.

CVP 6202 - Masters Project 2

Spring Semester

Instructor: Dr. Douglas Smego, MD
Email: douglas.smego@hsc.utah.edu
Phone Number: 773-329-5452
Office Hours: Appointment

Required Materials

- Users Guides to the Medical Literature, Essentials of Evidence-Based Clinical Practice. 2nd Edition; Gordon Guyatt, Drummond Rennie, Maureen O. Meade, Deborah J. Cook; McGraw Hill Medical; 2008. (ISBN: 978-0-07-159040-2)
    - Library link: https://jamaevidence-mhmedical-com.ezproxy.lib.utah.edu/book.aspx?bookID=847&TopLevelContentDisplayName=Books
- Gibaldi, Joseph, and Modern Language Association of America. MLA Handbook for Writers of Research Papers. 7th ed., 2009.
    - https://catalog.hathitrust.org/Record/005962415?
- University of Utah Annotated Bibliography Guide: Home
    - https://campusguides.lib.utah.edu/c.php?g=160354&p=1051883
- EBSCOhost Research Database
    - http://web.b.ebscohost.com.ezproxy.lib.utah.edu/ehost/search/selectdb?vid=0&sid=e8f0af92-b100-4488-9f85-a10313a3782b%40pdc-v-sessmgr04
- PubMed Link: http://www.ncbi.nlm.nih.gov/pubmed/?otool=uutahlib
- UofU Textbook Lookup: https://ebookcentral-proquest-com.ezproxy.lib.utah.edu/lib/utah/search.action
- University of Utah Research Links
    - https://lib.utah.edu/research/
    - https://library.med.utah.edu
    - https://library.med.utah.edu/or/rise.php
- University of Utah Research Guides
    - https://campusguides.lib.utah.edu/index.php?b=s
        - Medicine tab will provide you the best overall guides for your projects
- University of Utah Knowledge Commons
    - https://lib.utah.edu/services/research-consultation.php
    - This is a great resource for requesting research consultations through the Marriott Library. They have multiple "Subject Specialists" who can help you with your individual projects.

Summary: One (1) credit; Lecture, First year, Spring Semester

Prerequisites for this course are as follows:
CVP 6002 Perfusion Science 2
CVP 6020 Perfusion Lab 2
CVP 6200 Research Methodologies 1
CVP 6201 Masters Project 1
CVP 6301 Procedure Observations & Lectureships 1
CVP 6401 Perfusion Anatomy, Physiology and Surgical Repair
CVP 6502 Interdisciplinary Healthcare 2

Course Description

We will discuss this in better detail and update the handbook during orientation week 2023.
This course covers the ending stages of your master's project. This is the second of two semesters covering the large masters project in which you have been required to do extensive research and

then write a paper(s) to publish. Topics of research interest have been discussed and students will have chosen their particular project(s). These includes: research, case report(s), review articles, or technique research/article. The sole objective of this course is to help the students complete their research and papers for the perfusion and medical communities. At the end of master's courses, you will be **required** to present your findings at the University of Utah Rumel (research) conference or in front of a board to defend your research. This conference is put on by the University of Utah School of Medicine and your research will be among multiple medical disciplines projects. The presentations will be 8-10 minutes and will be followed by panel questions for you to defend your research. If timing does not permit to present at this conference an alternate time and location will be scheduled for you to present your findings to the Supervisory Committee and the public.

Course Outcomes
By the end of this course, you will:

- Update your timeline to complete your masters project
- Continue doing research for your project
- Finish writing your paper (Abstract, Keywords, Introduction, Materials and Methods, Results, Discussion, Conclusion, Acknowledgments, and References)

Teaching and Learning Methods
This course will be taught over the Spring Semester. Lectures/discussions will run for approximately 50 minutes per week and provide the knowledge and materials needed to complete your individual research projects. Most weekly lectures will be time for the instructor and students to cover what help they need in completing their masters project and to review the progress of each student's project. No quizzes or exams will be given in this course. Assignments may be given week to week to ensure that students keep on track with completing the research needed for their particular self-assigned projects.

Assignment(s)

Timeline:
Your timeline was written during the CVP 6201 Masters Project 1 course. It is required during this semester to update your timeline and submit for review. This may be a difficult task to determine for research-based projects but a rough updated timeline of how you plan to complete your project will be required. Failure to provide a timeline will result by the required date will result in a 5% deduction from your final grade.

Weekly research updates & Weekly attendance:
Each week we will meet and discuss each students' projects. We will discuss how the research is going and if any help is needed in completing the projects. We will also discuss ideas of bettering your research and papers being written. Each week the students will be required to show what work is being done to complete their projects.

It is required that each student attend the weekly project discussions. It is also required that each student be prepared to discuss their particular projects and how they are progressing. Failure to share or discuss advances in the individual project will result in a 1% drop (for each occurrence) in the weekly attendance/discussions final score.

Masters Presentation:
At the end of your master's courses, you will be **required** to present your findings at the University of Utah Rumel (research) conference. This conference is presented by the University of Utah School of Medicine and your research will be among multiple medical disciplines projects. The presentation will be 8-10 minutes and will be followed by panel questions for you to defend your research. If timing does not permit to present at this conference an alternate time and location will be scheduled for

you to present your findings to the Supervisory Committee and the public. Your presentation will be graded on the following criteria (worth 30% of your class total)

- 5% Professional attire worn
- 5% PowerPoint presentation layout
- 15% Presentation of materials (30 minutes each) (clear, concise, engaged with audience, etc.)
- 5% Class discussion

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades			
Timeline/Annotated Bibliography Completion update	20%	Grade	%	Grade	%
Weekly research updates	20%	A	95-100	B-	76-79
Weekly Attendance	30%	A-	90-94	C+	72-75
Masters Presentation	30%	B+	86-89	C	70-71
		B	80-85	Below C	Course Fail
			Scores will be rounded up:		
			Example: 94.4 = 94		
			94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point.
For example, a 94.5 will be rounded up to a 95.
On the other hand, a score of 94.4 will be rounded down to 94.
To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

CVP 6203 - Perfusion Standards and Liability Management

Spring Semester

Instructor: Chris Blaylock
Email: chris.blaylock@hsc.utah.edu
Phone Number: 801-678-0425
Office Hours: Appointment

Required Materials

- The Checklist Manifesto: How to Get Things Right; Atul Gawande; 2009. ISBN 978-0-312-43000-9 (Required)
- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; 2008 Lippincott Williams; Wilkins, Philadelphia, PA. ISBN: 0-7817-681502 (If Desired)
- amsect.org - Standards and Guidelines (S&G), Clinical Practice Guidelines (CPG), and Perfusion Checklist (AmSECT-Perf. Check.) all found under the "Resources" tab on the website

Summary: Two (2) credits; Lecture, First Year, Spring Semester

Prerequisites for this course are as follows:
CVP 6002 Perfusion Science 2
CVP 6020 Perfusion Lab 2
CVP 6200 Research Methodologies
CVP 6201 Masters Project 1
CVP 6301 Procedure Observations & Lectureships 1
CVP 6401 Perfusion Anatomy, Physiology and Surgical Repair
CVP 6502 Interdisciplinary Healthcare 2

Course Description

This course is designed to help perfusion students understand standards of perfusionist, how to promote quality, what quality in perfusion looks like, the inherent risk of cardiopulmonary bypass and how to manage liability or risk. Students will develop process improvement plans and will identify potential safety issues that could arise during cardiac surgery. In preparation for hospital rotations, students will identify how they can provide quality perfusion services, while seeking to implement skills and practices which will hope to mitigate risk. As a part of discussing quality standards, we will discuss the importance of the cardiac surgery team and its' members importance in improving the standard of care.

Course Outcomes

By the end of this course, the student will be able to:

- Describe the basis of CQI
- Describe what CQI can accomplish
- Discuss how CQI is implemented in perfusion health care.
- Identify standards and guidelines that are pertinent to perfusionists
- Identify current clinical practice guidelines and plan how to implement those during cardiopulmonary bypass
- Identify the role a perfusionist plays in promoting the standard of care in the operating room
- Understand and develop a process improvement plan for patient care
- Understand and identify inherent risks and major safety concerns in cardiac surgery
- Understand and identify the prevalence of incidents, accidents, or negligence which occur during cardiac surgery
- Identify an approach to increasing the safety of cardiopulmonary bypass
- Discuss the potential for a catastrophe

- Describe the proper responses and actions to a catastrophe.

Teaching and Learning Methods
Lectures will run for approximately 2 hours per week and provide roughly 6 hours of at home study materials per week. Lectures taught will cover all required materials listed by the AC-PE. Each lecture for this course will be done in-person using in class slides with possible displays of equipment and disposables for visual reference. This course will be directed through reviewing current standards and guidelines based on current clinical evidence and currently accepted perfusion practices; as well as focusing on the importance of checklists in promoting patient safety and discussion of managing liability. The goal is for students to become familiar with current clinical standards and guidelines and learn how to implement these in their practice, in preparation for clinical rotations. Another goal is to help students understand the inherent risk of cardiopulmonary bypass and to help them manage that risk through increased quality improvements and processes to identify potential risks. As different risks are identified, plans are created for how to address it and a course of action that can be pursued when negative outcomes occur. Potential catastrophe that may occur will be discussed and the proper responses to those catastrophes will also be discussed.

Assignments
2 presentations (**RCA and FMEA).** Upon covering each topic, instructions will be given on the topics, what each student will be expected to present and what they will be graded on. These presentations will occur during the final week of class before finals week.

3 quizzes (**Standards and Guidelines, Clinical Practice Guidelines, Checklists**). Each quiz will cover previous lectures and students will be made aware which lectures will be covered by the quiz. Dates are TBD, but are notated on the course schedule.

Grading Policy

EXAM Schedule

Item	Description	Percent
Quiz 1	This quiz covers Lectures 1-4	15%
Quiz 2	This quiz covers Lectures 5-8	15%
Quiz 3	This quiz covers Lectures 9-11	15%
RCA Presentation	Students will design an RCA	15%
FMEA Presentation	Students will present a FMEA based on a topic of their choosing	30%
Attendance/Class Participation	This covers questions answered in class and overall participation	10%

Evaluation Method	% of Grade	Grades			
FMEA Presentation	30%	Grade	%	Grade	%
RCA Assignment	15%	A	95-100	B-	76-79
Quiz 1	15%	A-	90-94	C+	72-75
Quiz 2	15%	B+	86-89	C	70-71
Quiz 3	15%	B	80-85	Below C	Course Fail
Attendance/Class Part.	10%				
		Scores will be rounded up: *Example: 94.4 = 94* *94.5 = 95*			

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down

to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

CVP 6302 - Procedure Observations & Lectureships 2

Spring Semester

Instructor: Shawnda Gillespie
Email: shawnda.gillespie@hsc.utah.edu
Phone Number: 801-300-7719
Office Hours: Monday-Thursday, 10:00 am- 6:00pm
Office Location: HELIX Tower 30 North Mario Capecchi Dr.
4th Floor North, 4N124
SLC, Utah 84112

Required Materials

- The Manual of Clinical Perfusion, Second Edition Updated; Bryan V. Lich and D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5) (If Desired).
- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; 2008 Lippincott Williams; Wilkins, Philadelphia, PA. ISBN: 0-7817-681502 (If Desired)
- Library Link: https://login.ezproxy.lib.utah.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=nlebk&AN=1473204

Summary: Two (2) credits; Pass/Fail, First Year, Spring Semester

Prerequisites for this course are as follows:
CVP 6002 Perfusion Science 2
CVP 6020 Perfusion Lab 2
CVP 6200 Research Methodologies
CVP 6201 Masters Project 1
CVP 6301 Procedure Observations & Lectureships 1
CVP 6401 Perfusion Anatomy, Physiology and Surgical Repair
CVP 6502 Interdisciplinary Healthcare 2

Course Description

This course provides students the opportunity to observe medical procedures in which a certified clinical perfusionist may participate in, including, but not limited to:

- Coronary artery bypass grafting
- Heart valve procedures
- Complex aortic procedures
- Heart failure interventions
- Placement of mechanical circulatory support devices
- TAVR procedures
- HIPEC procedures
- Pacemaker lead extractions
- Catheterization lab procedures
- ICU

This course is an extension of CVP 6301 and will further build upon previous experiences obtained during that course. Procedure observations will occur in operating rooms, cardiac catheterization labs, or the cardiovascular ICU located in the University of Utah Hospital and Huntsman Cancer Hospital. Students will learn to identify the role each discipline plays in each setting and identify the role each discipline plays in creating a successful, multidisciplinary team.

In addition to observing various procedures, students will attend a series of lectureships presented by cardiac surgical fellows at the University of Utah School of Medicine. These lectureships will present disease processes and associated surgical interventions for each topic; along with current studies and trends related to each lectureship.

Course Outcomes
By the end of this course you will be able to:
- Identify capital equipment used by perfusionists at the University of Utah Hospital
- Identify disposable equipment used, including arterial cannulas, venous cannulas, tubing connectors, other ancillary pertinent items and understand the rationale for each selection
- Identify various procedures in which a perfusionist may be involved in and techniques used during each procedure
- Identify the primary roles of each individual working in the operating room, the importance of each interaction, and how each individual, in each roll, can perform successfully as a team.
- Be familiar with how to run tests performed by perfusionists during a cardiac procedure
- Identify pertinent information from patient history related to cardiac surgery
- Build confidence in discussing patient care with physicians, nurses, and other members of the cardiac team
- Be familiar with the sterile field and technique
- Help the student experience the role of a perfusionist and the pace of the profession

Teaching and Learning Methods
This course will enable the student to observe a plethora of procedures, varying in procedure type. Students will be assigned procedures based on procedure occurrence, student schedule availability and by previous observational experience. Brief assignments may be given each week, with an emphasis on a different facet of the surgical procedure. This will provide the student with specific questions to ask or will be given tasks to identify important parts to the surgical procedure; to provide a targeted learning opportunity.

In addition to observation of procedures, each Tuesday evening from 5:15-6:15 pm, Cardiothoracic surgical fellows will present various case presentations. These lectureships provide a unique opportunity to learn about different surgical interventions, why those are performed in relation to the patient's disease, and hear discussion amongst physicians regarding surgical considerations, current trends and studies. This will enable students to gain a well-rounded perspective and help them to understand more from the surgeon's perspective. We ask that the CVP Students attend at least Five Educational Conferences throughout the Fall Semester. The CVP Students may attend every Tuesday Educational Conference if they so choose.

Student attendance is required every time they are scheduled to be in the OR for observation. Students are assigned an Observation day once each week. With prior approval, a student may move their Observation day. If an Observation day is missed without prior approval, the student may be placed on academic probation.

Assignments
The student is required to complete a Cardiopulmonary Bypass Record while observing in the OR. This completed form will be given to Shawnda Gillespie at the conclusion of each observation day.

Grading Policy
Failure to complete assignments following a scheduled observation or lectureship will result in a fail for that associated observation or lectureship. Failure of more than 4 observations or lectureships will result in a failure in the course.

CVP 6402 - Pediatric Perfusion

Spring Semester

Instructor: Ed Harman
Email: ed.harman@hsc.utah.edu
Phone Number: 801-455-7036
Office Hours: Appointment

Required Materials

- Perfusion for Congenital Heart Surgery: Notes on Cardiopulmonary Bypass for a Complex Patient Population, Gregory S. Matte; 2015 Wiley Blackwell, ISBN: 978-1-118-90079-6
- Illustrated Field Guide to Congenital Heart Disease and Repair, 3rd Edition; Allen D. Everett, D. Scott Lim; 2010 Scientific Software Solutions, Inc., Charlottesville, VA. ISBN: 978-0-9796252-5-1
    - Highly Recommended for this course
- Pediatric Heart Surgery-A Ready Reference for Professionals, 4th Edition L. Eliot May; 2008 Maxishare.
    - Highly Recommended for this course
- Langman's Medical Embryology,12 edition; T.W. Sadler, Jan Langman; 2012 Wolters Kluwer Health/Lippincott Williams & Wilkins. Philadelphia, PA. ISBN: 9781451144611
- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravle, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; 2008 Lippincott Williams & Wilkins, Philadelphia, PA. ISBN: 0-7817-681502
- Vricella, Luca A., et al. "Milestones in Congenital Cardiac Surgery." *Johns Hopkins Textbook of Cardiothoracic Surgery, Second Edition* Eds. David D. Yuh, et al. McGraw-Hill,2014,
    - https://accesssurgery.mhmedical.com/content.aspx?bookid=963&sectionid=55176426.
- The Manual of Clinical Perfusion, Second Edition Updated; Bryan Lich, D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5)

Summary: Three (3) credits; Graded; Lecture, First year, Spring Semester

Prerequisites for this course are as follows:
CVP 6001 Perfusion Sciences 1
CVP 6002 Perfusion Sciences 2
CVP 6401 Perfusion Anatomy, Physiology, and Surgical Repair
CVP 6020 Applied Anatomy
CVP 6630 Medical Physiology

Course Description

This course covers cardiac congenital defects, the surgical procedures used to correct each defect, and an overview of pediatric perfusion. Components of the pediatric perfusion circuit, device selection, CPB management, cannulation techniques, temperature management, deep hypothermic circulatory arrest, and cerebral protection techniques will also be covered.

Course Outcomes

By the end of this course, you will be able to:

- Describe the history of pediatric heart surgery
- Master the differences of pediatric bypass
- Understand and build the disposables for pediatric bypass
- Master the diverse pediatric bypass components pertaining to prime and cardioplegia
- Discuss the following elements pertaining to pediatric bypass:
    - Cooling techniques
    - Blood gas management
    - Electrolyte balances

    - DHCA
    - Ultrafiltration
- Understand the large number of congenital defects and the procedures to repair the congenital defects

Teaching and Learning Methods
Lectures will run for approximately 3 hours per week and provide roughly 9 hours of at home study materials per week. Each lecture for this course will be done in-person using in class slides with possible displays of equipment and disposables for visual reference. As an added benefit to your weekly PowerPoint slides, material highlighted in BLUE will be information I want you to know forever. This information will be something you will use or need to understand throughout your careers. Please note that many papers, textbooks, etc. will have conflicting values, ranges, and recommendations for disposables/equipment. Any information presented in class will be a compilation of this information and not be all inclusive. Please use the information presented in class for all exams, quizzes, and discussions and note that this information may be slightly different than what is presented to you by individual perfusionists in the field.

A weekly study guide will be available to you to fill out during the semester covering information I want you to thoroughly understand. Some study guides may contain elaborate amounts of information and it is important to follow along in class to determine what information should be included.

Quizzes will also be incorporated into this course and will be given on paper (unless Covid restrictions occur; quizzes will then be given via canvas/ExamSoft) during class periods. These quizzes will count towards your final/overall grade. Quizzes will consist of 5-10 questions and will be given before class (in-between exam weeks with a couple of exceptions when they will not be given) (See schedule below). Quiz questions may also be found on your exams, but be sure to understand the concepts behind the questions and not just memorize the question itself (as they might change slightly from a given quiz and a subsequent exam).

Exams will make up a large portion of your overall grade and will be issued via ExamSoft at various times during the semester. These times and subjects covering the exams will be outlined below. All exams will be administered in Board format (unless otherwise noted) and will have one question and four possible answers. Questions may require you to critically think through what you've learned and/or to do math problems to come up with the correct answer(s). Extra credit questions on exams may be administered at the discretion of the professor. Extra credit exam questions will be from the provided PowerPoint on Medical Terminology (found in Canvas under Week 1).

EXAM Schedule

Item	Description	Percent
Exam 1	This examination covers Lectures 1-3	18%
Exam 2	This examination covers Lectures 4-7	18%
Exam 3	This examination covers Lectures 8-11	18%
Exam 4	This examination covers Lectures 12-15	18%
Final Exam	This examination covers all Lectures 1-16	18%
Quizzes/Assignments	This covers all quizzes and assignments covered throughout the semester	10%

Grading Policy (Evaluation Methods & Criteria)

Evaluation Method	% of Grade	Grades

Exam 1	18%	Grade	%	Grade	%
Exam 2	18%	A	95-100	B-	76-79
Exam 3	18%	A-	90-94	C+	72-75
Exam 4	18%	B+	86-89	C	70-71
Final Exam (Comprehensive)	18%	B	80-85	Below C	Course Fail
Quizzes/Assignments	10%		*Scores will be rounded up:* *Example: 94.4 = 94* *94.5 = 95*		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

CVP 6550 - Mechanical Circulatory Support

Spring Semester

Instructor: Brandon Tomecek
Email: Brandon.Tomecek@hsc.utah.edu
Phone Number: 623-302-1730
Office Hours: Appointment

Required Materials

- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; Lippincott Williams; Wilkins, Philadelphia, PA; 2008. ISBN: 0-7817-681502 (Required) (G)
- Mechanical Circulatory Support: Principles and Applications; David L. Joyce, Lyle D. Joyce, Matthias Locke; McGraw-Hill; 2012. ISBN: 978-0-07-175344-9 (Required) (MCS)
- Extracorporeal Life Support: The ELSO Red Book, 5th Edition; Thomas Brogan; ELSO ISBN: 978-0-9656756-5-9 (Required) (ELS)
    - https://www.elso.org/Resources/Guidelines.aspx; (ELSO)

Summary: Two (2) credits; Lecture, First Year, Spring Semester

Prerequisites for this course are as follows:
CVP 6001 Perfusion Science 1
CVP 6010 Perfusion Lab 1
CVP 6100 Introduction to Hospital Environments
CVP 6403 Hemodynamic Monitoring
CVP 6501 Interdisciplinary Healthcare 1
CVP 6620 Applied Anatomy
CVP 6630 Medical Physiology 1
CVP 6071 Perfusion Pharmacology

Course Description

This course is designed to give students a more in-depth look at mechanical circulatory support including the devices used, indications for support, variations in configurations and more. With increased utilization and reliance on mechanical circulatory support, the topics discussed in this course will help prepare students for the application of them. The subjects discussed will include the various types of support, the history of the field, cannulation strategies, and current trends in the field. The types of mechanical support that will be discussed include IABP, VADs, ECMO, TAH, Impella and what each might look like.

Course Outcomes

By the end of this course, the student will be able to:

- Discuss various coagulopathic states which may occur in patients requiring MCS
- List methods of testing the coagulation system and how to relate clinical history to coagulation status.
- Discuss measurement of laboratory values regarding normal and abnormal hemostatic states which may occur in patients requiring MCS
- Describe the pathways that contribute to inflammation following blood contact with artificial materials
- Describe the methods of physiologic monitoring for the MCS patient.
- Identify the important monitoring variables that would assure that MCS delivery of nutrients meets the tissue demands
- Describe the physiological variables used to assess cellular energy balance during MCS
- Describe the different types and characteristics of ultrafiltration that may be used

- Describe the actions, dosing, and considerations of the various drugs available to reduce the amount of blood loss after cardiac surgery and during the use of MCS
- Describe the technical aspects associated with hemodynamic monitoring in patients requiring MCS
- Describe the indications for CPS
- Describe the technical considerations of CPS
- Discuss the complications associated with CPS.
- Describe the indications and contraindications for MCS, including, VAD and ECMO
- Discuss the advantages of each cannulation technique
- Discuss management of the ECMO patient – especially flows and anticoagulation
- Describe how to terminate ECMO.
- Compare and contrast the different VAD systems and indications for use
- Describe the long-term management requirements for each VAD system.
- List the indications and contraindications for the IABP
- Identify the equipment required for the IAB insertion
- Describe the purpose for IABP and understand proper timing
- Define methodology utilized in blood gas analysis
- Describe the quality control procedures required to ensure adequacy of results.
- Define laboratory test utilized in the determination of renal function, liver function and cardiac disease

Teaching and Learning Methods
Lectures will run for approximately 2 hours per week and provide roughly 6 hours of at home study materials per week. Lectures taught will cover all required materials listed by the AC-PE. Each lecture for this course will be done in-person using in class slides with possible displays of equipment and disposables for visual reference and guest lecturers to provide an expert look in that particular topic. This course will help students become knowledgeable in the area of mechanical circulatory support (MCS) and the facets of this emerging field within cardiovascular medicine. Regular quizzes will be given throughout this course to help encourage students to approach the course with consistent study which will be needed to achieve a satisfactory score. Two exams will be given, which will challenge each student to demonstrate a more comprehensive understanding of the topics of this course.

Assignments
1 or 2 brief assignments may be given during this course to help the students deepen their understanding of specific topics. Instructions for each assignment will be given at the end of class to assist the student in the completion of the assignment, along with the associated due date for the assignment.

Grading Policy

EXAM Schedule

Item	Description	Percent
Quiz 1	This quiz covers Lectures 1-3	10%
Quiz 2	This quiz covers Lectures 4-6	10%
Quiz 3	This quiz covers Lectures 7-9	10%
Quiz 4	This quiz covers Lectures 10-13	10%
Mid-Term Exam	This exam will cover Lectures 1-8	25%
Comprehensive Final	This exam will cover all lectures	25%
Attendance/Class Participation	This covers questions answered in class and overall participation	10%

Evaluation Method	% of Grade	Grades			
Quizzes	40%	Grade	%	Grade	%
Mid-Term Exam	25%	A	95-100	B-	76-79
Comprehensive Final Exam	25%	A-	90-94	C+	72-75
Assignments/Attendance/Class Participation	10%	B+	86-89	C	70-71
		B	80-85	Below C	Course Fail
			Scores will be rounded up:		
			Example: 94.4 = 94		
			94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

Year Two
Clinical Rotations

Clinical Handbook

Overview

Students who have successfully completed all didactic coursework will be permitted to enter clinical rotations. Students who have not completed all didactic coursework including perfusion labs/scenarios with a 3.0 (C or higher) in each course (graduate school requirement) will not be permitted to enter rotations. There are no exceptions to this rule. It is imperative that students pass all courses showing understanding and mastery of all didactic materials. Failing any one particular course shows lack of knowledge and understanding in life saving techniques and could result in poor performance in clinical rotations. Poor performances in clinical rotations can result in significant harm to the patients that you are entrusted to take care of.

Students will be assigned their clinical rotations no less than one month prior to attending their first rotation. Clinical site selection and approval rests with the University of Utah Master of Science in Cardiovascular Perfusion program (CVP). The CVP program ensures that the clinical rotation sites are able to provide clinical instruction and experiences necessary for an exceptional perfusion education. To confirm that the clinical rotation site is providing a quality education and to ensure the assigned student is attending their rotation, site visits may be conducted by the CVP program.

The CVP program works very hard to guarantee that all clinical sites assigned to each student will give them the best experience possible. The CVP program reserves the right to assign students based on availability of clinical site, location, and experience. Occasionally there are situations out of the CVP programs control, that will require changes in a student's clinical rotation schedule. Any changes, whether before you attend the clinical site or while attending a clinical rotation, will be communicated to you immediately.

If at any time you would like to attend a particular location, each student must contact the CVP Administrator and Director 30 days in advance. All requests will be considered, but the administrator and director MUST give final approval. Any students not getting final approval from the administrator and director before changing locations will be subject to review by the CVP program faculty and staff. This review could result in an automatic failure for this rotation and possible dismissal from the program.

Summary

Clinical rotations 6701- 6708 will begin your second year of the program and span over three semesters (Summer, Fall and Spring). The total number of rotations is eight and each rotation will be approximately six weeks. The total number of credits is 32. These rotations are an essential part of your perfusion education training. Strict adherence to all rules and regulations by the CVP program and the rotation sites is of utmost importance. Failure to follow these rules and regulations could result in automatic failure of the perfusion program.

Policies and Procedures for All Clinical Rotations

Program Responsibilities

- Provide malpractice insurance for perfusion students while they are enrolled at the University of Utah
- Complete drug screen on student prior to clinical rotations
- Complete background check prior to clinical rotations
- Complete OSHA and HIPAA training prior to clinical rotations
- Complete BLS CPR training prior to clinical rotations
- Ensure student obtains immunizations required for clinical rotations
- Provide students with evaluations and forms
- Provide preceptors and clinical sites with evaluations and surveys
- Provide students access to guidebook and contact information
- Provide students and preceptors with a clinical orientation
- Facilitate support and communication between students and preceptors
- Arrange for and coordinate visits to the clinical sites from the perfusion program

Preceptor Responsibilities

- Meet with the student for orientation and to review responsibilities and expectations:
    - Communicate specific site expectations, both clinical and academic
    - Review hospital policies and procedures
        - Site specific and as needed
    - Review Badge/ Parking/ Scrub access/ Locker access
        - Site specific and as needed
    - Review rotation schedule
        - Daily schedule
        - Call
        - Responsibilities
    - Tour/show student where all perfusion related equipment or supplies are located
    - Tour/show student operating room(s) and important areas
        - Front desk
        - Locker rooms

- Introduce student to other preceptors/surgeons and staff they may work with during their rotation.
- Provide clinical instruction and hands-on learning with a variety of cases and availability of patients and resources.
- Recognize the student is still learning and under the guidance of a clinical professional
    - Review all work completed by student. Provide feedback where necessary.
    - Review all charting and paperwork completed by student. Provide feedback where necessary.
    - Always be present when the student is with a patient.
- Provide feedback to student about performance and expectations
    - Daily case evaluations need to be completed
    - Student is responsible to provide the evaluation and submit evaluation
    - At the end of the six (6) week rotation, the main preceptor needs to complete an end of rotation evaluation
        - Student is responsible to provide document to preceptor
    - Feedback should be a candid and accurate assessment of the student's clinical competency and professionalism.
- Provide feedback to the perfusion program of any issues/concerns observed and identified
    - Allow program site visits to assess student progress and learning

Student Responsibilities

ATTENDANCE IS MANDATORY

- Communicate with your preceptors about performance on established responsibilities and expectations
- Comply with the hospital or site-specific policy and procedures
- Comply with the University of Utah policy and procedures
- Conduct yourself with professionalism and abide by the University of Utah behavior and performance guidelines
- Adhere to all dress code and uniform requirements
- Always wear identification in a visible location
- Arrive on time, engaged, and ready to work
- Perform duties within scope of practice and training
    - Do not provide patient care in the absence of a preceptor
- Students are allowed (2) personal days per semester that must be approved by the perfusion program. These personal days may not roll over into following semesters.
    - Semesters
        - Summer
        - Fall
        - Spring
    - An excess of excused or unexcused absences may require the student to make up clinical days
        - This can be completed after the end of a semester and before grades are due for submission
- Students are allowed to attend a perfusion meeting and job interviews
    - Students must notify preceptors and perfusion program in advance
    - Students do receive the following breaks
        - July 4th holiday
        - Thanksgiving
        - Winter break
    - Student is responsible to let preceptor/program administrator know of any absences
        - Must follow procedure outlined in syllabus
- Case evaluations must be completed for any case performed or patient care (ICU) (ECMO)
    - Student is responsible to have preceptor complete and submit the evaluation
- End of rotation evaluation
    - It is the student's responsibility to deliver evaluation to the main preceptor
- End of site student evaluation
    - It is the student's responsibility to complete their evaluation and return to the perfusion program
- Complete and pass all online courses
- Complete research and program requirements required for graduation
- Student is responsible to check their university email and canvas communication
- Student is responsible to stay up to date on all required certifications and immunizations to be at clinical sites

Attendance

Attendance includes timeliness and participation in accordance with the CVP Didactic Policy on Attendance, Timeliness, and Participation.
All students must be in daily attendance throughout each rotation unless prior arrangements have been made with their clinical site and CVP administration.
In the event of an absence, you are responsible for contacting the CVP Administrator and Site Director as soon as possible to request a day off or explain why the absence occurred.

Students are required to attend all scheduled cases and clinics associated with each rotation. Each rotation may have you participate in call and it is the student's responsibility to follow this request. Part time jobs, extracurricular activities, or lack of childcare are not acceptable excuses for absences from student rotation responsibilities. An excess of excused or unexcused absences may require the student to make up clinical days after the completion of a semester and before grades are due for submission. Unexcused absences my result in disciplinary action and possible dismissal from the program.

Absences

Pre-Approved Absences

- The CVP program supports the student in attending conferences, job interviews, and other perfusion and family related events. The student must follow all of the following in order to qualify for such events.
    - Students seeking permission to attend an off-campus conference or program must not be on academic probation and in good academic standing in their current course/rotation.
    - University of Utah School of Medicine approved student organizations must be granted permission from the appropriate CVP program faculty and staff to send students to an off-campus activity. A written request must be made at least one month prior to the planned event.
    - Students who desire to attend an approved off-campus activity must obtain pre-approval. Written requests to attend approved off-campus activities must be submitted two weeks prior to the activity.
    - Students attending off-campus conferences or events, must make up missed classes, laboratories, rotations, examinations or any other course assignments.
- Email any request to the CVP Clinical Director Jessica Russ and the CVP Administrator, Shawnda Gillespie, shawnda.gillespie@hsc.utah.edu and the Director of your current clinical rotation.
- Ensure you receive approval before you take the time away from clinical rotations.
- Special circumstances will be reviewed by the faculty on a case-by-case basis and must be approved before an absence is considered excused. Faculty will take into consideration factors such as academic standing, probation status, professionalism history, etc.

Sick Days

- Immediately communicate with the CVP Clinical Director, Jessica Russ, the CVP Administrator, Shawnda Gillespie, and the Site Director of your current clinical rotation.
- If student has more than four days of absence due to illness, it is required that the student provide documentation of illness, letter from physician.

Unexcused Absence

- An unexcused absence is considered unprofessional and may result in formal evaluation of your professionalism and remedial action. You will not be permitted to make up work/exams missed due to an unexcused absence. Examples of occurrences when an absence may not be excused:

    - Vacation
    - Employment
    - Family obligations
    - Travel
    - Previous plans
    - No call No Show

Professional Conduct
Refer to the Behavioral Standards policy for professional conduct. It is the student's responsibility to read this policy on a regular basis as to remind themselves of the required professional conduct during didactic and clinical activities. Student conduct is expected to be exemplary and professional at all times. Failure to exhibit professional demeanor jeopardizes a student's continued participation in the CVP program. Poor or unprofessional behavior reflects poorly on the student, the University of Utah, the CVP program and the Perfusion profession.

Students will also be evaluated on a daily basis while out on clinical rotations. These evaluations will be conducted on a case-by-case basis by each individual clinical instructor. Refer to the Professionalism Grading Rubric, Behavior Standards, Clinical Rotations Policy, and University of Utah Student Code Conduct policy. The Professionalism Grading Rubric will give the instructor a day-by-day ability to analyze each individual student for professional behavior (See Clinical Rotations Syllabus for further information). This form will then be forwarded to the CVP program on a daily basis for review by the program Director and office administrator. Students not meeting the day-to-day professional behavior will be subject to academic discipline and possible dismissal from the program.

Professional Attire
During all clinical rotations, students are expected to maintain a professional appearance at all times. While attending clinical rotations, students must wear the professional attire required by each individual clinical site. Nametags issued by each site must be worn at all times. Failure to wear the proper student identification will result in review by the CVP program. As a representative of the CVP program, students must be well groomed, clean and neat, avoiding extremes of hair and clothing styles. Excessive perfumes or jewelry are highly discouraged. Do not chew gum. Long fingernails are not appropriate in the care of patients. Local clinical standards and common sense should guide a student's choice of clothing. Hospital guidelines must be strictly obeyed.

Communication with the CVP program
It is the student's responsibility to stay in contact with the CVP program in the event that a clinical rotation is not up to par with clinical standards. Unfortunately, clinical issues and problems may arise and are inevitable during the clinical year. Students should not hesitate to call the CVP Program office for help, counsel, or advice. All information forwarded from the student to the CVP program will be kept strictly confidential.

University of Utah CVP Program Contact Information
School of Medicine, CVP program……**1-801-300-7719**

Charting and Prescriptive Activities
While on clinical rotations, students may not prescribe medications. A student name is not to appear on any prescription and students may not take any medications or supplies from any clinical site. Any student violating these guidelines will have his/her rotation terminated immediately. All charting and clinical activities must be signed off by a licensed supervising physician and/or certified clinical perfusionist. Should a student have any questions or concerns with this policy please do not hesitate to contact the CVP program.

Student Evaluation of Rotation Site
At the end of each 6-week rotation, the student is required to do an evaluation of the clinical site and forward it to the CVP program. In order to pass the rotation this form must be filled out in a timely manner and sent the CVP program.

On-line Classes
During your 8, 6-week rotations, there will be two online courses taught. Each course will cover different topics pertaining to advanced perfusion techniques and the American Board examination. Both courses are mandatory to pass your clinical rotations.

Incomplete Rotations
A rotation is considered incomplete ("I") if a student fails to submit all activity logs, student evaluation(s), preceptor evaluation(s), and online coursework activities.

Graduation Requirements
In order for a student to be considered for graduation, each student must successfully complete all of the following CVP criteria for the clinical rotations:

1. Attend and complete all activities during the clinical rotations.
2. Complete all eight required rotations with a passing grade
3. Meet clinical performance criteria for each rotation as set forth in the Clinical Rotations syllabus and this Clinical Handbook.
4. Submit daily case reports filled out by clinical preceptors. Students must participate in 70 CPB cases, 10 pediatric (observation/pump) and 5 ECMO/VAD clinical cases while on rotation as required by the American Board.
5. Submit end of rotation evaluations
6. Submit end of site evaluations
7. Attend and pass the two online clinical rotation courses.

CVP 6701-6708 - Clinical Rotations 1-8

Instructor: Jessica Russ
Email: jessica.russ@hsc.utah.edu
Phone Number: (928) 368- 7497
Office Hours: Appointment

Required Materials

- Pediatric Heart Surgery-A Ready Reference for Professionals, 4th Edition L. Eliot May; 2008 Maxishare. (P)(Required)
- The Manual of Clinical Perfusion, Third Edition Updated; Bryan Lich, D. Mark Brown;
- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravle, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; 2008 Lippincott Williams & Wilkins, Philadelphia, PA. ISBN: 0-7817-681502 (C)(Required)

Summary: Four credits per Rotation; Clinical, Second Year, Summer through Spring Semesters

Course Description

The curriculum for the second year CVP program covers three semesters of clinical rotations. During these three semesters you will attend 8, 6-week rotations. The first rotation CVP 6701 will start with a one-day clinical orientation covering the paperwork, etiquette, parking, etc. needed to attend your assigned clinical site. Attendance is mandatory.

During these 8 rotations, students will be required to master all competencies needed in cardiovascular perfusion and all related technologies involved in open heart surgery and related perfusion procedures. It is required that all students develop the needed skills in an enumerable number of specialties, patient problems, stressful situations, creating patient care plans, and gathering the correct equipment/supplies for each surgical case. It should be noted that all students will attend at least one or more clinical rotations in pediatrics.

Prerequisites for this course are as follows: Successful completion (with a C or better) in all first-year didactic courses.

Included with the Clinical Rotations, three additional courses must be completed with a passing grade of 70% or higher. These three courses are CVP 6198 Statistics, CVP 6721 Advanced Topics in Perfusion and CVP 6722 Board Certification Prep. In order to advance within rotations, you must pass these courses. Failure to pass these courses may result in failure of your rotations and possible failure from the program.

Course Outcomes

By the end of this course, you will be able to:

- Successfully complete tasks assessed in case evaluations
- Follow the guidelines and rules outlined for clinical rotations
- Successfully submit a case report for each case that you attended on rotation
- Participate in all assigned online activities and assignments during each rotation
- Adhere to all University of Utah student behavior and performance requirements during all clinical rotations
- Successfully conduct yourself in a professional manner at all times

Teaching and Learning Methods
Clinical Rotations will start your second year of the program and span 3 semesters (Summer,Fall,Spring). They are comprised of eight (8) six (6) week rotations totaling 48 weeks. Students will be assigned their rotation schedule one month prior to starting clinical rotations. Students are required to submit daily case evaluations that assess clinical/behavioral criteria and standards. Daily case evaluations are submitted to the clinical director and assessed weekly. Students receive a passing grade outlined in the syllabus and clinical handbook. Midway thru rotations the clinical director will schedule a meeting with the student to go over progress and address questions or concerns.
At the end of the spring semester, the successful CVP student will have completed all the tasks and met the minimum criteria set by the program for graduation.

Students will report back to the University of Utah following completion of all clinical rotations for a day of review and discussion. Details of graduation will also be discussed to help students prepare to receive their diploma.

Attendance
Attendance is mandatory during clinical rotations. Students will be allowed (2) personal days per semester (Summer, Fall, Spring). Students will also be allotted time during the winter break.

During clinical rotations students may request time off to attend job interviews and attend perfusion conferences. Please inform your clinical site, CVP Clinical Director and the CVP administrator of your interview/conference dates. Approval of leaving your clinical site for an interview MUST be pre-approved.

If students do not fulfill attendance requirements, they will be asked to complete them at the University of Utah to graduate. This will take place in between rotations such as winter break or before graduation.

Clinical Experience
While attending all rotations, it is the student's responsibility to be active and engaged in their clinical responsibilities. It is each student's responsibility to become as familiar as possible with the hospital, OR's, equipment, staff, policies, and practices of the rotation they are attending. Failure to adhere to these responsibilities could result in immediate termination from the site rotation and possible termination from the program.

Grading Policy (Evaluation Methods & Criteria)

Criteria	Item	Description
Successful Completion	Clinical Orientation	Students will participate in and complete required paperwork on Orientation Day to begin their clinical rotations.
Completion and Electronic Submission	Student Daily Case Report	Students will complete daily case evaluations pertaining to the case they participated in. The evaluation must be completed and turned in on a daily basis
Meet Professional and Behavioral Requirements	Behavioral criteria (based on a running average from Case Evaluations done by each individual preceptor	Students must meet the behavioral performance requirement for each clinical rotation as indicated in the "Clinical Handbook". Failure to meet the behavioral performance requirement will result in the student failing that particular rotation and could result in the student being dismissed from the program. The student's behavioral performance is evaluated on a daily basis via a case evaluation form. This form is to be completed by the assigned preceptor for each particular case. Students behavior that results in a surgeon permanently dismissing the student from the operating room during a procedure will result in the

	following each case)	student failing that particular rotation and could result in the student being dismissed from the program. Also, a student's behavior that results in the clinical site asking for the removal of the student from the clinical site will result in the student failing that particular rotation and could result in the student being dismissed from the program
Meet Clinical and Performance Requirements	Clinical performance criteria (based on a running average from Case Evaluations done by each individual preceptor following each case)	Students must meet the clinical performance requirement for each clinical rotation as indicated in the grading scale and syllabus for clinical rotations. Failure to meet these requirements could result in the student failing that rotation and could result in a failure from the program.
Successfully complete and electronically submit	End of Rotation Evaluation & End of Site Evaluation	Students are required to provide and submit an End of Rotation Evaluation to their main preceptor at the end of each clinical site rotation. Students are required to evaluate each clinical site they rotate at and submit once they complete that rotation.
Pass and/or complete online coursework	Online courses	Student will successfully complete all assigned online course work. Failure to do so can result in failing the clinical rotations and could result in the student being dismissed from the program

Grading Scale
Daily Case Evaluations

Clinical rotations for the University of Utah Perfusion Program consists of eight (8) six (6) week rotations. When a student is involved in a case or patient care a case evaluation must be completed and submitted. The student is expected to present the evaluation to their preceptor and submit the evaluations by the end of each clinical day.

Case evaluations are utilized by the perfusion program to evaluate a student's progress and assess a Pass/Fail grade for the six (6) week rotation. In order to graduate from the perfusion program all coursework and clinical rotations must be completed with a passing grade. Case evaluations may also be used by the student to study what they need to improve while on rotations.

The grading scale is used to assess the daily case evaluations and end of rotation grades.

How is each case assessed?

Grading Rubric

- **N/A-Student not evaluated on criteria**
- **0- Unacceptable: Critical/Fatal error or unacceptable behavior**
- **1- Needs Improvement: Clinical expectations met with great guidance or assistance**
- **2- Satisfactory: Clinical expectations met with moderate guidance or assistance**

- **3- Meets Expectations: Clinical Expectations met with minimal guidance or assistance needed**

Pediatric Rotations

- Observation only
- Standby
- 70 % average of 1's on evaluated criteria to pass rotation
    - Please refer to grading rubric

Clinical Rotations 1-4 (6701-6704)

- Observation only
- Standby
- 70 % average of 1's on evaluated criteria to pass rotation
    - Please refer to grading rubric

Clinical Rotations 5-8 (6705-6708)

- Observation only
- Standby
- 70% average of 2's on evaluated criteria to pass rotation
    - Please refer to grading rubric
- Exceptions
    - When a student is starting a new rotation site, they may receive 1's for a period of 3 weeks
        - This allows for the student to learn site preferences and protocols

What is evaluated criteria?

Each evaluation will consist of a list of questions that a preceptor will use to assess the student. If the student performs a task detailed in the evaluation, they will receive a score.

Preceptor comment section (optional)

How is the final grade assessed?

At the end of the six (6) week rotation, all case evaluations will be tallied. To receive a passing grade each criteria/question evaluated must obtain a 70% average or greater associated with the above clinical rotation.
The program does reserve the right to pass a student on a rotation if one section/criteria/question does not meet expectations. For example, the student only participated in a few ECMO cases and did not receive enough 2's on the evaluations. This student would need to pass all other criteria on evaluations and have passing recommendations from preceptors.

Students are required to complete a **minimum** of **70 adult CPB** cases to graduate

Students are required to complete/observe **10 pediatric CPB** cases to graduate

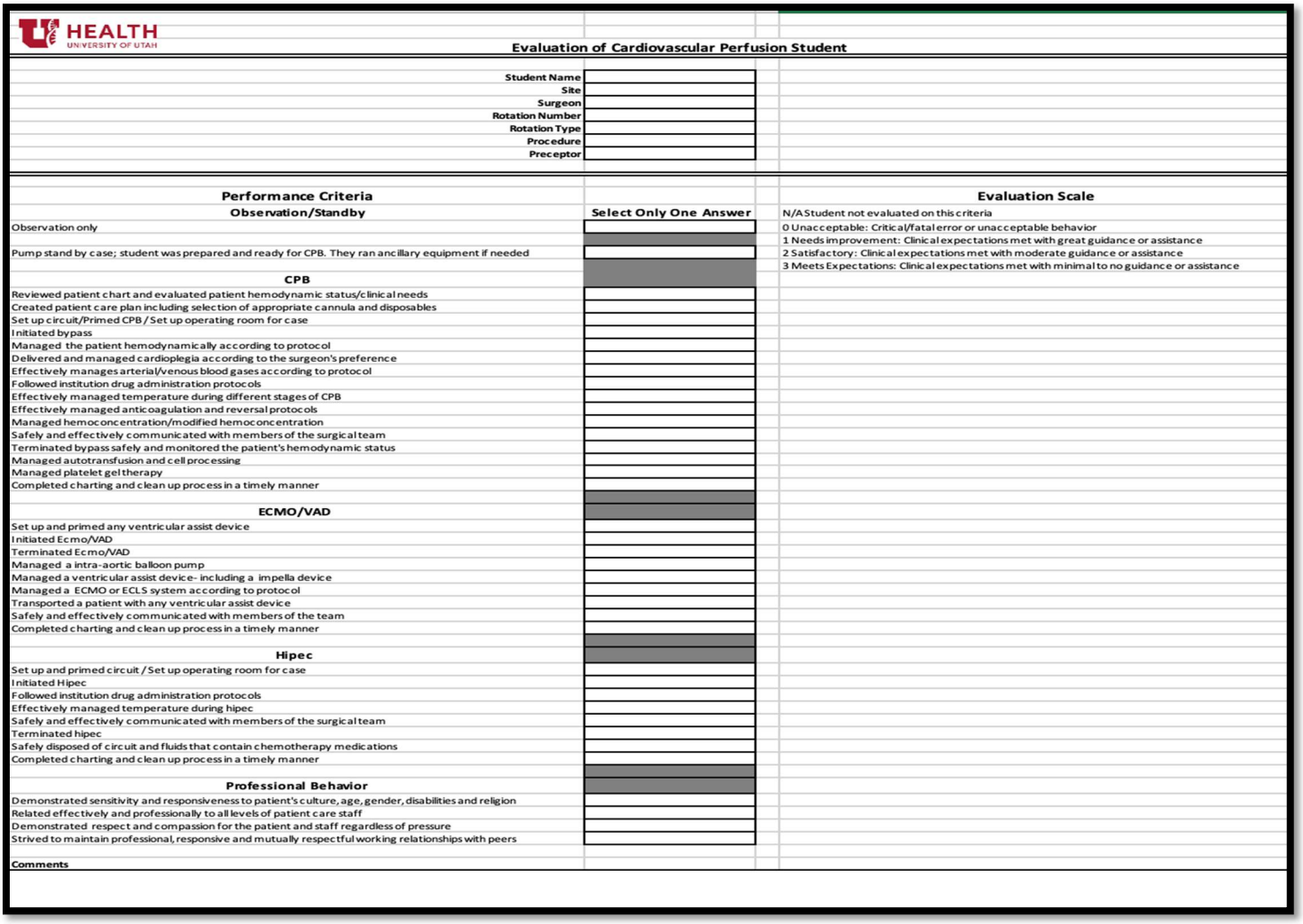
Students are required to complete a **minimum of 5 ecmo/vad** cases to graduate

THESE ARE MINIMUM REQUIREMENTS. STUDENTS MUST STILL COMPLETE ALL 8 ROTATIONS AND COMPLY WITH UNIVERSITY POLICY AND PROCEDURES

Please refer to the grading rubric for all evaluated criteria.

Please contact the program if there are any questions or concerns.

Evaluation of Cardiovascular Perfusion Student



HEALTH
UNIVERSITY OF UTAH

Evaluation of Cardiovascular Perfusion Student

Student Name	
Site	
Surgeon	
Rotation Number	
Rotation Type	
Procedure	
Preceptor	

Performance Criteria		Evaluation Scale
Observation/Standby	**Select Only One Answer**	N/A Student not evaluated on this criteria
Observation only		0 Unacceptable: Critical/fatal error or unacceptable behavior
		1 Needs improvement: Clinical expectations met with great guidance or assistance
Pump stand by case; student was prepared and ready for CPB. They ran ancillary equipment if needed		2 Satisfactory: Clinical expectations met with moderate guidance or assistance
		3 Meets Expectations: Clinical expectations met with minimal to no guidance or assistance
CPB		
Reviewed patient chart and evaluated patient hemodynamic status/clinical needs		
Created patient care plan including selection of appropriate cannula and disposables		
Set up circuit/Primed CPB / Set up operating room for case		
Initiated bypass		
Managed the patient hemodynamically according to protocol		
Delivered and managed cardioplegia according to the surgeon's preference		
Effectively manages arterial/venous blood gases according to protocol		
Followed institution drug administration protocols		
Effectively managed temperature during different stages of CPB		
Effectively managed anticoagulation and reversal protocols		
Managed hemoconcentration/modified hemoconcentration		
Safely and effectively communicated with members of the surgical team		
Terminated bypass safely and monitored the patient's hemodynamic status		
Managed autotransfusion and cell processing		
Managed platelet gel therapy		
Completed charting and clean up process in a timely manner		
ECMO/VAD		
Set up and primed any ventricular assist device		
Initiated Ecmo/VAD		
Terminated Ecmo/VAD		
Managed a intra-aortic balloon pump		
Managed a ventricular assist device- including a impella device		
Managed a ECMO or ECLS system according to protocol		
Transported a patient with any ventricular assist device		
Safely and effectively communicated with members of the team		
Completed charting and clean up process in a timely manner		
Hipec		
Set up and primed circuit / Set up operating room for case		
Initiated Hipec		
Followed institution drug administration protocols		
Effectively managed temperature during hipec		
Safely and effectively communicated with members of the surgical team		
Terminated hipec		
Safely disposed of circuit and fluids that contain chemotherapy medications		
Completed charting and clean up process in a timely manner		
Professional Behavior		
Demonstrated sensitivity and responsiveness to patient's culture, age, gender, disabilities and religion		
Related effectively and professionally to all levels of patient care staff		
Demonstrated respect and compassion for the patient and staff regardless of pressure		
Strived to maintain professional, responsive and mutually respectful working relationships with peers		

Comments

1. This form is in an excel format and accessible on the Canvas Course CVP 6701-002 Summer 2021 Clinical Rotation 1.
2. The student is responsible for completing the top portion of the form and handing his/her laptop to the preceptor.
3. The preceptor will complete the bottom portion of the form.
4. The student will save the file as follows: Student Name, Date.
    a. Example: Shawnda4.21.21
5. The student will upload their completed evaluation into box each day

Clinical Rotation Sites and Contacts

Rotation Name	Location
UUH	University of Utah Hospital and the VA University of Utah ICU, TAVR and Perfusion lab
UV	Utah Valley Hospital
PCH	Primary Children's Hospital
IMC	Intermountain Medical Center
UMASS	University of Massachusetts Memorial
NYU	New York University Langone Health
Penrose	Penrose St Francis/ St Anthony Hospitals
BUMC	Baylor Univeristy Medical Center
St. Alphonsus	St. Alphonsus Regiona Medical Center
John Muir	John Muir Health
KP- Santa Clara	Kaiser Permanente Santa Clara
Luicile Pakard	Lucile Packard Children's Hospital
UT San Antonio	University of Texas San Antonio
UF	University of Florida Shands Hospital
Indiana	Beacon Health Memorial Hospital
MN	Mercy Hospital & Abbot Northwestern
LLU	Loma Linda University

University of Utah Hospital
50 N Medical Drive
Salt Lake City, UT 84132
Brandon Tomecek
Perfusionist
623-302-1730

University of Utah ICU
50 N Medical Drive
Salt Lake City, UT 84132
Kathleen Stoddard
Clinical Nurse Coordinator
801-503-1846

Don R. Kimble Perfusion Lab
Spencer S. Eccles Health
Sciences Library
10 N. 1900 E.
Salt Lake City, UT 84112
Sam Harman & Jessica Russ
Perfusionists and Instructors
801-897-6709 & 928-368-7497

George E. Wahlen
Department of Veterans Affairs
Medical Center
Drive
500 Foothill Drive
Salt Lake City, UT 84148
Paul Matlin MS, MBA, CCP
Perfusionist
801-558-4624

Primary Children's Hospital
100 N Mario Capecchi
Salt Lake City, Ut 84113
Dustin Goodrich
Pediatric Perfusionist
702-350-3481

Intermountain Medical Center
5121 S. Cottonwood St.

Utah Valley Hospital
1034 N 500 W

Murray, UT 84107
Shane Froebe& Steve Garrett
Perfusionists
801-865-0955 & 801-554-9564

Penrose Hospital
2222 N. Nevada Ave
Colorado Springs, Co 80907
Devin Eilers
Perfusionist
515-971-6536

University of Massachusetts Memorial
55 N. Lake Ave
Worcester, MA 01655
Kristina Woldorf
Perfusionist
605-354-2736

New York University Langone Health
550 1st Ave
New York NY 10016
Marci Bendel
Perfusionist
914-772-5888

Kaiser Permanente Santa Clara
710 Lawrence Expy
Santa Clara, Ca 95051
Tony Chalfant
Perfusionist
(408) 220-5323

UT San Antonio
8300 Floyd Curl Dr
San Antonia, Tx 78229
Alberto Rostro
Perfusionist

Memorial Hospital
615 N. Michigan St
South Bend, IN 46601

Abbot Northwestern Hospital
800 E. 28th st
Minneapolis MN 55407
Malea Dageford
Perfusionist

Provo, UT 84604
Kevin Nokleby
Perfusionist
208-585-1440

Baylor University Medical Center
3500 Gaston Ave
Dallas, Tx 75246
Olivia Jaklic
Perfusionist
(412) 913- 4062

St. Alphonsus Regional Medical Center
1055 N. Curtis Road
Boise, Id 83706
John Jameson
Perfusionist
(949) 292- 8399

John Muir Health
2540 East St
Concord, Ca 94520
Ryan Dysart & Jesse Lobodinsky
Perfusionist/Owner
(925) 324- 8406 & 724-331-8272

Lucile Packard Children's Hospital
725 Welch Road
Palo Alto, Ca 94304
Samantha Kollmann
Perfusionist

University of Florida Shands
1600 SW Archer Road
Gainsville, FL 32608
Allison Rowden
Perfusionist

Loma Linda University
11234 Anderson St
Loma Linda, CA 92354
Kholoud Nassar
Perfusionist

Mercy Hospital
4050 Coon Rapids Blvd
Coon Rapids, MN 55433
Malea Dageford
Perfusionist

Clinical Rotation Goals and Expectations

UUH Clinical Rotation includes the University Hospital and the VA Hospital.
UUH Clinical Rotation includes the University ICU, TAVR and Perfusion Science Lab.

Student Development Schedule

This schedule is a general outline for what we want each student to accomplish within the specified time.

Week 1:

- Obtain badge
- Tour of pertinent areas of the facility
- Learn location of supplies
- Practice equipment set up including, cell saver, platelet gel machine, and heart-lung machine (HLM), including priming of HLM.
- Observe cases

Week 2:

- Practice pump set up and prime
- Run ACT's during the case
- Run pump sucker and vents
- Run cardioplegia pump
- Begin charting for patient on bypass.
- Successfully build pump and prime the circuit without assistance

Week 3:

- Prepare for the case including:
    - Room set up
    - Selecting appropriate disposables
    - Display familiarity with case flow (know when to move the pump to the table, connect table line to cell saver at appropriate time, etc.)
- Run the pump side during bypass including:
    - Initiate bypass
    - Safely manage patient during bypass
    - Terminate bypass
    - (Preceptor may run sucker/vents/cardioplegia pumps).

Week 4-6:

- Conduct all aspects of cardiopulmonary bypass including:
    - Room set-up (including selection of appropriate disposable equipment and hand-off of equipment to the sterile field)
    - Develop perfusion plan
    - Initiate bypass
    - Safely manage patient during bypass including proper delivery of cardioplegia, manage sucker/vent pumps, properly complete charting and terminate bypass
    - Proper charting and completion of paperwork.

Student Expectations

The following items are a list of expectations we have at the University Hospital of each perfusion student who completes a rotation here:

- Come ready to work, with a positive attitude, and ready to receive instruction.
- Be prepared to work at the hospital Monday through Friday, 0700 - 1900.
    - If cases end earlier than 1900, your preceptor may allow you to leave early.
    - If a case goes past 1900, you may determine with your preceptor whether you will remain in the case or leave for the day.
- Arrive to the OR by 0600 each day, unless otherwise instructed by your preceptor that day.
- Each Wednesday is a late start day. On Wednesday mornings, before cases start, complete HMS Liquid QC Process. As directed, help complete heater-cooler cleaning.
- Before you leave each day, complete each of the following:
    - Set up 3 heart-lung machines, with at least 2 pumps primed.
        - If leaving before 1900 and pump(s) are still in use, build enough pump packs to replace disposable equipment that is in use
    - Set up 3 cell savers
    - Set up the Magellan platelet gel machine
    - Re-stock carts
    - Ensure ICU has 2 primed ECMO circuits
    - Check in with other perfusionists if any cases are going on
- You are not obligated to take call; however, the opportunity to take call or participate in a case during the weekend may be extended towards the end of your rotation.
- Inform your preceptor for the day if you are sick or will be late in arriving to the OR.
- Lunch breaks may be taken between procedures or when the preceptor you are working with receives a break from another perfusionist.
- Vacation time or time off may be taken in accordance with your school policy.
- The use of cell phones are prohibited in the OR. Use of a cell phone in the OR may lead to a failure for that case.
- Drugs must be prepared with a preceptor present

Preceptor Expectations

The following items are a list of expectations you may have of your preceptors here at the University Hospital during your rotation:

- Each preceptor will conduct themselves in a respectful manner and will help provide an environment conducive to your learning.
- Each preceptor will complete an assessment of the student's performance, at the request of the student.
- Each preceptor will assist the student in their learning and will help provide an environment conducive to the student's learning.

University of Utah Hospital Clinical Rotation Goals and Expectations

The clinical rotation handbook is not inclusive of all Cardiovascular Perfusion Program policies and procedures. The program does attempt to outline every appropriate scenario and rule, but occasions may arise that fall outside of listed guidelines. The Cardiovascular Perfusion Program expects students and the program to always find reasonable solutions to differing situations that may occur.

Primary Children's Hospital Clinical Rotation Goals and Expectations

PCH Requirements Before Clinical Rotation

1. Current CV with picture.
2. All Hospital requirements must be completed before start of the rotation.
3. A Hospital badge must be obtained before the student starts his/her rotation. This badge is for identification only and does not allow the student access to any restricted areas.
4. There is no parking for students at Primary Children's Hospital.
5. There are no lockers available for students at Primary Children's Hospital.

Expectations of Clinical Rotation:

1. Professionalism
2. Communication
3. Engagement (with perfusionists and OR staff)
4. Punctuality (You should be here earlier than your preceptor and have a plan and understanding of case for that day)
5. Dependability (only ask to leave early if you have something important to get to)
6. Students will be Included on Perfusion texts for the case schedule the next day
7. Students are expected to attend the weekly Cath Conferences
8. Review anatomy and repair for the surgical case and be able to discuss
9. Students should want to become fully hands on as soon as possible
10. Focus on case management / conduct of case / Ask questions
11. No charting is allowed on patient charts, but can take notes
12. Setup as time allows
13. Prime as time allows
14. Cleanup, wipe down equipment
15. ATS (setup, run, troubleshoot, de-air syringe or blood bag)
16. Students will not be included in the call schedules, but students can ask to be called to see unique cases

VA Salt Lake City Health Care System Clinical Rotation Goals and Expectations

1. Purpose – To facilitate an impactful clinical rotation site for 2nd year perfusion students.
2. Background – The VA is a unique setting for cardiothoracic surgery. It is not a community hospital, nor is it a university hospital. While the operation of the heart lung machine is very standard, the other ancillary tasks performed by the perfusionist are varied, and not necessarily ordinary. The patient population is unique, as is the staff. Anesthesia, the surgeon and 1st-Assistant/PA are University of Utah faculty. Nursing and OR staff is all made up of VA employees, and then there is perfusion – currently 3rd party contractors. Historically, the VA does about 100 cases per year between hearts, stand-bys, and cell saver cases. Emergencies, while uncommon, do happen, and the perfusion team usually plays an integral role in critical patient care.
3. Scope – Perfusion is responsible for the following at the SLC VA:
    a. Heart-Lung Machine (2) – The current equipment is a Sorin S5 with centrifugal pump head. Perfusion is responsible for storage, setup, operation, charting, teardown, cleaning, battery testing, minor maintenance, and reporting malfunctioning equipment to VA staff.
    b. Quest MPS (3) – storage, setup, teardown, cleaning, minor maintenance, and reporting malfunctioning equipment to VA staff.
    c. Cell Saver (3)– The current equipment is the Fresenius Continuous AutoTransfusion System (CATS). Perfusion is responsible for all cell savers at the SLC VA, and also monthly QC testing, storage, setup, operation, charting, teardown, cleaning, minor maintenance, and reporting malfunctioning equipment to VA staff.
    d. Heater-Cooler (2) – The current equipment is a Sorin T3. Perfusion is responsible for storage, setup, teardown, cleaning, minor maintenance, and reporting malfunctioning equipment to VA staff.
    e. Medtronic HMS (2) - Perfusion is responsible for storage, setup, teardown, cleaning, weekly and monthly QC activity, minor maintenance, and reporting malfunctioning equipment to VA staff.
    f. ECMO – The current equipment is a Centrimag console with two independent drive units. Perfusion is responsible for storage, setup, teardown, minor maintenance, and reporting malfunctioning equipment to VA staff.
    g. Pump Cart – Perfusion is responsible for the contents of the cart, and for following VA protocols regarding storage of medications.
4. Expectations
    a. Perfusion students are expected to act professionally and with respect at all times at the VA.
    b. Perfusion students are expected to follow all VA policies and rules.
    c. Perfusion students are expected to arrive rested and intent on fully participating each day. Due to the relative infrequency of heart operations, missing a case during your rotation will not be tolerated without advance notice and good reason (illness, etc.).
    d. Perfusion students will be asked to arrive between 0730 and 0745 on days where a case is scheduled. Cases start at 0800 unless otherwise stated. You are not expected to be at the VA unless there is a case.
    e. Perfusion students are expected to complete any VA specific training related to clinical practice at the VA in the required timeframe.
    f. Perfusion students will be asked at the beginning of each day in the OR what skill or concept they are interested in focusing on, and they are expected to come prepared with an answer.
    g. Perfusion students will be notified by their clinical instructor as soon as a case is announced, and again the night before by 8pm. Students are expected to communicate with instructor by text, phone, and email (text primarily).
5. Primary Goals – By the end of the rotation at the VA, the perfusion student, at any given time, must be able to:
    a. Maneuver all equipment into correct locations and hook up appropriately
    b. Perform CO2 flushing
    c. Setup and prime the cardiopulmonary bypass circuit and MPS
    d. Mix cardioplegic solution(s)

e. Calibrate CDI-550
f. Perform ACT testing on HMS - wet and electronic QC's and patient samples
g. Operate the Cell Saver
h. RAP
i. Initiate cardiopulmonary Bypass
j. Interpret hemodynamics, physiology, and clinical presentation
k. Deliver cardioplegia – antegrade, retrograde, osteal
l. Cool the patient
m. Use an iStat for ABG, and interpret results
n. Administer perfusion drugs for pressure effectively
o. Administer perfusion drugs for acid/base balance effectively
p. Administer perfusion drugs for ACT management effectively
q. Warm the patient
r. Terminate bypass
s. Tear down and dispose of the circuit
t. Clean the pump

6. Secondary Goals -
   a. Connect all cords for EVH
   b. Setup a Mister-Blower
   c. Practice sterile delivery of disposables to operating table
   d. Operate a balloon pump
   e. Setup, prime, and initiate VA and VV ECMO

SAFETY – Perfusionists are integral and well-respected parts of the cardiothoracic team. As such, it is our responsibility to teach the other members of the team what we do in the case of a pump emergency, as well as instruct them on what will be expected of them during management of a perfusion crisis. The perfusion student will be required to prepare and present a perfusion crisis management course to the VA operating room staff at some point during their rotation. A date for the in-service will be coordinated.

*You will not be expected to do this completely from scratch – there are materials available as well as defined protocols. The purpose of the exercise is two-fold – first to provide the knowledge of how to handle the main perfusion emergencies, and second, to provide each student with the means to facilitate a crisis management scenario when hired. You can even bring the course materials that you create to an interview!

Intermountain Medical Center Clinical Rotation Goals and Expectations

Student Expectations

1. Set up as many pumps as possible with-in your first few weeks. After set up is mastered then you are responsible for set up of your own cases.
2. Prime as many pumps as possible with-in the first few weeks. Once mastered you are responsible for cases that you will be involved in.
3. Tear down and clean up after each case.
4. Restock carts before and after your case.
5. Know how to completely fill out the perfusion chart for each CCP.
6. Understand and follow how each CCP wants his case run.
7. Know the pump room and where supplies are kept i.e. Cannulas, pump packs, stopcocks.
8. Have your case ready to go before the patient enters the room.
9. Stay until your case is finished, patient leaves the room or the CCP says you can leave.
10. Set up of Rapid infusers and ECMO pumps in pump room.
11. Stocking of OR rooms with vacuum lines, vent lines, hemoconcentrators and extra oxygenators at end of day.
12. Develop an understanding of hospital protocols, surgeon preferences and CCP preferences.
13. Be involved in as many cases as you possibly can during your rotation here.
14. Maintain a professional demeanor with all staff and employees of IHC.

_____
Student Name

_____
Date

_____
Preceptor Name

_____
Date

UMass Memorial Health
Perfusion Student Manual

Cardiovascular Perfusion
January 1, 2021

Jeremy Engel DHSc, MHS, CCP, LP

Table of Contents

General Information

Phone Numbers

Room	
Pump Room	508-421-1288
OR 3	11307
OR 4	11308
LICU 3	11661
ECMO Cart	11661
Mark's Office	774-443-8839
OR Front Desk	11300
Perfusionists	
Mark Wante	774-285-5387
Kristina Woldorf	605-354-2736
Alan Dubey	774-285-5269
Patrick Orgel	508-858-6660
Bettina Alpert	774-303-6309
Anne Oulton	617-460-4611
Kathi O'Leary	508-615-5794
Autotransfusionists	
Greg Romaniuk	774-285-5302
Esdras Oliveras	508-740-2502
Lucas Russell	774-285-5353

Important Locations

Each student has visited and knows how to navigate each location designated. In addition, the student knows the codes and means of access to each location.

1. Pump Room _____
2. OR 3 _____
3. OR 4 _____
4. OR 17/ 13/ 6 Cath Lab (TAVR) _____
5. 125 Room (Code: 1,2,5) _____
6. Neptune Docking Room (Code: 1,2) _____
7. Marks Office _____

8. Cath Lab _____
9. Emergency Department _____
10. Lake Side ICU 3/ 6 _____
11. Stat Lab _____
12. Gas Tank Room (Code: 24, 3) _____

Supplies

Each student has reviewed the location of and all necessary equipment for cardiopulmonary bypass, MPS, hemoconcentrator, Centrimag, ECMO carts and locations, VAD support, balloon pump, and cell saver. Each student has familiarized him or herself with all the necessary cannulas, insertion kits, pump packs, and ancillary equipment associated with perfusion support.

Student Responsibilities and Expectations

1. Pull drugs, cannulas, striped cartridge (HMS), Istat, Hemocue, and ancillary equipment pertinent to case.
2. Electronic QC HMS, liquid QC Hemocue.
3. Prime pump, MPS, cell saver
4. QC- CDI, zero arterial line, flow probe, attach level detector, and input charges and cell saver in EPIC.
5. Review chart and input patient data into HMS and Bio 560.
6. Get cardioplegia ice, circ arrest ice if needed, and Neptune.
7. Turn on Nonin and record baseline cerebral saturation.
8. Conduct baseline ACT/ Hgb.
9. Notify Perfusionist.
10. Determine heparin dosage with perfusionist and tell anesthesia.
11. Conduct cardiopulmonary bypass with perfusionist.
12. Conduct post protamine ACT and Hgb.
13. Make sure the perfusion chart is complete with all charges, cell saver total, medications and times, and inputted into EPIC.
14. Breakdown pump and cell saver.
15. Move in new pump/ set up room/ cell saver/ shut off Nonin and pump O2 blender.
16. Restock OR room.
17. Debrief case with perfusionist and complete evaluation.

18. Set up pumps in pump room.

19. For TAVR cases: bring pump, cell saver, and all ancillary equipment to rm 6 cath lab. Set up room.

20. Students are expected to complete both cases (if there are 2) in their respected OR, or if there is a to follow case in another room unless stated otherwise by instructor.

Dr. Jennifer Walker

CABG:

- Aortic (22 Fr. EOPA)
- Venous (Edwards 29/37/02)
- Antegrade (Medtronic DLP straight)
- Octopus (Medtronic 5 armed vented)
- Mister blower
- White cap

AVR:

- Aortic (22 Fr. EOPA)
- Venous (Edwards 29/37/02)
- Antegrade (Medtronic DLP straight)
- Octopus (Medtronic 5 armed vented)
- 12 Fr. 90 and 45 degree ostial perfusers
- Pedi drop sucker
- LV vent for Intuity valve only (20 Fr. with VRV)
- White cap

MVR:

- Aortic (22 Fr. EOPA)
- Venous (2 28 Fr. right angled metal)
- Antegrade (Medtronic DLP straight)
- Octopus (Medtronic 5 armed vented)
- 3/8 X 3/8 X ½ connector
- Drop sucker
- Pump sucker
- Retrograde (15 Fr. Gundry manual inflating)
- White cap

Observations:

- Drift to 34 degrees
- Do no RAP
- Checks pressures of distals by running at 50cc/min through vein graft
- Axillary cannulation via ¼ X 3/8 connector for circ arrest. Cool to 18 degrees.
- IABP: ½ augmentation, rate of 40
    1. Semi-auto
    2. Trigger source: internal
    3. Pump options: internal rate 40 BPM
    4. Lower augmentation halfway
    5. Restart IABP
    6. Unplug slave cable so it doesn't alarm
    7. Plug back in when XC comes off and rhythm is established
    8. Operation mode back to auto with full augmentation

CABG:

- Aortic (7.0mm Soft Flow)
- Venous (Edwards 29/37/02)
- Antegrade (Medtronic 14 Ga. WITH vent)
- Octopus (non-vented)
- Mister blower
- Cool to 32 degrees

AVR:

- Aortic (7.0mm Soft Flow)
- Venous (Edwards 29/37/02)
- Antegrade (Medtronic 14 Ga. WITH vent)
- Octopus (non-vented)
- Retrograde (Edwards RC2012)
- Pump sucker
- Pedi drop sucker
- Cool to 30 degrees

MVR:

- Aortic (7.0mm Soft Flow)
- Venous (Right angled metal 24 Fr. with a 28 or 30Fr. Straight Medtronic (by ACT cartridges))
- Antegrade (Medtronic 14 Ga. WITH vent)
- Octopus (non-vented)
- Retrograde (Edwards RC2012)
- Pump sucker
- Drop sucker
- 3/8 X 3/8 X ½ connector
- Cool to 30 degrees

VAD:

- Aortic (possibly 22Fr. EOPA Arterial **if doing valve or redo,** 7.0mm Soft Flow if not doing valve- have both ready)
- Venous (Edwards 29/37/02 if not doing valve, 24 Fr. right angled metal with 28-32 Fr. straight if valve)
- No cardioplegia
- Octopus not used
- Pump sucker
- Drop sucker
- CO2 filter
- Stay warm (<36.5)

Aortic dissection:

- Aortic (axillary 8mm graft with 7.0mm Soft Flow)
- Venous (Edwards 29/37/02)
- Y the arterial line with 3/8 Y
- 14 Fr. Argyle PA vent with VRV
- Retrograde (Edwards RC2012)
- Refers to antegrade cerebral perfusion as SACP

Last modified 2/7/20

Dr. Ricardo Bello

CABG:

- Aortic (22 Fr. 3D EOPA)
- Venous (Edwards 29/37/02. If 100Kg or larger, ask about 36/46)
- Antegrade (Medtronic DLP straight)
- Octopus (Medtronic 5 armed vented)
- Mister blower
- Drop sucker
- White cap
- Cool to 34 degrees. Rewarm on your own.

AVR:

- Aortic (22 Fr. 3D EOPA)
- Venous (Edwards 29/37/02. If 100Kg or larger ask about 36/46)
- Antegrade (Medtronic DLP straight)
- Octopus (Medtronic 5 armed vented)
- 12 Fr. 90 and 45 degree ostial perfusers. DLP mushroom tip if ostia are very large. 100cc/min.
- CO2 filter
- LV vent (20 Fr.), VRV, and pedi drop for Intuity valve only
- Retrograde (15 Fr. Gundry manual inflating) ONLY for severe AI- ask.
- White cap
- Cool to 32 degrees. Rewarm on your own.

MVR:

- Aortic (22 Fr. 3D EOPA)
- Venous (Two Medtronic DLP metal right angle. Usually 24 and 28 Fr.)
- 3/8 X 38 X ½ connector
- Antegrade (Medtronic DLP straight)
- Octopus (Medtronic 5 armed vented)
- Drop sucker
- White cap
- CO2 filter
- Cool to 32 degrees. Rewarm on your own.

TVR:

- Aortic (22 Fr. 3D EOPA)
- Venous (Two Medtronic DLP metal right angle. Usually 24 and 28 Fr.)
- 3/8 X 38 X ½ connector
- Antegrade (Medtronic DLP straight)
- Octopus (Medtronic 5 armed vented)
- Drop sucker
- White cap
- CO2 filter
- Drift to 34 degrees. Rewarm on your own.
- May not cross clamp

Observations:

- When flowing through vein grafts, pressure should equal systemic pressure.
- RAP
- Induction dose: 1000cc. If retro is in, 700 cc antegrade, 300 cc retrograde
- Maintenance doses: 250cc
- Will give a warm shot occasionally
- Pause IABP during pump run
- Retrograde (94115T 15 Fr. Gundry)
- Add another suction line into orange with a drop sucker for axillary cannulation
- For femoral arterial or venous cannulation, he needs Maquet dilator pack.

Surgeon Surgical Preferences

Dr. Jennifer Walker

She is very easy to work with; if you ever have any questions don't feel guilty to ask. I would always say ask her if you are not sure.

Case Preferences:

- For all "standard cannulation" (right atrium, ascending aorta) cases she will use a 29/37 triple stage venous. She will use a Medtronic 22 french EOPA arterial cannula.
- She will use a Medtronic DLP 10014 straight (non-Y'ed) cardioplegia/vent cannula and a 5-armed octopus (RF 14001) for plegia.
    - The 5-armed octopus will connect to your antegrade plegia line and your vent.
    - Dr. Walker is very good about telling you how to deliver you plegia (i.e. vent on/off at what rate and what dosage amount or time frame).
    - 1st dose is 1 liter.
- Retrograde she'll only use if she cannot use antegrade all the time (AVR, that aren't intuity, MVR and special cases). Will use manually inflating 94115T Gundry.
- Most AVR cases Dr. Walker will use the Edwards intuity valve (3 anchor points and then a balloon will inflate it) and this is a quick process. She'll use 12Fr 90° and 45° handheld ostial perfusers, pediatric drop suction, and LV vent with Vacuum Release Valve. Suction will be on orange, Aortic root vent on black, and LV vent on green typically.
- Will use a mister blower on every CABG
- For mitral valves and other cases that require bicaval cannulation, Dr. Walker will use two metal 28 french right angled venous cannulae, a ½,⅜,⅜ Y'ed connector, drop sucker and pump sucker.
- For circulatory arrest cases, Dr. Walker will cannulate the axillary artery using a ⅜ by ¼ adaptor and a graft off the axillary. However, she will usually cannulate the aorta as normal.

Approach to Perfusion

- Dr. Walker will typically tell you everything she wants in clear and concise statements. For example, if you are about to run cardioplegia Dr. Walker will say, "Run 900 of plegia at 250" and you will just keep repeat the communication.
- For cooling and rewarming the same is true in that she'll tell you when to drift, cool and rewarm and what temperatures. Usually drift to 34.
- For CABGs Dr. Walker will do all the distals first, the LIMA, and then the proximals. She may have you run pelgia down the vein grafts at 50 cc/min to test the graft and then run the plegia for 1 minute as a dose.
- CO_2 through Mister Blower on CABGs and just CO2 for every valve heart procedure.
- For her LV vent she'll typically tell you to run it at 5 or 10 (0.05 [50 cc/min]) - .10 [100 cc/min])
- Balloon pump set at internal rate of 40 and ½ augmentation during bypass

Dr. Ricardo Bello

Dr. Bello is harder to work with as he does mumble and does not project his voice while you are on pump. He also likes to listen to music, so don't feel bad if you must turn it down a little so you can hear. He expects you to know exactly where you are in the case, so it is very important for you to get ahold of his routine.

He is a very nice surgeon (cracking jokes and usually in a good mood). And he is easy going. Uses a lot of the same equipment and procedure as Dr. Walker and they will sometimes work together on large cases.

Case Preferences:

- His standard cannulation is 22Fr. **3D** EOPA aortic and 29/37 triple stage venous for right atrium.
    - Will use 36/46 venous in patients over 100kg sometimes.
- Uses the same antegrade setup as Dr. Walker (5-armed octo and straight needle)
    - Dr. Bello will not usually tell you what to run the plegia at as long as it is a routine case. (Liter of antegrade and 250 subsequent doses)
- His retrograde is the same as Dr. Walker 94115T 15Fr. Gundry. He will use retrograde and a LV sometimes on cases where the patient has AI for his CABGs or when he is concerned about fully occlusive coronaries and wants to ensure his protection.
    - I would say ask if it is not a routine looking CABG.
    - Will have you give ante and retro for induction, but he'll usually tell you the amount; be sure to communicate with him because it's not always clear.
- LV vent is 20Fr. Medtronic 12002 with Vacuum Release Valve. He runs he vent much higher than Walker does. (.20 [200 cc/min] – .40 [400 cc/min])
- CO_2 for every valve/ open heart procedure.
- For AVRs, standard cannulation and Bello will typically use both retrograde and ostial perfusion as well as an LV vent.
    - For ostial perfusion, same as Dr. Walker 45° & 90° 12Fr. Handheld.
- For MVRs, you'll use two Medtronic DLP metal right angle venous cannulae (usually 24 & 28Fr). If you have a large or smaller patient, just ask what he wants to use.
- Cool to 32 degrees for any type of valve, drift to 35 degrees for cabg, and rewarm (on your own) when he begins to tie down the valve (sooner if he is using the intuity) or is on the LIMA.
- **For circulatory arrest cases, there is a diagram in the case preferences binder that outlines his cannulation approach.**
- For femoral cannulation or ECMO he will ask for the Maquet dilator pack RF12210

Approach to Perfusion

- Dr. Bello will use a drop sucker on every case, usually on orange. When ACT is good for bypass turn on sucker at 250mL/min.
- When running up the plegia, he won't tell you to stop flushing up (sometimes the PA will) so you must be aware of when you should turn it off
- For CABGs, he will work very similarly to Dr. Walker in that he will do all of his distals, his LIMA and then his proximals.
    - He'll usually say to run one, or two and this will correspond to how many distals you are running plegia. Your pressure for the plegia should be close to systolic (120 mmhg). Make sure aortic root vent is off.
    - You should start to rewarm (on your own) usually when he's on his LIMA, but may want to delay if you have a large number of proximals
    - Will ask you to fill the root, or heart for his proximals; so give him volume by pinching the venous line or fill the root by giving cardioplegia. Cardioplegia doses during his proximals may be more than 250 cc. That is because he is trying to deair root which is normal.
    - Plegia doses are typically 1 liter antegrade, then 250 subsequent doses antegrade and or down distals.
    - Warm blood hot shot before taking off cross clamp.
- Keep your aortic vent on always, he likes it at about 250ml/min.
- Before taking the cross clamp he will run warm blood. Be ready for this as he typically doesn't tell you to warm so you have to know when his last proximal is/ when he is going to take the clamp off.
    - He will typically run warm retrograde if the option is available but will run antegrade if the option is not.
- He will have you pause the balloon pump while you are on pump.
    - Go to Semi-Auto mode, then select internal for trigger, and then hit pause and remove the EKG replica cable to keep it from alarming.
        - Don't forget to plug the EKG replica cable back in before starting back up the IABP.

Dr. Leora Balsam

Dr. Balsam is quiet but very clear with her commands. Not as chatty as the other two, but still very friendly and approachable. I would definitely ask for her preference if the case was something other than a routine CABG or AVR.

Case Preferences

- Her standard cannulation is the 7.0mm Soft Flow arterial and the 29/37 triple stage venous for all patients
    - She will typically ask you to use vacuum for larger patients as opposed to using the larger cannula
    - For redo sternotomies she will use the 22Fr. EOPA without the leur lock (located below the ACT cartridges)
- For her antegrade cardioplegia she will use the 4-armed octopus (RF 14000) and the aortic root cannula with integrated vent (RF 20014)
- For retrograde she will typically use the auto-inflating Edwards RC2012.
- For her PA vent she will use the 14Fr. Argyle vent and VRV.
- For her AVRs she will use the 90° ostial perfuser and a pump sucker.
    - She may ask for the LV vent with VRV
- For MVRs, she will use a right angled metal tipped 24Fr. and a 28Fr. straight single stage cannulae.
    - She will also use retrograde, a pump sucker and a drop sucker.
- For (centrimag) VADs she will use the 22Fr. EOPA 3D arterial and the 32 or 36Fr. Straight Medtronic Malleable Venous (for LV or LA drainage)
    - Both are found on rack below retrograde cannulas
    - The arterial will be put inside a gel-weave graft and sewn onto the aorta.
    - Will use a 31Fr. right angled metal tipped venous for RA cannulation
- For her circ arrest cases she will cannulate the axillary artery with a 7mm soft flow cannula and also use this for antegrade cerebral perfusion.
    - She will use retrograde, a LV vent, pump sucker and you will need a 3/8'' wye plus extra 3/8'' tubing.
    - She will redose cardio after she initiates circ arrest

Approach to Perfusion

- For her CABGs she will do her anastamoses distal-proximal, distal-proximal and then finish up with the LIMA.
    - She will ask you to fill the heart in order to measure the grafts before she does the proximals and have you give a dose to fill the root before she punches for the proximals.
    - 1000mL initial dose and 250mL subsequent doses after every 20 minutes.
- She will sometimes ask if you and anesthesia if you want to RAP
- You should have vacuum ready to be used because it is the first thing she will ask for when you have poor venous drainage Use Argyle specimen trap attaching it to reservoir.
- She will have you cool to 32, if you need to you can add ice to the water bath, but with the heating blanket off you should be able to drift to 32°C
- She will have you rewarm to 37.5°C **venous**.
- Will have you turn the balloon pump onto standby for the pump run same as Bello cases.

CVP 6198 Introduction to Biostatistics
Cross-listed with MDCRC 6000 Introduction to Biostatistics

Fall Semester

Fully online pre-recorded lectures, so no class days or times.

Revision date: 5 Nov 2022

Instructor

Greg Stoddard (professional biostatistician)
Co-Director, Study Design and Biostatistics Center
https://ctsi.utah.edu/cores-and-services/triad/sdbc
Adjunct Assistant Professor, U of Utah School of Medicine, Department of Orthopaedics
Adjunct Associate Professor, U of Utah School of Medicine, Department of Family and Preventive Medicine
Home Department: Division of Clinical Epidemiology, Department of Internal Medicine

Email: greg.stoddard@hsc.utah.edu
Phone Number: 801-213-3774 (email is a better way to reach me)
Office Location: Williams Building, 295 Chipeta Way Room 1N433

Office Hours

By appointment only. Please email to set up a zoom meeting, phone conversation, or we can meet in person at my office in the Williams Building. You are welcome to meet with me as many times as you need during the semester.

Availability to Answer Statistics Questions Not Related To Class (During Fall Semester)

You are welcome to approach me while you are in my class with questions about statistics that are not even related to the course material. This is particularly useful to you as you analyze your own data and want to confirm you are approaching the analysis correctly. I will consider this normal instructor "office hours."

Availability to Answer Statistics Questions Not Related To Class (After Fall Semester)

I take the view that all faculty at the University have a teaching mission and should be open to talk to students. So, you are welcome to approach me after the class is over with questions about statistics.

Prerequisites

No previous experience with statistics is required. The course begins with the basics.

Semester Credits

2 credits

Registration
The class is shown in the U of U Summer 2023 class schedule, under the department MDCRC (Medicine Clinical Research Center). If you need a permission code, or other assistance with registration, Kellie Brown can help you.

Kellie E. Brown, M.S.
Utah Clinical and Translational Science Institute
University of Utah
801-581-2302
kellie.e.brown@hsc.utah.edu

Master of Science in Clinical Investigation (MSCI) Student Advisor
Although our courses use the MDCRC course numbers, this is a core course in the University's MSCI program. The MSCI student advisor is Kellie Brown.

Summer Intensive Schedule (July 11 to August 5)
Students in the MSCI program go through a four-week summer intensive, July 11 to August 5, 2023, so that is the official start and end date for this course. However, since everything for this course is fully online in Canvas, with no class meeting times, you are welcome to begin as soon as the class is made available in Canvas and proceed at your own pace. The official day that instructors must turn in grades is Monday, August 15. So, for this MDCRC 6000 course, you have until Sunday, August 14, to turn in the assignments in Canvas and finish the exams in Canvas.

Required Materials
No textbook is required. The course manual, which is an electronic textbook written by the instructor, is provided as a free download in Canvas and from Ubox.

While you are in this course, the fastest way to get the course manual is download it from the Canvas course home page.

A few years ago, the course manual was online at

http://medicine.utah.edu/ccts/sdbc/stoddard_textbook.php

which is the website shown as the suggested citation on the first page of each chapter in the course manual, but was taken off while some copyright issues are being resolved. Work is in progress to put it back online.

For now, the course manual can be found online outside of Canvas as a zip file in UBox for anyone with a University ID number. To get access, copy the following link into your Web browser:

https://uofu.box.com/s/2fm1yi9jqvttwy9mtzrac4pqu6wh7qdg

After you provide your University ID and password, it will take you to a folder with the following three zip files:

Biostats & Epi With Stata.zip
Biostats & Epi with R.zip
Biostats & Epi with Stata – Chapter pdf's.zip

The one you want is *Biostats & Epi With Stata.zip*, which contains the chapters as Word documents, the datasets, and the articles referred to in the chapters.

The *Biostats & Epi with Stata – Chapter pdf's.zip* is a work in progress, where the chapters are being converted to pdf files. These are helpful if the graphs or formulas do not appear to be shown correctly in the Word document chapters, which happens on some Mac computers.

The *Biostats & Epi with R.zip* is a work in progress where the chapters are being translated to the statistical software R. You are welcome to have that if you want it, but only Stata is being used in the course.

In this class, we will cover Chapters 2-1 to 2-10, 2-13, 2-19, 3-4, 3-7, part of 4-1, and 6-1 of the course manual. You can see the entire contents of the course by looking at these chapters in the course manual.

The Course, MDCRC 6000 (Biostatistics) Assumes That You Will Also Enroll in MDCRC 6030 Computer Practicum (Stata)

This class assumes that you will also enroll in MDCRC 6030 Computer Practicum (Stata), as the two courses are meant to be a set. That is, the details of Stata are not taught in the MDCRC 6000 class, because that would be duplication of material from the MDCRC 6030 class. The companion MDCRC 6030 course covers Chapters 1-1 to 1-8 and 1-14, which are the specifics of how to use Stata. A major part of every statistical analysis in real life is getting the data into shape before you analyze it. That is what the 6030 material is about, as well as Stata graphics. In the Fall semester, MDCRC 6000 (statistics) and MDCRC 6030 (Stata) are combined into a single course, which is MDCRC 6000 (statistics) because you really need both.

In the Summer semester, however, they are broken out into two courses to meet the demand for a Stata only course. These tend to be practicing statisticians or graduate statistic students who feel confident they already know statistics but simply want to gain experience with Stata.

Computer Statistical software

You will be given, without cost to you, the Stata version 17 statistical software, on a 35 simultaneous user network license. The license permits the software to be installed on as many computers as the network license manager, Greg Stoddard, chooses, but only 35 users are allowed to be running the software at exactly the same time. All lectures and homework assignments will use Stata. After the class ends, you are welcome to keep it installed on your computer, as long as you are still associated with the University of Utah (it is a University of Utah site license). The software will not expire, but new versions come out every two years (version 18 will come out June 2023). Enough new things are added with each new version that it is always worthwhile to upgrade to the next version when it becomes available. You can use the same Ubox webpage to download future versions of Stata for as long as you associated with the University of Utah.

You do not have to be expert with Stata--examples of how to use it for specific applications are shown in the course manual.

To install Stata/BE-17, which used to be called Stata/IC, go into Ubox by copying the following link into your Web browser:

https://uofu.box.com/s/oih2p0vrvdnxt0jygnpjbho3rh5t9g5w

Then, open the file "READ ME installation instructions" for instructions for installing Stata/BE-17. It runs on Mac, PC, or Unix.

If you are using a Mac, and you already have a previous version of Stata installed, you should uninstall the previous version first; otherwise, the Mac gets confused about which version to run.

You can install the Stata on as many computers as you need to make it convenient for you.

Stata/BE, where BE stands for "basic edition", contains the entire software package, but it does not allow extremely large datasets or utilize multiple processors on your computer. With BE, you can still have up to 2,048 variables in memory at a time, and 2.14 billon observations.

Stata Reference Manuals
When you install Stata, you have full access to the electronic copies of the reference manuals. To see them, open Stata. Then click on *Help* on the Stata task bar at the top of the Stata window. Then click on *PDF documentation* on the drop-down menu.

What if References Manuals Cannot Be Opened in Stata
Starting with version 17, I could not get the reference manuals to open on my PC when my default pdf reader was Adobe Acrobat. After I downloaded a free copy of PDF-XChange Editor, they opened just fine. Here is a webpage describing that issue if it happens to you:

www.stata.com/support/faqs/resources/pdf-documentation-tips/

Stata Command Cheat Sheets
If you want to have cheat sheets of many useful Stata commands, you can download them from the Stata webpage. Go to:

https://www.stata.com/bookstore/stata-cheat-sheets/

At the bottom of the screen, you will see a box with "Download the cheat sheets." Click on that and they will appear on your screen. Finally, right click your mouse and choose "Save" to actually download a pdf of them to your computer.

You do not need them, but it is fun to see what they are. Much of the material in the cheat sheets is beyond the scope of this course.

Optional Supplemental Videos
The official Stata website provides a long list of its own lecture videos which you might interesting. To see these, copy the following web address into your internet browser and go to that page:

http://www.stata.com/links/video-tutorials

Seeking Internet Help (Useful in Real Life, But Not Needed For the Course)
There exists a wealth of information about Stata on the Internet. In a search engine, like *Google*, type your question or keywords and add *Stata* as a keyword. You will almost always find an answer to your question.

The homework and exams, though, do not require you to go to the internet. Everything can be found in the course manual. On the Canvas home page, and in the Agenda section at the end of

this syllabus, you will see what pages of the course manual go with the homework problems, so you know right where to go in the course manual to find what you need to answer the homework problems.

Website for computing a wide range of statistics with Stata, Excel, R, Python, Google Sheets, SPSS, and the TI-84 calculator

Zach Bobbitt has a website that shows how to compute a wide range of statistics in several statistical packages. Go to:

https://www.statology.org/about/

Scroll down the page and you will see the hyperlinks to the different software packages:

> And if you want to learn how to use statistical software,
> I recommend the following guides:

- R Guides
- Python Guides
- Excel Guides
- SPSS Guides
- Stata Guides
- SAS Guides

There is no need to use Bobbitt's website for this course. However, you will find it is fun to go to one of his topics under the "Stata Guides" hyperlink, after you have learned that topic in this course, to discover you understand what you find there.

Course Description
Traditional statistics classes are taught using a formula approach. This class is very different. It teaches statistics using a research problem approach—how to solve the problem with software and what you need to know to solve actual research problems. A conceptual, intuitive approach to statistics is used, illustrating the concepts with simulation. Statistics topics include: errors in research, randomization, bias, confounding, descriptive statistics and graphs, levels of measurement, choosing a statistic, logic of significance tests, comparison of two groups, outliers, confidence intervals, reporting marginal significance, robustness to normality and to equal variance assumptions, multiple comparison adjustments, power analysis, correlation, linear regression, and diagnostic tests. In actual research, datasets always require some work to get them ready for statistical analysis. The companion class, MDCRC 6030, covers this data management step of a statistical analysis, where the data management is performed in the Stata statistical software. These Stata topics include: getting data into Stata, creating and recoding variables, data cleaning such as removing invalid scores, checking for duplicates, merging files, assigning labels to variables and values, and reshaping datasets. It also teaches some basic computer programming constructs, such as: operators, functions, looping, and if statements. Finally, it covers creating scientific graphs of the quality required for submission of manuscripts for publication.

Technical Level of the Course
This is an applied course, not theoretical. Instead of emphasizing mathematical formulas, it will emphasize how to get the computer to do the computations for you. The class will utilize computer simulation to illustrate points, but you will not be required to do these yourself. The course will cover many things that are not taught in other statistics courses, so there will be a lot of new information

even if you have had several previous statistics courses. A large number of solutions to practical problems, which other courses and statistics textbooks omit, will be covered in this class. The course will challenge a lot of ideas that statistics textbooks, instructors, statisticians, and journal reviewers propose, but justification for the challenge will always be provided in a supported, understandable way.

Course Outcomes
At the completion of this course, you will be able to understand statistics reported in research articles, be able to prepare the patient characteristics table and statistical methods section for your own research, perform the statistical data analysis of the many commonly encountered statistical problems using the Stata statistical software, have a good grasp of the underlying logic behind applying statistics to research problems, and be able to respond to journal reviewers on a large number of common reviewer requests. The goal of the course is to prepare you to analyze your own data.

The Reason for Making This a Fully Online Course
In past years, the course was offered in-class with the option to take it online. Interestingly, about 20 students would enroll each semester, but only two would ever come to class, because the online format was simply more popular. The online students did as well as the in-class students when in came to completing homework correctly, answering exam questions correctly, and achieving an A grade for the course. So, then the course was moved to be a fully online course, with optional lectures using zoom. That is, students were given the choice of completing the course on their own schedule or they could show up for the zoom lectures. Two students opted to attend the zoom lectures for the first session, but then stop attending because they decided it was just more convenient to complete the course on their own time. So, it was decided to just make the course fully online without scheduled zoom lectures.

Teaching and Learning Methods
Recorded lectures of the material are available in Canvas, but these are not "live" lectures that include in-class discussion. Many students find that reading the course manual is sufficient, and so they do not bother viewing the lecture videos. In fact, the course manual is designed to not require the video lectures. You can use any combination of reading or viewing lecture videos.

While you are in the course, the best way to view the lecture videos is to click on the links found on the home page of the Canvas course.

If you are interested in viewing the lecture videos after the class has ended, they can be found in Ubox. To get access to these, copy the following link into your Web browser:

https://uofu.box.com/s/1y1b5tuzj45cs2gpbh3nxtkuugp68c93

To make it more convenient, the correspondence between the videos and pages in the course manual are shown in the Agenda section below.

When you open a lecture video in Canvas, it appears in a small window. If you enlarge video, the video loses some resolution. A work around is to download the video to your computer first and then open it. To download it, click on the Download hyperlink, which looks something like *Download Ch 2-1 normal distribution – 5m.mp4*. On a PC, that downloads the video file to the Downloads folder. When you double click on it, it starts the video. If you want to stop the video before it ends, hit the "| |" icon at the bottom where you see the controls for sound, fast forward slider, etc.

The course manual is designed to be a look-up reference text for when you need it professionally, so it contains more material than the key points covered in the lectures. You are not responsible for the fine points, just the key points. If you can do the homework problems and answer the questions on the exams, you know you will have understood the key points that you are responsible for. Nobody is tracking whether you are reading the chapters, or watching the lecture videos. All that is tracked is the homework problems completed and uploaded into Canvas and the midterm exams taken in Canvas.

University Policies

This class complies with University policies:

6. ***The Americans with Disabilities Act***. The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.
7. ***Addressing Sexual Misconduct***. Title IX makes it clear that violence and harassment based on sex and gender (which Includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

More information about University polices can be obtained at:

a. Student Code: http://regulations.utah.edu/academics/6-400.php
b. Accommodation Policy (see Section Q): http://regulations.utah.edu/academics/6-100.php

Assignments

Homework is of two types:

1. *Required problems to turn in for grading*. These problems are found in Chapters 1-97, 2-97, 3-97, 4-97, 5-97, and 6-97. So, there is a homework chapter that goes with each section of the course manual. Your solutions will need to be uploaded to Canvas, and will count toward your class grade.
2. *Additional practice problems not turned in for grading*. These are optional, so do them only if you want additional practice. These problems are found in Chapters 1-98, 2-98, 3-98, and 5-98, with solutions found in Chapters 1-99, 2-99, 3-99, and 5-99. Fair less effort has gone into writing the x-98 chapters as has gone into the x-97 chapters, so the x-98 chapters are incomplete. For that reason, I do not recommend bothering with this additional practice. You will only notice these additional practice problems in the course syllabus. They are not even mentioned on the Canvas course home page.

Exams: there will be four midterm exams. A paper copy (Word document) of the exam is provided on the Canvas course home page, so you can work out the solutions before you take the exam. The exam questions are to be answered in Canvas, which has to be done in a single setting, so complete the exam on your paper copy first.

Turning in Assignments and Exams After the Suggested Date

Although a date is suggested for each homework assignment and exam, these are merely suggestions to that allow you to pace the material evenly across the semester. You are welcome to go at any pace you choose to. The only stipulation is that everything must be turned in by the day before the instructor must enter grades into the University's grading system. The official day that instructors must turn in grades is Monday, August 15, 2022. So, for this MDCRC 6000 course, you have until Sunday, August 14, 2022 to turn in the assignments in Canvas and finish the exams in Canvas.

Grading

Grades will be based two-thirds on the homework problems and one-third on the four take-home exams. Some of the questions will be conceptual, and some require computing statistics using Stata. You can miss a total of 8 exam questions during the semester, which is equal to 2 questions per exam, and still get an A, miss 12 questions during the semester, which is 3 questions per exam, and get a B, and so on. For the homework assignments, you will need to get 90% correct to get an A, 80% for a B, 70% for a C, and 60% or a D.

Updating the Course During the Semester

I plan to improve the course manual throughout the semester. If I do this, the course manual will be changing several times during the semester, which means you will have to download the new version from time to time. If you want to type notes in a chapter, save it to a new file name, such as adding "notes added" to the end of the Word document file name, or save it to another folder outside of the course manual, so you do not copy over it later and lose your notes.

Practicing With the Stata Commands As You Go (Optional)

All of the Stata commands seen in each chapter can be found in the course manual folder, datasets & do-files, with a do-file using the same chapter name (Ch 2-1.do, Chapter 2-2.do, …). If you want to see the commands in action, you can open that do-file for each chapter and execute the commands to see them in action as you read them in the course manual chapters.

The steps to using the do-files are:

Close Stata. Go to the course manual and double click on a do-file. This will open Stata and change the working directory to the "datasets & do-files" folder. That way, Stata will search for the data file in the correct folder when it attempts to open a data file. To execute one or more commands, highlight them with your computer mouse, then click on the execute button (looks like a triangle pointing to the right) to execute the commands. The execute button is the rightmost button on the do-file editor menu bar. If you click on the execute button without highlighting something first, it will execute the entire do-file. Beware that when you move your mouse to a line in the do-file, it creates a shadow on that line, but this is not a highlight. You have to move your mouse over the command manually to highlight it.

Pace of the Course

The course is designed as 3 class days each week for 4 weeks, where each class is 2 hours of lecture time. So, consistent with the pace the instructor would require if lecturing in person, it requires reading 40 pages from the course manual 3 times per week for 4 weeks (40 pages × 12 class sessions = 480 pages). The 40 pages comes from it taking 1 hour to cover 20 pages in an in-class lecture (a pace discovered from experience from when the course was originally offered as an in-person class), and each in-class session is 2 hours. You are welcome to go at any pace you want, or you can use the following schedule to pace yourself evenly across the 4 weeks.

Class Day	Chapter	assigned pages	page count	# of homework problems	general topic
Class 1	3-4	2-5	4	0	logical argument of scientific paper
Jul 11	3-7	1-18	18	1	randomization
	2-1	1-26	31	7	distributions
Class 2	2-1	27-56	30	6	descriptive statistics
Jul 13	2-2	1-10	10	0	statistical regularity
Class 3	2-2	11-46	36	1	logic of significance testing
Jul 15					
Midterm 1					
Class 4	2-3	1-4	4	0	choosing a test
Jul 18	2-4	1-48	48	5	comparing two groups
Class 5	2-4	49-84	35	2	comparing two groups
Jul 20					
Class 6	2-19	1-35	35	0	robustness of t-test
Jul 22					
Midterm 2					
Class 7	2-5	1-40	40	7	sample size & power comparing means
Jul 25	4-1	7-11	5	3	sample size & power comparing proportions
Class 8	2-6	1-19	19	0	levels of measurement
Jul 27	2-13	1-11	11	0	borderline significance

	3-4	1-14	14	0	philosophy of science
Class 9	2-8	1-39	39	3	multiple comparisons
Jul 29					
Midterm 3					
Class 10	2-8	40-64	25	1	multiple comparisons
Aug 1	2-10	1-15	15	2	linear regression/correlation
Class 11	2-10	16-34	19	2	linear regression/correlation
Aug 3	2-9	1-12	12	0	correlation effect sizes
	2-5	41-47	8	2	overfitting
Class 12	6-1	1-28	28	6	diagnostic tests
Aug 5					
Midterm 4					
Total			486	48	

What homework problems go with what course manual pages and with what optionally viewed lecture videos

Date	Lecture Materials and Assignments	Topics Covered
Class 1 Jul 11	■ view recorded lecture "Ch 3-4 disjunctive syllogism Olestra example" (22 min) ■ read Ch 3-3 "Hill's Causal Criteria", page 3 only (introduce the Cheskin study) ■ read Ch 3-4 "Logic & Errors", page 2, beginning with section Disjunctive Syllogism through page 4	- disjunctive syllogism - logical argument of a scientific paper - organization of a scientific paper
	■ view recorded lecture "Ch 3-7 randomization" (16 min)	- randomization methods

	■ read Ch 3-7 “randomize using excel”, all 18 pages ■ complete Homework_class1: Ch 3-97: ch 3-7 prob 1 ■ optional practice homework Ch 3-98: ch 3-7 problem 1 (preparing a randomization list)	
	■ view recorded lecture “Ch 2-1 frequency tables” (13 min) ■ read Ch 2-1 “describing variables”, pp.1-6 ■ complete Homework_class1: Ch 2-97: ch 2-1 prob 1	- frequency tables - missing data
	■ view recorded lecture “Ch 2-1 histograms” (10 min) ■ read Ch 2-1 “describing variables”, pp.7-16 ■ complete Homework_class1: Ch 2-97: ch 2-1 probs 2-4	- histogram - kernal density plot - mirror plot
	■ view recorded lecture “Ch 2-1 boxplots” (9 min) ■ read Ch 2-1 “describing variables”, pp.17-26 ■ complete Homework_class1: Ch 2-97: ch 2-1 probs 5 to 7	- box plot - box plot outlier identification - clustered box plot
Class 2 Jul 13	■ view recorded lecture “Ch 2-1 descriptive stats” (8 min) ■ read Ch 2-1 “describing variables”, pp.27-28	- descriptive statistics definitions
	■ view recorded lecture “Ch 2-1 normal distribution” (5 min) ■ read Ch 2-1 “describing variables”, pp.29-32	- historical account of normal distribution - normal distribution fits particularly well to distributions of errors - normal distribution formula - Stata “twoway function” for graphing any function
	■ view recorded lecture “Ch 2-1 normal approximation to distribution” (7 min) ■ read Ch 2-1 “describing variables”, pp.32-39	- normal approximation to histogram - mean and standard deviation properties of Normal distribution

		- purpose of mean±SD notion - left and right skewness
	■ view recorded lecture "Ch 2-1 standard error" (10 min) ■ read Ch 2-1 "describing variables", pp.40-44 ■ complete Homework_class2: Ch 2-97: ch 2-1 prob 8	- standard error of the mean (SEM) - verify using a Monte Carlo simulation Gauss' claim (on page 29 that measurement errors (errors in measuring the mean) follow a normal distribution - verify formula for the SEM with that same Monte Carlo simulation
	■ view recorded lecture "Ch 2-1 level of measurement" (21 min) ■ read Ch 2-1 "describing variables", pp.45-52	- levels of measurement - choosing the best descriptive statistic for a patient demographics table in manuscript - failure of mean±SD to bound middle 2/3 when distribution is skewed
	■ view recorded lecture "Ch 2-1 table and tabstat commands" (5 min) ■ read Ch 2-1 "describing variables", pp.53-62 ■ skip pp.63-94, which are specific to basic science) ■ complete Homework_class2: Ch 2-97: ch 2-1 probs 9 to 13	- "by" prefix to get subgroup analysis - table command for descriptive stats - tabstat command for descriptive stats
	■ view recorded lecture "Ch 2-2 statistical regularity" (15 min) ■ read Ch 2-2 "logic of significance tests", pp.1-10	- simple and conditional probability - probability distributions - laboratory reference ranges - statistical regularity (strong law of large numbers) - simulation of statistical regularity - sampling variability
Class 3 Jul 15	■ view recorded lecture "Ch 2-2 signal-to-noise ratio" (5 min)	- signal-to-noise ratio simulation - signal-to-noise ratio form of all

	■ read Ch 2-2 “logic of significance tests”, pp.11-14	significance tests
	■ view recorded lecture “Ch 2-2 sampling distribution” (7 min) ■ read Ch 2-2 “logic of significance tests”, pp.15-20	- sampling distribution of test statistic - t distribution
	■ view recorded lecture “Ch 2-2 definition of p value” (9 min) ■ read Ch 2-2 “logic of significance tests”, pp.21-26 ■ complete Homework_class3: Ch 2-97: ch 2-2 prob 1	- definition of p value - desired probability is an untractable problem - proof by contradiction - demonstration by improbableness - dysjunctive syllogism - “acceptance region” is a misleading choice of words - same statistics work for basic science and population science (one size fits all)
	■ view recorded lecture “Ch 2-2 reporting SD vs SEM” (10 min) ■ read Ch 2-2 “logic of significance tests”, pp.27-38	- when report SD and when to report SEM - 95% confidence intervals can overlap by 25% and still be statistically significant - cut-and-paste response to reviewer who tells you to report SD in place of SEM for study outcomes
	■ view recorded lecture “Ch 2-2 discrimination problem” (7 min) ■ read Ch 2-2 “logic of significance tests”, pp.39-46 ■ skip pp.44-52, which are specific to basic science)	- discrimination problem - mean profile plot with error bars - bar graph with error bars
	■ Midterm 1	

Class 4 Jul 18	■ view recorded lecture "Ch 2-3 choice of significance test" (7 min) ■ read Ch 2-3 "choice of significance test", pp.1-4, glance at rest of chapter to see what is there ■ optional practice homework Ch 2-98: ch 2-3 problems 1 to 2	- choosing a statistical test
	■ view recorded lecture "Ch 2-4 test for dichotomous outcome" (19 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.1-10 ■ complete Homework_class4: Ch 2-97: ch 2-4 probs 1 and 2	- properties of a confounding variable - p values in Table 1 for clinical trials - asymptotic vs exact tests - independent and dependent variables - two proportions z test - chi-square test - two proportions z test and chi-square test are identical tests in the 2 × 2 crosstabulation table case - preview of Fisher's exact test
	■ view recorded lecture "Ch 2-4 Fishers exact test is conservative" (10 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.11-17	- why chi-square test with continuity correction should not be used (and so is not available in Stata - conservativeness of Fisher's exact test - "exact" test does not mean "better" test
	■ view recorded lecture "Ch 2-4 choosing between chi-square and Fisher" (10 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.18-23 ■ complete Homework_class4: Ch 2-97: ch 2-4 prob 3	- choosing between chi-square test and Fisher's exact test - minimum expected cell frequency rule-of-thumb - expected cell frequencies - Barnard's unconditional exact test
	■ view recorded lecture "Ch 2-4 Fisher-Freeman-Halton test" (6 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.24-26	- Fisher-Freeman-Halton test for $r \times c$ tables

	■ complete Homework_class4: Ch 2-97: ch 2-4 prob 4	
	■ view recorded lecture "Ch 2-4 Wilcoxon-Mann-Whitney test" (11 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.27-32 ■ complete Homework_class4: Ch 2-97: ch 2-4 prob 5	- Wilcoxon-Mann-Whitney test
	■ view recorded lecture "Ch 2-4 WMW test porder option" (9 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.33-38	- Wilcoxon-Mann-Whitney test is not a comparison of medians - WMW test, P(X>Y) estimate of effect size
	■ view recorded lecture "Ch 2-4 WMW test another example and exact WMW test" (7 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.39-48	- example WMW test when medians are equal but p < .05 - reporting the WMW test P(X>Y) estimate of effect size - exact WMW test - rule of thumb for choosing between WMW test and exact WMW test
Class 5 Jul 20	■ view recorded lecture "Ch 2-4 central limit theorem" (11 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.49-53	- parametric and nonparametric tests - Central Limit Theorem (CLT) - simulation of CLT - CLT operates to make parametric tests robust to normality assumption
	■ view recorded lecture "Ch 2-4 two assumptions of t-test" (12 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.54-59 ■ complete Homework_class5: Ch 2-97: ch 2-4 prob 6 and 7	- two versions of independent sample t-test - homogeneity of variance (equal variance) assumption of independent sample t-test - Levene's equal variance test - normality assumption of t-test

		- Shapiro-Wilk normality test - robustness of t-test to these assumptions
	■ view recorded lecture "Ch 2-4 influence of outliers" (9 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.58-64	- influence of outliers on t-test - Wilcoxon-Mann-Whitney test is not influenced by outliers
	■ view recorded lecture "Ch 2-4 reporting styles" (16 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.65-71	- truncation approach to outliers - how many decimals to report for descriptive statistics - how many decimals to report for p values - reporting styles for two group comparison of showing means or medians - protocol or statistical methods section suggestion for an interval scale variable comparison
	■ view recorded lecture "Ch 2-4 Fisher-Pitman_test confidence_ intervals" (23 min) ■ read Ch 2-4 "comparison of 2 independent groups", pp.72-84	- Fisher-Pitman permutation test for independent samples - confidence intervals - relationship of confidence interval and significance testing - statistical tests to identify outliers - discussing outliers in articles - pre-specification of analysis
	■ (optional) read Ch 2-4 "comparison of 2 independent groups", pp.85-92	- mathematric proof that two proportions z test is identically the chi-square test for 2×2 table
Class 6 Jul 22	■ view recorded lecture "Ch 2-19 robustness_of_t-test_to	- robustness of t-test to normality and equal variance assumptions

	_assumptions" (24 min) ■ read Ch 2-19 "robustness of t-test", pp.1-33 basically skim read to see what is there	- Wilcoxon-Mann-Whitney is not a panacea, having problems of its own
	■ Midterm 2	
Class 7 Jul 25	■ view recorded lecture "Ch 2-5 definition_of_power" (11 min) ■ read Ch 2-5 "basics of power analysis", pp.1-8 ■ complete Homework_class7: Ch 2-97: ch 2-5 problems 1 and 2	- sample size determination and statistical power are based on statistical regularity - monotonic increasing power with increasing sample size
	■ view recorded lecture "Ch 2-5 decision_errors" (12 min) ■ read Ch 2-5 "basics of power analysis", pp.9-11	- decision errors (Type I and Type II errors) - diagnostic test logic - sensitivity and specificity - lack of statistical significance with high statistical power does not provide a logical argument for "no effect"
	■ view recorded lecture "Ch 2-5 one_or_two-sided_comparisons" (13 min) ■ read Ch 2-5 "basics of power analysis", pp.12-18	- power is a function of 5 things - one- or two-sided comparisons (one- or two-tailed tests) - number of tails affects power - ethically bound to always report a two-sided comparison
	■ view recorded lecture "Ch 2-5 sample_size_and_power_ calculation" (7 min) ■ read Ch 2-5 "basics of power analysis", pp.18-23 ■ complete Homework_class7: Ch 2-97: ch 2-5 problems 3 and 4	- choice of alpha affects power - difference in means affects power - SDs affects power - power calculation with *power* command - sample size calculation with *power*

		command
	■ view recorded lecture “Ch 2-5 five_items_for_power” (14 min) ■ read Ch 2-5 “basics of power analysis”, pp.24-28	- 5 items required for power or sample size calculation - range/6 and range/4 rule for estimating SD - obtaining SD from IQR - starting with power and N, computing the smallest effect you can detect
	■ view recorded lecture “Ch 2-5 standardized_effect_size” (9 min) ■ read Ch 2-5 “basics of power analysis”, pp.29-33 ■ complete Homework_class7: Ch 2-97: ch 2-5 problems 5 and 6 ■ optional practice problems: Ch 2-97: ch 2-5 problems 1 to 3	- standardized effects size (Cohen’s d)
	■ view recorded lecture “Ch 2-5 popularity_of_standardized_ approach” (12 min) ■ read Ch 2-5 “basics of power analysis”, pp.33-38	- reasoning behind Cohen’s d - protocol suggestion using standardized approach - protocol suggestion using actual means and SDs - published examples of sample size paragraphs
	■ view recorded lecture “Ch 2-5 large_sample_p_value_problem” (4 min) ■ read Ch 2-5 “basics of power analysis”, pp.39-40 ■ complete Homework_class7: Ch 2-97: ch 2-5 problem 7	- large sample p value problem - replace p values with confidence intervals when sample sizes are very large
	■ remainder of Ch 2-5 requires some later chapters be covered first—we will return to some of the remaining pages later	
	■ view recorded lecture “Ch 4-1 chi-square fisher” (6 min) ■ read Ch 4-1 “specific applications”, pp.7-11 ■ complete Homework__class7: Ch 4-97: ch 4-1 probs 1 to 3	- sample size and power for chi-square test - sample size and power for Fisher’s exact test

Class 8 Jul 27	■ view recorded lecture “Ch 2-6 summing_scale_items” (6 min) ■ read Ch 2-6 “more on levels of measurement”, pp.1-2	- sum of ordinal scale items produces an interval scale
	■ view recorded lecture “Ch 2-6 ordinal_analyzed_as_interval” (12 min) ■ read Ch 2-6 “more on levels of measurement”, pp.3-6	- visual analog scales (VAS) are interval scales - 11 tick marks is an interval scale - treating ordinal scale as interval opens you to criticism, but the criticism is not actually justified
	■ video lecture not yet available ■ read Ch 2-6 “more on levels of measurement”, pp.7-13	- support for treating ordinal scale as interval scale
	■ view recorded lecture “Ch 2-6 dichotomous_is_interval_descriptive_ stats” (7 min) ■ read Ch 2-6 “more on levels of measurement”, pp 10 to 16	- both outcome and predictor variables in linear regression model must have at least an interval scale - psychometrician argument that dichotomous variable (scored 0 or 1) is an interval scale - treating dichotomous variable as interval scale works for descriptive statistics demonstration - Bernoulli variable - population standard deviation
	■ view recorded lecture “Ch 2-6 dichotomous_is_interval_test_stats” (4 min) ■ read Ch 5-3 “more on levels of measurement”, pp 17 to 19	- treating dichotomous variable as interval scale works for test statistics demonstration - t-test and chi-square test in 2 x 2 crosstabulation table are algebraically identical tests

	■ skip pages 20-21 which is specific to basic science	
	■ view recorded lecture “Ch 2-13 confidence_intervals” (11 min) ■ read Ch 2-13 “reporting CIs vs P values”, pp.1-3	- confidence intervals contain much more information than p values - published example of using confidence interval graph (forest plot) to make claims without using p values
	■ view recorded lecture “Ch 2-13 marginally_significant” (14 min) ■ read Ch 2-13 “reporting CIs vs P values”, pp.4-11	- Fisher’s retraction of $p<0.05$ cut-off for statistical significance - arguing $0.05<p<0.10$ as marginally significant
	■ view recorded lecture “Ch 3-4 disjunctive_syllogism errors_in_publications” (15 min) ■ read Ch 3-4 “Logic and Errors”, pp 1-7	- Hume’s refutation of induction - Popper’s deductive testing of theories - Proof in science - disjunctive syllogism - IMRAD structure of research article - Errors in published research
	■ view recorded lecture “Ch 3-4 paradigm_eras” (12 min) ■ read Ch 3-4 “Logic and Errors”, pp 8-14	- Stoddard’s aphorism - paradigm eras - prepostivist era - postivist era - postpositivist era - paradigm transitions - bloodletting and beliefs
Class 9 Jul 29	■ view recorded lecture “Ch 2-8 how_multiplicity_arises” (11 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.1-5	- multiple comparison problem - multiplicity (a fancier name) - Monte Carlo simulation of multiplicity - 5 ways multiplicity arises in clinical trials

	■ view recorded lecture “Ch 2-8 p_value_adjustment_procedures” (14 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.6-10 ■ complete Homework_class9: Ch 2-97: ch 2-8 prob 1	- formula for inflation of alpha - revised Monte Carlo simulation of multiplicity - multiple comparison adjustments are expected - p value adjustment procedures (Bonferroni and Holm’s)
	■ view recorded lecture “Ch 2-8 propagation_of_Bonferroni” (7 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.11-14	- more p value adjustment procedures (Šidák, Holm-Šidák, Hochberg, Finner’s, Hommel’s) - unfortunate propagation of Bonferroni, resulting in loss of deserved research findings
	■ view recorded lecture “Ch 2-8 math_proofs_for_Holms” (9 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.14-18	- mathematical proofs that Holm’s maintains alpha as well as Bonferroni - protocol suggestion for describing multiple comparison procedure - correlated endpoints situation (Tukey-Ciminera-Heyse procedure)
	■ view recorded lecture “Ch 2-8 install_mcpi” (5 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.18-20	- installing *mcpi* command and other commands in *ado files* section of course manual - *sysdir* command to reveal where Stata searches for *ado* files (program files)
	■ view recorded lecture “Ch 2-8 mcpi_command” (7 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.21-24 ■ complete Homework_class9: Ch 2-97: ch 2-8 prob 2	- *mcpi* command to get adjusted *p* values

	■ view recorded lecture “Ch 2-8 primary-secondary” (9 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.25-28	- primary-secondary approach to multiplicity
	■ view recorded lecture “Ch 2-8 misconception_that_anova_is_ required (8 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.29-33	- misconception that analysis of variance (ANOVA) must precede pairwise multiple comparisons - conservativeness of ANOVA
	■ view recorded lecture “Ch 2-8 false_discovery_rate (6 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.33-38 ■ complete Homework_class9: Ch 2-97: ch 2-8 prob 3	- false discovery rate - Benjamini-Hochberg procedure
	■ Midterm 3	
Class 10 Aug 1	■ view recorded lecture “Ch 2-8 win_criteria_approach (9 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.40-47	- win criteria (clinical decision rule) Approach - Moonblast energy drink example
	■ view recorded lecture “Ch 2-8 reporting_comparisons_separately_approach (10 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.48-49	- reporting and discussing comparisons separately approach
	■ view recorded lecture “Ch 2-8 when_to_use_global_test (7 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.50-54	- global test only useful in Table 1 “patient characterisics” - comparing 3+ groups on dichotomous outcome - comparing 3+ groups on nominal outcome
	■ view recorded lecture “Ch 2-8 ordinal_outcome_comparison” (5 min)	- comparing 3+ groups on ordinal outcome

	■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.54-57	- Kruskal-Wallis analysis of variance
	■ view recorded lecture “Ch 2-8 interval_outcome_comparison” (6 min) ■ read Ch 2-8 “multiplicity and comparison of 3 or more independent groups”, pp.58-64 ■ complete Homework_class10: Ch 2-97: ch 2-8 prob 4	- comparing 3+ groups on interval outcome - one-way analysis of variance
	■ view recorded lecture “Ch 2-10 extending_t-test” (8 min) ■ read Ch 2-10 “linear regression”, pp.1-5 ■ complete Homework_class10: Ch 2-97: ch 2-10 probs 1 and 2	- mimicking bench experiment with regression model - linear regression extends t-test to allow control for potential confounders (covariates)
	■ view recorded lecture “Ch 2-10 controlling_for_covariates” (10 min) ■ read Ch 2-10 “linear regression”, pp.6-11	- adding covariates to model - 10% change-in-effect variable selection rule - adding restriction to model
	■ view recorded lecture “Ch 2-10 mean-centering” (11 min) ■ read Ch 2-10 “linear regression”, pp.12-15	- restriction vs representativeness - pragmatic (health services) research - mean-centered models
Class 11 Aug 3	■ view recorded lecture “Ch 2-10 holding_constant” (4 min) ■ read Ch 2-10 “linear regression”, pp.15-21	- *predict* command to obtain predicted values - multivariable prediction equation
	■ view recorded lecture “Ch 2-10 perpendicular distance” (5 min) ■ read Ch 2-10 “linear regression”, pp.21-28	- geometric intrepretation of holding constant - perpendicular distances between groups
	■ view recorded lecture “Ch 2-10 correlation” (9 min) ■ read Ch 2-10 “linear regression”, pp.29-34 ■ complete Homework_class11: Ch 2-97: ch 2-10 probs 3 and 4	- correlation - Pearson r, Multiple R - coefficient of determination

	■ read Ch 2-9 “correlation”, pp.2-4 (no video lecture available)	- interpreting the size of correlation - futility of a rule of thumb for size of correlation
	■ read Ch 2-9 “correlation”, pp.5-7 (no video lecture available)	- futility of correlation with small sample sizes
	■ view recorded lecture “Ch 2-5 overfitting” (9 min) ■ read Ch 2-5 “basics of power analysis”, pp.41-47 ■ complete Homework_class11: Ch 2-97: ch 2-5 problems 8 to 9	- overfitting - graphical illustration of overfitting - rule-of-thumb to avoid overfitting
Class 12 Aug 5	■ read Ch 6-1 “test characteristics”, pp.1-4	- reference standard - simple and conditional probability notation - binary reference standard and binary diagnostic test situation - test characteristics: sensitivity, specificity, positive predictive value, negative predictive value, disease prevalence, accuracy - always say no diagnostic test
	■ read Ch 6-1 “test characteristics”, pp.5-11 ■ complete Homework_class12: Ch 6-97: ch 6-1 prob 1 to 5	- *diagt*, *diagti* commands - *reversetab* command - uterine_cancer.dta dataset
	■ read Ch 6-1 “test characteristics”, pp.12-19 ■ complete Homework_class12: Ch 6-97: ch 6-1 prob 6	- Bayes’ formula to determine probability of disease - Bayesian prior and posterior probabilities - detecting a useless test - *prev* option to the *diagt*, *diagti* commands to apply Bayes’ formula
	■ read Ch 6-1 “test characteristics”, pp.20-25	- confidence intervals for a proportion

		- simulating coverage probabilities - rule-of-thumb for when Wald CI can be used - FDA preference for Wilson CI
	■ read Ch 6-1 “test characteristics”, pp.26-28	- diagnostic testing likelihood ratios - ROC curves
	■ Midterm 4	

Note: This syllabus is meant to serve as an outline and guide for the course. Please note that I may modify it with reasonable notice to you using a Canvas announcement.

CVP 6801 - Advanced Topics in Perfusion

Fall Semester

Instructor: Jessica Russ
Email: jessica.russ@hsc.utah.edu
Phone Number: 928-368-7497
Office Hours: Appointment

Required Materials
Access to Canvas

Summary: One (1) credit, Pass/Fail, Second Year, Fall Semester

Prerequisites for this course are as follows:
CVP 6002 Perfusion Science 2
CVP 6020 Perfusion Lab 2
CVP 6200 Research Methodologies
CVP 6201 Masters Project 1
CVP 6301 Procedure Observations and Lectureships 1
CVP 6401 Perfusion Anatomy, Physiology and Surgical Repair
CVP 6502 Interdisciplinary Healthcare 2
CVP 6701-6702 Clinical Rotations 1 and 2

Course Description
This is an online course presenting information on special and advanced perfusion techniques. Topics of study include perfusion strategies for the following patients: pregnant patient, clotting irregularity patient, Jehovah's Witness patients, Infectious diseases patients, elderly patients, diabetic patients, organ transplant patients, aortic surgery patients, emergency cardiopulmonary bypass patients, and HIPEC patients. The course is concurrent with clinical rotations, and serves to supplement clinical practice. This course will also prepare you for the clinical board examinations.

Course Outcomes
By the end of this course, you will be able to:

- Discuss perfusion strategies for a pregnant patient
- Discuss perfusion strategies for patients with clotting irregularities
- Discuss perfusion strategies for Jehovah's Witness patients.
- Discuss perfusion strategies for patients with Infectious diseases
- Discuss perfusion strategies for elderly patients
- Discuss perfusion strategies for diabetic patients
- Discuss perfusion strategies for organ transplants
- Discuss perfusion strategies for aortic surgery
- Discuss perfusion strategies for emergency cardiopulmonary bypass
- Discuss strategies for HIPEC

Teaching and Learning Methods
Course material will be presented on Canvas, along with references for further exploration. Students will be encouraged to discuss the topic with their preceptor, as well required to make a post in the Canvas discussion relating to their experience with the topic. The idea is to encourage collaboration with your peers, as well as develop a solid resource to use for future reference.

Assignments
Topics will be made available on canvas at the beginning of the week (Monday, at 12:01am) and will close on Sunday at 11:59pm). Each student must post to the course discussion board, and reply to one other student's post weekly.

Grading Policy (Evaluation Methods & Criteria)
This course will be Pass/Fail; All grades for assignments must average out to be higher than 70% to pass this course.

Grades			
Grade	%	Grade	%
A	95-100	B-	76-79
A-	90-94	C+	72-75
B+	86-89	C	70-71
B	80-85	Below C	Course Fail
	Scores will be rounded up:		
	Example: 94.4 = 94		
	94.5 = 95		

Point grades/percentages earned will be rounded up to the nearest full percentage point. For example, a 94.5 will be rounded up to a 95. On the other hand, a score of 94.4 will be rounded down to 94. To pass this course, the final grade MUST be 70% or higher. Final grade is reported as a whole number.

Course Schedule

DATE	TOPIC/DISCUSSION	SUGGESTED READING
Week 1:	**Aortic Surgery**	
Week 2:	**Elderly Patient**	
Week 3:	**Emergency CPB**	
Week 4:	**Diabetic patient**	
Week 5:	**Obese patient**	
Week 6:	**Transplant patient**	
Week 7:	**Jehovah's Witness**	
Week 8:	**Pregnant Patient**	
Week 9:	**Infectious Disease patient**	
Week 10:	**Cold Agglutins Patient**	
Week 11:	**HIPEC Patient**	
Week 12:	**Sickle Cell patient**	
Week 13:	**Hemophelia-A (VIII Deficiency)**	

Finals Week:

Note: This syllabus is meant to serve as an outline and guide for our course. Please note that it may be modified with reasonable notice. Any changes will be announced in class and posted on Canvas under Announcements.

CVP 6802 - Board Certification Prep

Spring Semester

Instructor: Brandon Tomecek
Email: Brandon.Tomecek@hsc.utah.edu
Phone Number: 623-302-1730
Office Hours: Appointment

Required Materials

- The Manual of Clinical Perfusion, Second Edition Updated; Bryan V. Lich and D. Mark Brown; perfusion.com, Inc.; 2004. (ISBN: 0-9753396-0-5) (If Desired)
- Cardiopulmonary Bypass Principles and Practice, 3rd Edition; Glenn P. Gravlee, Richard F. Davis, Alfred H. Stammers, Ross M. Ungerleider; 2008 Lippincott Williams; Wilkins, Philadelphia, PA. ISBN: 0-7817-681502 (If Desired)

Summary: One (1) credit; Pass/Fail, Second Year, Spring Semester

Prerequisites for this course are as follows:
CVP 6002 Perfusion Science 2
CVP 6020 Perfusion Lab 2
CVP 6200 Research Methodologies
CVP 6201 Masters Project 1
CVP 6301 Procedure Observations and Lectureships 1
CVP 6401 Perfusion Anatomy, Physiology and Surgical Repair
CVP 6502 Interdisciplinary Healthcare 2
CVP 6701-6705 Clinical Rotations 1 through 5

Course Description

This course is designed to help each student prepare themselves to take the basic science and clinical application exams to become a certified clinical perfusionist. This online course will help prepare students during their final rotations to help replicate questions which will assist them in the test-taking process, as well as staying sharp in basic science topics and clinical application of perfusion knowledge. Sample exam questions will be given regularly and recommended study techniques will be shared to help each student identify which study technique best suits them.

Course Outcomes

By the end of this course, students will be able to:

- Be more prepared to take both certification exams
- Identify pertinent areas of study for each individual, to help them better prepare for each examination.
- Identify exam layout and understand how each exam will be administered
- Identify which method best prepares them for each exam

Teaching and Learning Methods

This course is designed to help prepare students for taking their certification exams after completion of the perfusion program. This online course will offer students the chance to take short tests each week that will attempt to help recreate the certification exam. The questions asked will offer students the opportunity to identify subjects they should emphasize in their studies and help them realize subjects they should focus on. Students will also be given various study methods for preparing for the exams, to help them potentially identify a method which may be successful for them. Students will be directed to specific materials, including books or websites, which will help them know what information is pertinent for them. Students will also be given details on where testing centers are located and guidelines that the testing centers have that they should be aware of.

Assignments
Weekly assignments will be provided. Each assignment will be multiple choice, with options A-D, just as will be seen on the certification exams. Each assignment will cover various topics that appear on the basic science and clinical application exams.

Basic science exam assignments will cover topics related to perfusion, including but not limited to, cardiac anatomy, gas exchange, equipment selection, immunology, pharmacology, etc. The clinical applications assignments will cover the application of clinical scenarios. A scenario will be presented and will give pertinent information to help answer the questions. Questions regarding the scenario may cover cannulation strategies, physiology of the patient, special considerations, conduct on bypass, etc. These assignments will attempt to replicate how questions will appear on the boards and help students familiarize themselves with questions they may see on the certification exams.

Discussion topics will be included as assignments during the course. Participation is required and posting at least 2 comments is expected to pass for that week.

Grading Policy
To pass this course, no more than 4 assignments can be failed. Failure of assignments consists of not turning in the assignment by the Sunday evening of the week that the assignment is given. Example: an assignment will typically be posted by the Tuesday of each week and the student will have 5 days to complete the assignment and post the assignment by Sunday, 11:59 pm MDT.

Cardiovascular Perfusion Student Agreement

As a University of Utah Cardiovascular Perfusion Student, I have read, understand, asked questions, discussed and agree to all the policies detailed in the Cardiovascular Perfusion Handbook in the following areas:

- Classes by Semester
- CVP Technical Standards
- University of Utah Policies
- Academic Standards and Progression
- Student Assessment
- Behavioral Standards
- Technology Requirements/Etiquette
- Student Attendance, Timeliness and Participation
- Textbooks and Electronic Resources
- Perfusion Curriculum and Policies
- American Society of Extracorporeal Technology Code of Ethics and Scope of Practice

This includes all University of Utah Regulations and Academic Policies, Academic Policies - Regulations Library - The University of Utah **and The Graduate School Polices,** Graduate Policies - Graduate School - The University of Utah

I also understand the syllabi and policies may change between Handbook updates and this Handbook is not inclusive of day to day, class, circumstance, student, staff and program changes.

As a University of Utah student in a Graduate program, I will be understanding and professional in handling any changes and updates to Cardiovascular Perfusion Program updates and changes.

The Cardiovascular Perfusion Program and I, the student, will professionally communicate and resolve any issues that may occur during attendance.

I will abide by all policies, standards, rules and etiquette outlined in the Cardiovascular Perfusion Handbook.

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Printed Student Name

_____

Student Signature

_____

Date