



UNIVERSITY OF CALGARY
CUMMING SCHOOL OF MEDICINE

UNDERGRADUATE MEDICAL EDUCATION (UME)
Medical Doctor Program (MD)

COURSE OUTLINE

Course Number:	MDCN 370
Course Name:	Cardiology/Respirology
Dates:	January 4, 2021 – March 12, 2021
Schedules and classroom locations:	For pre-clerkship: Year 1 & 2 timetable is here https://cumming.ucalgary.ca/mdprogram/current-students/pre-clerkship-year-1-2/timetable Detailed scheduled is located online in OSLER

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Course Description
Please refer to the University Calendar: http://www.ucalgary.ca/pubs/calendar/current/medicine.html#8554

Prerequisites
Not applicable in the MD program.

Supplementary Fees/Costs
<ul style="list-style-type: none"> • Lab Coat • Stethoscope

Learning Objectives
See Appendix A (Learning Objectives By Topic)

Course Text(s)/Recommended Reading/Learning Resources

Material available online can be accessed at the following address:

<http://library.ucalgary.ca/branches/healthscienceslibrary/>

Recommended Reading for Cardiology Medicine

Pathophysiology of Heart Disease

Editor, Leonard S. Lilly

7th edition, Philadelphia, Wolters Kluwer/Lippincott Williams & Wilkins, 2020

(N.B. Library does not have the 7th edition available online or in print, however 6th edition is available online)

Recommended Readings for Respiratory Medicine

Principles of Pulmonary Medicine

Steven E. Weinberger

8th edition, Philadelphia, Saunders, 2014

Respiratory Physiology – The Essentials

John B. West

9th edition, Philadelphia, Lippincott Williams & Wilkins, 2012

Additional Reading Recommendations

For those interested in additional readings, we have provided a list of other suggested resources.

The following is a list of recommended reference material. The books marked "Reference" are comprehensive reviews of General Medicine and/or Cardiology. They are useful for researching particular topics but should not be read "cover to cover".

Material available online can be accessed at the following address:
<http://library.ucalgary.ca/branches/healthscienceslibrary/>

Physiology

Cardiovascular Physiology
David E Mohrman and Lois J Heller
9th Edition, New York, McGraw-Hill Education, 2018

Cardiovascular Physiology
Achilles J. Pappano and Withrow Gil Wier
11th edition, Philadelphia, Elsevier, 2018

Pathology (Cardiac and Respiratory)

Robbins and Cotran Pathologic Basis of Disease
Editors: Vinay Kumar, Abul K. Abbas, Jon Aster ;
9th edition, Philadelphia, Elsevier Saunders, 2015
Chapters – 11 "Blood Vessels" 12 "The Heart" 15 "The Lung"
The full text of the 9th edition is available online:
<http://library.ucalgary.ca/branches/healthscienceslibrary/>

General Textbooks of Cardiology (References)

Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine
Edited by Douglas P. Zipes, Peter Libby, Robert O. Bonow, Douglas L. Mann, Gordon F. Tomaselli
11th edition, Philadelphia, Saunders/Elsevier, 2018

Hurst's The Heart
Valentin Fuster, Robert A. Harrington, Zubin J. Eapen, Jagat Narula, MD
14th edition, New York, McGraw-Hill, 2017

Physical Examination

Essentials of bedside cardiology: with a complete course in heart sounds and murmurs on CD
Jules Constant
Boston, Little, Brown and Company, 1989

Bate's Guide to Physical Examination and History Taking
Lynn S. Bickley
13th Edition, Philadelphia, Lippincott Williams & Wilkins, 2020

ECG Interpretation

Rapid Interpretation of EKG's: a Programmed Course

Dale Dubin

6th Edition, Tampa, 2000

The Only EKG Book You'll Ever Need

Malcolm S. Thaler

9th edition, Philadelphia, Wolters Kluwer, 2018

Pediatric Cardiology

Nelson Textbook of Pediatrics

Editors, Robert M. Kliegman and Joseph St. Geme

21st edition, Philadelphia, Elsevier, 2020

Park's The Pediatric Cardiology Handbook

Myung K. Park (Myung Kun),

5th Edition, Philadelphia, Elsevier, 2016

Canadian Cardiovascular Society Cardiology Practice Guidelines

Antiplatelet Therapy

2018 CCS/CAIC Focused Update of the Guidelines for the use of Antiplatelet Therapy

Atrial Fibrillation

2018 Focused Update of the Canadian Cardiovascular Society Guidelines for the Management of Atrial Fibrillation

Dyslipidemia

2016 Guidelines for the Management of Dyslipidemia for the Prevention of Cardiovascular Disease in the Adult

Application of GRADE and Evidence Review

Heart Failure

2017 Comprehensive Update of the CCS Guidelines for the Management of Heart Failure

American Heart Association Cardiology Practice Guidelines

Endocarditis

2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

Valvular Heart Disease

2017 AHA/ACC Focused Update of the 2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines

Risk Assessment Tools

GRACE score

http://www.outcomes-umassmed.org/GRACE/acs_risk/acs_risk_content.html

TIMI Risk Score

<http://www.mdcalc.com/timi-risk-score-for-uanstemi>

Evaluation and Course Requirements

EXAMS

FORMATIVE: The formative online exam is a multiple choice format to be completed between **9:00 am on January 18, 2021 to 4:00 pm on January 25, 2021**. Instructions and log-in details will be emailed to you. Writing the formative exam is mandatory and will let you experience the level of performance expected from students in this course. It will also help you to decide where you need to focus your studies prior to the summative exams. We will be reviewing the formative exam to help with emphasis for the planning of review week.

MID COURSE QUIZZES: There will be two multiple-choice format mid-course quizzes. They are each 1.5 hours in duration and will be delivered online via Dolphin.

Quiz #1: Worth 15% of final grade. January 28, 2021

Can include the material covered up to and including January 26, 2021

Quiz #2: Worth 15% of final grade. February 18, 2021

*** Can include the material covered up to and including February 17, 2021***

IMAGING EXAM: There will be an ECG/CXR/Pathology exam worth 15% of the final evaluation on March 11, 2021.

FINAL EXAM: The final exam will consist of an MCQ exam worth 55% on March 12, 2021.

In the event that a student is unsatisfactory overall, a rewrite of the Summative/Final MCQ Exam will be required. In this case, the final course grade will be composed of the following:

- Rewrite MCQ Exam (100%)

Clinical Correlation: Each student must participate in the clinical correlation program. These sessions focus on the development of history-taking and physical examination skills in cardio-respiratory medicine. The first cardiology clinical core session will occur together as a class. Each group will be assigned one preceptor for Cardiology clinical correlation, and one for Respirology. The group leader should contact both preceptors to coordinate meetings. Completion of 4 sessions (two 2-hour cardiology sessions, two 2-hour pulmonary sessions) is a **mandatory** requirement of the course. **All clinical core sessions are to be done virtually.**

It is essential that preceptors are contacted ASAP. An evaluation of student performance will be completed by each preceptor on one45 and printed for student files by the UME office.

Harvey: All students are required to complete a two-hour Harvey simulation session to be scheduled by the Program Coordinator.

Calculators for MCQ exam – Calculators are allowed for MCQ exams during Course 3.

Grading

The University of Calgary Medical Doctor Program is a Pass/Fail program. The grading system that will appear on a student's legal transcript is as follows:

Grade	Description
CR	Completed Requirements
RM	Remedial Work Required
F	Fail
I	Incomplete
W	Withdrawal
MT	Multi-Term (Used for Part A Courses that fall under 2 different terms in the calendar year.)
<p>For Pre-Clerkship - A student's final grade for the course is the sum of the separate components. It is not necessary to pass each mandatory components separately in order to pass the course.</p> <p>For Clerkship - A rotation signed off as "Satisfactory with Performance Deficiencies" will appear as a credit on a student's medical school transcript.</p>	

Assignments/Projects

The following criteria shall generally apply to all written assignments. Faculty responsible for grading specific assignments may add additional criteria.

Timeliness

In general, dates listed in Core Documents are intended to act as guidelines for assisting students to complete their learning activities and assignments in a timely fashion. Students encountering difficulties completing assignments due to health or other serious factors must contact the Course Chair to arrange a deferral of term work. A Physician/Counsellor Statement to confirm an absence for health reasons may be required.

Professional Conduct

As members of the University community, students and staff are expected to demonstrate conduct that is consistent with the University of Calgary Calendar. The specific expectations cited in the Calendar include:

- respect for the dignity of all persons
- fair and equitable treatment of individuals in our diverse community
- personal integrity and trustworthiness
- respect for academic freedom, and
- respect for personal and University (or Host Institution) property.

Students and staff are expected to model behaviour in class that is consistent with our professional values and ethics. Students and staff are also expected to demonstrate professional behaviour in class that promotes and maintains a positive and productive learning environment. All students and staff are also expected to respect, appreciate, and encourage expression of diverse world views and perspectives. All members of the University community are expected to offer their fellow community members unconditional respect and constructive feedback. While critical thought, and debate, is valued in response to concepts and opinions shared in class, feedback must at all times be focused on the ideas or opinions shared and not on the person who has stated them.

Where a breach of an above mentioned expectation occurs in class, the incident should be reported immediately to the Associate Dean or his/her designate. As stated in the University Calendar, students who seriously breach these guidelines may be subject to a range of penalties ranging from receiving a failing grade in an assignment to expulsion from the University.

University of Calgary Medical School – Student Code of Conduct

<https://cumming.ucalgary.ca/mdprogram/current-students/pre-clerkship-year-1-2/student-code-conduct>

Electronic Submission of Course Work

Most assignments will be submitted via email to the Program Coordinator, UME unless otherwise stated. Assignments may be submitted in MS Word or Rich Text formats. It is the student's responsibility to confirm with the Program Coordinator that the assignment has been received. This may be done through utilization of the return receipt function available on most email packages, or by a follow up confirmation email to the Program Coordinator.

It is the Program Coordinator's responsibility to reply to any confirmation email from the student, and to inform the student promptly if there are any problems with the file (unable to open attachment, damaged data, etc.). In such cases, it is the responsibility of the student to promptly consult with the Program Coordinator regarding an alternate delivery method (e.g. courier, fax, etc.). It is the student's responsibility to retain a copy of the original document.

One45 Overview

The MD Program utilizes the One45 Software Program for assessment purposes for all evaluations in Year 1, 2 and 3. Students are able to view completed evaluations online through this software program. Evaluations and assessment data is collected at regular intervals.

It is the student's responsibility to distribute their evaluations to preceptors during any given course and to follow up with preceptors if evaluations have not been completed by the deadline given out by the Undergraduate Medical Education Office.

In addition to assessments and evaluations, One45 is also utilized to evaluate your preceptors and to gather information from students on their learning experiences.

All students are provided training at the beginning of their program in Year 1. This would include a personal log in access code and password.

One45 is used throughout your training in the MD Program (Undergrad) as well as Residency (PGME).

Website Link to Access One45: <https://calgary.one45.com/>

Problems Accessing One45: Please contact the Academic Technologies at osler@ucalgary.ca

Course Evaluation/Feedback

Student feedback will be sought at the end of each learning session as well as at the end of each course through the electronic UME evaluation tool.

At the end of each learning activity (ie. Lecture, small group, orientations, etc.), students will be asked to complete online evaluation forms to provide feedback to instructors regarding the effectiveness of their teaching and achievement of the learning objectives. An overall course evaluation will be completed following course completion.

Students are welcome to discuss the process and content of the course at any time with the Course Chairs or Preceptors.

Clinical Core Overview (Pre-Clerkship Only)

Please refer to the Clinical Correlation Guidelines here:

<https://cumming.ucalgary.ca/mdprogram/about/governance/policies>

Course specific learning objectives for Clinical Core in the setting of this course can be found in the course document.

Clinical Correlation Rules of Conduct

Students and preceptors will not be used as patients for clinical correlation sessions. This means that students will not examine the preceptor, the preceptor will not examine the students and students will not examine one another.

UME Policies, Guidelines, Forms & TORs

Please refer to the MD program website
<https://cumming.ucalgary.ca/mdprogram/about/governance>

Appeals

Please refer to the UME Student Evaluation: Reappraisals and Appeals for details regarding appeals
<https://cumming.ucalgary.ca/mdprogram/about/governance/policies>

If the student disagrees with the decision of the UME Student Evaluation Committee, the student may appeal that decision to the UME University Faculty Appeals Committee. Please refer to the [CSM UME Academic Assessment and Graded Term Work Procedures](#) for procedure for appeals.
<https://cumming.ucalgary.ca/mdprogram/about/governance>

Academic Accommodation

Students needing an accommodation because of a disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at https://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf .

Student Accessibility Services, please contact their office at (403) 220-8237, address: MacEwan Student Centre room 452 or email: access@ucalgary.ca. Students who have not registered with the Student Accessibility Services are not eligible for formal academic accommodation.

Accommodations on Protected Grounds Other Than Disability

Students who require an accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a protected ground other than disability, should communicate this need, preferably in writing, to the appropriate Assistant or Associate Dean

Students who require an accommodation unrelated to their coursework, based on a protected ground other than disability, should communicate this need, preferably in writing, to the Vice-Provost (Student Experience).

For additional information on support services and accommodations for students with disabilities, visit <https://live-ucalgary.ucalgary.ca/student-services/access>

Academic Integrity

The University of Calgary is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect.

It is expected that all work submitted in assignments should be the student's own work, written expressly by the student for this particular course. Students are referred to the section on plagiarism in the University Calendar (<http://www.ucalgary.ca/pubs/calendar/current/k-5.html>) and are reminded that plagiarism is an extremely serious academic offence.

Student Misconduct

A single offence of cheating, plagiarism, or other academic misconduct, on term work, tests, or final examinations, etc., may lead to disciplinary probation or a student's suspension or expulsion from the faculty by the Dean, if it is determined that the offence warrants such action. A student is defined as any person registered at the University for credit or non-credit courses.

Freedom of Information and Protection of Privacy

The Freedom of Information and Protection of Privacy (FOIP) Act indicates that assignments given by you to your course instructor will remain confidential unless otherwise stated before submission. The assignment cannot be returned to anyone else without your express permission. Similarly, any information about yourself that you share with your course instructor will not be given to anyone else without your permission.

Emergency Evacuations and Assembly Points

Assembly points for emergencies have been identified across campus. The primary assembly point for the Health Sciences Centre (HSC) building is HRIC - Atrium. For more information, see the University of Calgary's Emergency Management website: <https://www.ucalgary.ca/risk/emergency-management/evac-drills-assembly-points/assembly-points>

Emergency Evacuation Procedures - <https://www.ucalgary.ca/risk/emergency-management/plans-and-procedures>. In the case of an emergency during exam, immediately stop writing the examination and follow the direction of the invigilator and go to the nearest exit. Students should not gather personal belongings.

Internet and electronic device information and responsible use:

Students are welcome to use laptops and other electronic note-taking devices in this course unless otherwise stated. Please be considerate of others when using these devices.

Supports for student learning, success, and safety

Student Advising and Wellness (SAW): <https://cumming.ucalgary.ca/mdprogram/current-students/student-advising-wellness>
AMA Physician and Family Support Program:
<https://www.albertadoctors.org/services/physicians/pfsp>
Student Union Wellness Centre: <https://www.ucalgary.ca/wellnesscentre/>
Safewalk: <http://www.ucalgary.ca/security/safewalk>
Campus security - call (403) 220-5333
Student Success Centre: <https://www.ucalgary.ca/ssc/>
Library Resources: <http://library.ucalgary.ca/>
Student Union (<https://www.su.ucalgary.ca/about/who-we-are/elected-officials/>) or Graduate Student's Association (<https://gsa.ucalgary.ca/about-the-gsa/gsa-executive-board/>) representative contact information
Student Ombudsman: <http://www.ucalgary.ca/ombuds/role>

Copyright

All students are required to read the University of Calgary policy on Acceptable Use of Material Protected by Copyright (www.ucalgary.ca/policies/files/policies/acceptable-use-of-material-protected-by-copyright.pdf) and requirements of the copyright act (<https://laws-lois.justice.gc.ca/eng/acts/C-42/index.html>) to ensure they are aware of the consequences of unauthorised sharing of course materials (including instructor notes, electronic versions of textbooks etc.). Students who use material protected by copyright in violation of this policy may be disciplined under the Non-Academic Misconduct Policy.

Wellness and mental health resources

The University of Calgary recognizes the pivotal role that student mental health plays in physical health, social connectedness and academic success, and aspires to create a caring and supportive campus community where individuals can freely talk about mental health and receive supports when needed. We encourage you to explore the excellent mental health resources available throughout the university community, such as counselling, self-help resources, peer support or skills-building available through the SU Wellness Centre (Room 370, MacEwan Student Centre, <https://www.ucalgary.ca/wellnesscentre/services/mental-health-services>) and the Campus Mental Health Strategy website (<http://www.ucalgary.ca/mentalhealth/>).

Research ethics

If a student is interested in undertaking an assignment that will involve collecting information from members of the public, he or she should speak with the Assistant Dean, Research (UME) and consult the CHREB ethics website (<https://ucalgary.ca/research/researchers/ethics-compliance/chreb>) before beginning the assignment.

ATSSL Guidelines

Please refer to the ATSSL Web Lab PPE Requirement:
<https://cumming.ucalgary.ca/mdprogram/about/governance>

APPENDIX A

Learning Objectives by Topic

CARDIOLOGY OBJECTIVES

Embryology

1. Describe the pattern of fetal oxygenation
2. Describe the basics of fetal embryological cardiac development
3. Understand the transition from fetal to adult circulation

Development of the Heart

1. Single atrium → 1° & 2° septa, 1° & 2° foramina, endocardial cushions, foramen ovale → fossa ovalis, limbus of fossa ovalis; probe patent foramen ovale or atrial septal defect (ASD).
2. Single ventricle → muscular (lower) and fibrous (upper) interventricular septum; (VSD);
3. Single AV canal → endocardial cushions → 2 AV orifices → 2 AV valves (tricuspid & mitral) Truncus arteriosus, which becomes divided by 2 ridges → aorticopulmonary septum (spiral) → aortic arch & pulmonary trunk, with semilunar valves.

Fetal circulation

Umbilical arteries → placenta → umbilical vein (ligamentum teres) → liver → ductus venosus* (ligamentum venosum) → IVC (plus blood from SVC) → right atrium → left atrium via foramen ovale* (fossa ovalis) → left ventricle → aorta, OR
right ventricle → pulmonary trunk → aorta via ductus arteriosus* (ligament)

Genetics

1. Recognize that multifactorial disorders result from a combination of genetic and non-genetic factors
2. Understand different types of genetic variation, and explain the difference between a polymorphism/non-pathogenic and a pathogenic mutation.
3. Understand the common molecular diagnostic techniques used in genetic testing (such as DNA sequencing, deletion/duplication analysis, exome/genome sequencing)
4. Understand the difference between genetic testing for diagnostic versus predictive purposes.
5. Understand the indication for diagnostic, predictive and carrier genetic testing, and role of genetic counselling in this process
6. Appreciate the potential complexities of interpretation of genetic test results

Introduction to Cardiac Physiology

1. Explain the pumping function of the left ventricle
2. Define ventricular preload, afterload and contractility.
3. Explain how the left ventricle responds to changes in "preload," "afterload," and "contractility"
4. Define and be able to calculate cardiac output
5. Understand the factors that determine cardiac output
6. Calculate ejection fraction
7. Draw pressure-volume loops for a cardiac cycle of a normal heart
8. Understand and be able to label a Wiggers diagram for a normal heart. (*Pathology comes later*)
9. Be able to draw the normal contour of the JVP, labeling the waves, heart sounds and explaining the mechanism by which the waves occur.

Microcirculation

1. Understand the structure of the microcirculation
2. Understand the four main mechanisms of transport across capillary microcirculation

3. Know the main factors that determine capillary fluid exchange
4. Understand which of these factors would cause the clinical scenario of heart failure with pulmonary edema

Coronary Blood Flow

1. Explain how the heart modulates coronary blood flow according to oxygen requirements.
2. Explain how a reduction in coronary blood flow impairs cardiac contraction.
3. Explain how changes in cardiac performance (i.e., changes in heart rate, pressure development, or "contractility") modulate the heart's requirement for coronary blood flow (i.e. oxygen).
4. List the determinants of myocardial oxygen consumption.

Heart Sounds

Describe the 4 cardiac chambers, 4 cardiac valves, 2 great vessels, and the normal sequence of intra-cardiac blood flow.

1. Draw a diagram of the major epicardial coronary arteries
2. Draw a diagram of the normal cardiac electrical conduction system
3. Define the phases of the cardiac cycle
4. Explain the mechanism with which heart sounds occur (S1, S2, S3, S4).
5. Describe mechanisms that would cause the intensity of S1 and S2 to change.
6. Describe the mechanism causing physiologic splitting of S1 and S2.
7. Describe the mechanism of abnormal splitting of S2: wide, fixed, paradoxical
8. Describe the mechanisms by which the following extra heart sounds occur: opening snap, ejection click, systolic click, and pericardial knock.

Arterial Pulse

The student will recognize that abnormalities in the arterial pulse can occur with a wide variety of cardiac and non-cardiac conditions. Abnormalities in heart sounds and in the arterial pulse are particularly important in valvular heart disease and congenital heart disease and will be discussed later in the course.

1. Understand the distribution and regulation of the blood volume within the vascular tree.
2. Describe the gross structure and function of blood vessels.
3. Describe how to characterize the arterial pulse (location, rate, volume, contour)
4. Understand the differences between central and peripheral pulses.
5. Understand the determinants of systolic and diastolic blood **pressure**
6. Explain what happens to systolic and diastolic pressure in various places of the vascular tree (i.e. carotid artery versus femoral artery versus capillary bed versus IVC).
7. Describe the Kortokoff sounds
8. Understand the mechanisms by which these pressures change as blood flows through the vascular system.
9. Define hypertension.
10. Describe the anacrotic notch.
11. Describe the mechanism of abnormal pulses.
 - Parvus et tardus
 - Corrigan's pulse
 - Bisferiens pulse

Electrocardiography (ECGs)

1. Describe the action potentials of various cardiac cells (nodal, purkinje, ventricular) including ions, phases, velocity, and refractory period characteristics.
2. Draw a diagram of the normal electrical pathway.
3. Describe lead placement for obtaining a 12 lead ECG
4. Understand Einthoven's triangle

5. Develop an approach to ECG interpretation: rate (atrial and ventricular), rhythm, intervals, frontal plane QRS axis, wave morphology (P, Q, R, S, T, U).

ECGs that students will be expected to correctly interpret include (but are not limited to) the following:

- Normal sinus rhythm
- Atrial fibrillation
- Atrial flutter
- A-V block (first degree, 2nd degree (type I and II) and 3rd degree)
- Bundle branch blocks (LBBB, RBBB)
- Supraventricular tachycardia
- Ventricular tachycardia
- Ventricular fibrillation
- STEMI (anterior, inferior, inferolateral, RV)
- ST depression consistent with ischemia
- Left ventricular hypertrophy
- Pre-excitation (Wolff-Parkinson-White)

Ischemic Heart Disease

Pathophysiology

1. Describe the mechanisms (cellular and metabolic) of atherogenesis
2. Describe the role of immune cells (T-cells, macrophages, monocytes), smooth muscle cells and platelets
3. Describe the role of normal endothelial cells
4. List the risk factors for the development of atherosclerosis
5. Describe the mechanism by which each risk factor promotes atherogenesis
6. Understand that atherosclerosis affects vessels other than coronary arteries (cerebrovascular, peripheral)
7. List three mechanisms that can cause acute narrowing or obstruction of an artery.
8. Know the potential complications of atherosclerosis depending on the vascular bed affected

Pathology (Dr. A. Bromley)

1. Detail the gross pathology of myocardial infarction
2. Describe the stages of myocardial histopathology during and after ischemia and infarction
3. Describe the risk factors for and pathologic manifestations of the complications of myocardial infarction: aneurysm, mural thrombus, left ventricular free wall rupture, papillary muscle rupture / dysfunction, ventricular septal rupture
4. Describe the gross and microscopic features of chronic ischemic heart disease
5. Recognize the gross and microscopic features of the three major types of cardiomyopathy
6. Describe the microscopic features of myocarditis
7. Recognize the gross features of aortic and mitral valves with chronic RF
8. Know the most common primary cardiac tumor is a myxoma
9. Understand that certain malignancies can metastasize to the myocardium or pericardium.
10. Understand that certain malignancies can metastasize to the myocardium or pericardium.

Clinical Presentation IHD / Management of IHD

1. Distinguish between typical and atypical chest pain.
2. Recognize the features of non-cardiac chest pain.
3. Define stable angina.
4. Grade angina severity using the CCS Angina Classification.
5. Know the criteria used to diagnose myocardial infarction.
6. Understand the pathophysiology of acute coronary syndrome and the differences between unstable angina, NSTEMI and STEMI.

7. Distinguish the differences in clinical features between unstable angina, NSTEMI and STEMI.
8. Identify a STEMI on ECG and identify the correct epicardial coronary artery involved.
9. Outline the differences in management between unstable angina, NSTEMI, STEMI.
10. Know the clinical features at presentation that increase the risk of mortality/morbidity.
11. Know the initial management of a patient presenting with chest pain including therapies, investigations and disposition.
12. List which medications have been shown to reduce mortality in patients with coronary artery disease (secondary prevention).
13. Understand the mechanism of the above medications.
14. List the contra-indications and major adverse effects of treatments for coronary artery disease (beta-blockers, ASA, ADP receptor antagonists (clopidogrel, ticagrelor), ace inhibitor, thrombolytic, statins, heparin, fondaparinux)

Risk Stratification

1. Understand how a positive or negative test will affect the likelihood of CAD based on the pre-test probability (exercise treadmill testing).
2. Know the various options for cardiac risk stratification and the pros and cons of each:
 - Framingham Risk Score
 - Exercise Stress Test (EST)
 - Exercise Stress Test with Imaging: Myocardial perfusion imaging (Thallium/Sestamibi/Persantine) or Stress Echocardiography
 - Pharmacologic Stress Test with Imaging (Nuclear/Echo)
 - Coronary angiography (CT, Invasive angiogram)

Mechanical Complications of MI

1. List the three main acute/sub-acute mechanical complications of myocardial infarction and understand the differences in clinical presentation
2. Determine the appropriate investigations and treatment

Revascularization

1. Understand the principles of coronary artery bypass grafting (how it is done).
2. Know key indications for CABG.
3. Know the possible conduits used for grafting.
4. Know the major complications post CABG surgery (tamponade, ischemia, stroke, renal failure, heart failure, arrhythmia)
5. Understand the principles of coronary artery angioplasty (how it is done, when it is indicated, when it has mortality benefit, major complications).
6. Know the medications indicated post revascularization.
7. Know the major complications post angioplasty.

Prevention of CAD

1. Understand the epidemiology of heart disease (prevalence, burden of disease)
2. Determine the vascular risk for a patient (Framingham)
3. Describe the factors that most accurately predict cardiac risk in asymptomatic patients
4. Know the vascular treatment targets (Canadian Guidelines: HTN, lipids, DM).
5. Know the medications and lifestyle modifications used to obtain those targets.

Pericardial Disease

1. Know the anatomy of the pericardium.
2. Define pericarditis.
3. Describe the clinical presentation (symptoms and physical exam) of a patient with pericarditis.
4. List at least five potential causes of pericarditis.
5. Describe the potential complications of pericarditis.
6. Define cardiac tamponade.
7. Describe the clinical presentation (symptoms and physical exam findings) of cardiac tamponade.

8. Know the acute management of cardiac tamponade.
9. Describe the physical exam findings (HR, JVP, heart sounds, BP, peripheral) in constrictive pericarditis.
10. Describe the presentation of a patient with constrictive pericarditis.
11. List at least three causes of constrictive pericarditis including the most common (post- cardiac surgery).
12. Know the treatment of constrictive pericarditis (generally surgical removal of the pericardium).

Peripheral Vascular Disease

1. Know the symptoms of claudication depending on the artery affected.
2. Know the principles of investigating possible claudication.
3. Know the risk factors for development of claudication.
4. Know the principles of therapy for PVD.
5. Know the potential complications of PVD
6. Understand the pathophysiology of abdominal aortic aneurysm formation and potential complications.

Aortic Disease

1. Describe the histological architecture of the aorta.
2. Understand that weakness of the architecture may lead to aneurysm or tear.
3. Define aortic dissection versus aortic rupture.
4. Define the differences between type A and type B aortic dissection.
5. List three causes of aortic dissection.
6. List three features of Marfan Syndrome.
7. Describe the genetic inheritance pattern of Marfan Syndrome.
8. Describe the clinical presentation (symptoms and physical exam) of aortic dissection.
9. List the complications of aortic dissection.
10. Know the investigations used to diagnose disease of the aorta (CT, MRI, TEE)
11. Know the definitive management for a type A dissection.

CLINICAL PRESENTATION DYSPNEA

Heart Failure

Pathophysiology

1. Define heart failure (clinical syndrome/diagnosis).
2. Understand the prevalence of heart failure.
3. Describe the pathophysiology of heart failure (neurohormonal activation)
4. List the neurohormonal consequences of heart failure.
5. Understand that heart failure can be systolic or diastolic
6. Know the changes that occur in preload, afterload and contractility for systolic and diastolic heart failure.

Clinical Presentation

1. Know the symptoms of heart failure.
2. Be able to grade symptoms by the NYHA functional class.
3. Describe the physical exam features / signs of left heart failure.
4. Describe the physical exam features / signs of right heart failure and how it differs from left heart failure.
5. Describe the differences between left heart failure and isolated right heart failure (signs)
7. Know potential causes of left heart failure and isolated right heart failure
8. Describe the stimuli that cause cardiac remodeling including physical stress, direct myocardial injury or hormonal, biochemical or genetic.
9. Know the stages of heart failure: A, B, C, D
10. Describe the difference between compensated and decompensated heart failure.
11. List the complications of heart failure.
12. Know the initial investigations to perform in a patient presenting with heart failure.
13. Know the chest X-ray findings of heart failure.
14. Know what brain natriuretic peptide (BNP) is and how it is used in diagnosis.

Cardiomyopathies

1. Define the 3 major types of cardiomyopathy (dilated, hypertrophic, restrictive).
2. Recognize the gross and microscopic features of the three major types of cardiomyopathy
3. List key anatomic features that distinguish the different types of cardiomyopathy.
4. List major causes of dilated cardiomyopathy.
5. List the major cause of restrictive cardiomyopathy.
6. Describe the mode of inheritance of hypertrophic cardiomyopathy.
7. Understand the differences between hypertrophic cardiomyopathy and left ventricular hypertrophy.
8. Describe common presenting symptoms for each of the cardiomyopathic conditions.
9. Describe the hemodynamic consequences of each condition.
10. Describe the unique mechanism of outflow obstruction in hypertrophic cardiomyopathy.
11. Explain the principle of medical therapy for each of the types of cardiomyopathies.
12. Define myocarditis.
13. List potential causes of myocarditis.
14. Describe the clinical presentation of a patient with myocarditis.
15. Describe the microscopic features of myocarditis.

Management of Heart Failure

1. Know the initial management of patients presenting in heart failure; both acute decompensated and chronic.
2. List the medications that are known to reduce mortality in patients with heart failure.
3. Understand how beta-blockers are used in patients with heart failure.
4. List the medications used to aid in the control of heart failure symptoms.
5. Know the mechanism of action for medications used, major side effects and contraindications (beta blockers, ace-inhibitors, angiotensin receptor blockers, spironolactone, diuretics, digoxin, nitrates, morphine).

6. List the potential causes for decompensation in a previously compensated HF patient.

Valvular Heart Disease

Mitral Valve

1. Describe the morphology of the normal atrio-ventricular valves.
2. List conditions which may result in mitral stenosis.
3. List conditions which may result in mitral regurgitation.
4. Describe typical symptoms for each of mitral stenosis or mitral regurgitation
5. Describe the hemodynamic effects of mitral regurgitation in terms of the concept of "ventricular volume loading".
6. Explain the difference between acute and chronic mitral regurgitation in terms of causes, symptoms, hemodynamics and expected physical exam findings.
7. Describe the hemodynamic effects of mitral stenosis.
8. Identify mitral stenosis based on a Wiggers diagram (Pressure tracings through a cardiac cycle).
9. Identify mitral regurgitation based on a Wiggers diagram (Pressure tracings through a cardiac cycle).
10. List cardiac complications of chronic mitral regurgitation.
11. List complications of mitral stenosis.
12. Describe the physical findings which would be expected in a patient with either mitral stenosis or chronic mitral regurgitation.
13. Explain the principles of medical therapy in treatment of symptomatic mitral valve disorders (MS, MR).

Tricuspid Valve

1. List two conditions that may result in tricuspid stenosis.
2. List four conditions that may result in tricuspid regurgitation.
3. Explain the relationship between mitral valve disorders and acquired tricuspid regurgitation.
4. Describe the JVP findings of a patient with tricuspid stenosis.
5. Describe the JVP findings of a patient with tricuspid regurgitation.

Aortic Valve

1. Describe the morphology of the semilunar valves.
2. List the two most common conditions that may result in aortic stenosis.
3. List four most common conditions that may result in aortic regurgitation.
4. Describe the incidence and potential clinical consequences of a bicuspid aortic valve.
5. Describe the typical symptoms for aortic stenosis and aortic regurgitation.
6. Describe the hemodynamic effects of aortic stenosis in terms of "ventricular pressure loading".
7. Describe the hemodynamic effects of aortic regurgitation in terms of "ventricular volume loading".
8. Explain the difference between acute and chronic aortic regurgitation in terms of causes, symptoms, and expected physical exam findings.
9. Identify aortic stenosis based on a Wiggers diagram (Pressure tracings through a cardiac cycle).
10. Identify aortic regurgitation based on a Wiggers diagram.
11. List cardiac complications of chronic aortic regurgitation.
12. List cardiac complications of aortic stenosis.
13. Describe physical findings that would be expected in a patient with aortic stenosis.
14. Describe physical findings that would be expected in a patient with aortic regurgitation.
15. Explain the options for medical therapy in treatment of symptomatic aortic valve disorders
16. Know the mainstay of therapy for severe symptomatic aortic stenosis
17. Understand the difference between a fixed and dynamic outflow obstruction.

Pulmonic Valve

1. List two conditions which may result in pulmonic stenosis
2. List two conditions which may result in pulmonic regurgitation

Rheumatic Fever

1. Define acute rheumatic fever (RF).

2. Describe the pathophysiology of RF.
3. Understand the populations in which RF is more commonly seen.
4. List 5 major Jones criteria for RF.
5. List the 3 anatomic locations affected by RF pancarditis.
6. Describe the common acute and chronic valvular lesions of RF.
7. Understand that the right-sided valves can be affected however, far less commonly.
8. Recognize the gross features of aortic and mitral valves with chronic RF.
9. Know how to prevent the development of RF.

Endocarditis

1. Define endocarditis.
2. Understand the differences between the three main types of endocarditis (infectious, marantic, rheumatic).
3. List four risk factors for the development of infectious endocarditis (IE) (commonly also called subacute bacterial endocarditis (SBE)).
4. Know that most likely group of organisms to cause IE.
5. List the acute complications of IE.
6. Describe the clinical presentation of a patient with IE.
7. Understand that the treatment of native valve endocarditis and prosthetic valve endocarditis are different.
8. List the chronic complications of IE.
9. Name diseases that can be associated with Marantic endocarditis.
10. Know the conditions that put patients at high risk of SBE and therefore require antibiotic prophylaxis.

Cardiac Tumors

1. Know the most common primary cardiac tumor is a myxoma.
2. Describe the most common location of a cardiac myxoma.
3. Describe the potential complications from a cardiac myxoma.
4. Understand that certain malignancies can metastasize to the myocardium or pericardium.

CLINICAL PRESENTATION PALPITATIONS

Pathophysiology

1. Describe the mechanisms of dysrhythmias (automaticity, re-entry, after-depolarizations, conduction block).
2. Describe the hemodynamic effects of tachycardia and bradycardia (BP, CO, preload, coronary blood flow).
3. Understand the classification /mechanisms of the key medications used in the treatment of dysrhythmia

Atrial Fibrillation

1. Recognize atrial fibrillation on a 12-lead ECG.
2. Know the prevalence of atrial fibrillation.
3. Describe the risk factors for the development of atrial fibrillation.
4. Describe the classification of atrial fibrillation (new onset, paroxysmal, persistent, permanent).
5. Understand the underlying difference in mechanism between atrial fibrillation and atrial flutter.
6. Know the major clinical consequences of atrial fibrillation. Identify which are secondary to heart rate and those secondary to left atrial thrombus formation.
7. Understand the principles for management of atrial fibrillation and the risks of therapy.
8. Determine appropriate systemic thromboembolism prophylaxis (CHA2DS2 -Vasc score) - aspirin versus coumadin / Novel oral anticoagulants.
9. Try to identify underlying cause or exclude those reversible causes.
10. Heart rate control versus rhythm control
11. Understand the contra-indications and major side effects of medications used in the treatment of atrial fibrillation: digoxin, beta-blockers, non-dihydropyridine calcium channel blockers, amiodarone, sotalol.

Supraventricular Tachycardia (SVT)

1. Describe an approach to narrow complex tachycardia.
2. Know the potential rhythms causing regular SVT.
3. Describe the mechanism of AVRT and AVNRT.
4. Describe the difference between AVRT and Wolff-Parkinson- White syndrome.
5. Identify SVT on an ECG.
6. Know the clinical presentation of a patient with SVT.
7. Know initial maneuvers that may aid in the diagnosis and management of SVT.
8. Know three classes of medications that could be used in management (adenosine, beta-blockers, non-dihydropyridine calcium channel blockers).
 - Know there are invasive therapies available for refractory patients with some forms of SVT.

Bradyarrhythmias

1. Define bradycardia.
2. Describe the action potential of the pacemaker cell and how it differs from the myocyte.
3. Understand how dysfunction at various levels of the electrical pathway will change the ECG.
4. Understand the mechanisms that cause bradyarrhythmias.
5. Describe the symptoms associated with bradycardia.
6. List the rhythms associated with bradycardia.
7. Describe symptom-rhythm correlation.
8. Know the reversible causes of bradycardia.
9. Know the major causes of long QT (genetic, drugs, metabolic).
10. Know the basic treatment for long QT syndrome.
11. Understand what a pacemaker is and where it is positioned in the heart.
12. Know the general indications for pacemaker therapy.
13. Be familiar with the different types of pacing modalities (single lead, dual lead, biventricular).

Syncope

1. Define syncope.
2. List the potential causes of syncope.
3. Know the high-risk features (i.e. more likely secondary to an arrhythmia) of a patient presenting with syncope.
4. Know the most common cause of syncope is vaso-vagal syncope.
5. Understand the mechanism that causes vaso-vagal syncope.
6. Know the basic suggestions for a patient presenting with vaso-vagal syncope.
7. Know the basic investigations for someone presenting with low-risk syncope.
8. List the investigations performed in patients with syncope and high-risk features.

Ventricular Arrhythmias

1. Know the differences between: premature ventricular contractions, non-sustained ventricular tachycardia, sustained ventricular tachycardia, polymorphic ventricular tachycardia, and ventricular fibrillation.
2. Identify VT and VF on an ECG.
3. Describe an approach to wide complex tachycardia.
4. Know the risk factors for ventricular arrhythmias.
5. Know the JVP and heart sound changes in someone with A-V dissociation.
6. List medications that may decrease the frequency of ventricular arrhythmias.
7. Know what an Implantable Cardioverter Defibrillator (ICD) is.
8. To know the general indications for ICD therapy
9. Know that ICD therapy is the only therapy known to decrease mortality.

Cardiac Palliative Care

1. Understand that cardiac disease has significant morbidity and mortality.
2. Understand that patients on a terminal trajectory should be offered palliative care.
3. Understand the basic principles of palliative care and specifically how it pertains to cardiac disease (i.e. symptom control).

ACUTE CARE UNIT

Clinical Approach to Managing an Emergency Situation

By the end of the session, the medical student will be able to recognize an emergency situation and initiate basic management of the patient.

Specific Knowledge Objectives:

By the end of the session, the medical student will:

- Recognize signs that would suggest that the patient is clinically unstable or critically ill.
- Describe a basic approach to managing any emergency situation.
- List as important the ability to call for help early in any emergency situation.

Acute Dyspnea

By the end of the session, the medical student will be able to identify a patient with acute dyspnea, initiate emergency management and describe key features on history, physical examination and investigations that could be used to determine the underlying etiology of the dyspnea.

Specific Knowledge Objectives:

By the end of the session, the medical student will be able to:

- Describe the pathophysiology of acute dyspnea, including the role of the respiratory control center in the brain, chemoreceptors, mechanoreceptors, and the chemical constituents of the blood.
- Using information acquired from history, physical examination and investigations list an appropriate differential diagnosis using the broad categories of cardiac, pulmonary and neuropsychiatric etiologies.
- List signs and symptoms suggestive of impending respiratory failure.
- Select appropriate investigations to help elucidate the underlying etiology.
- Interpret the results of the following relevant investigations:
 - arterial blood gas.
 - chest x-ray.
 - electrocardiogram.
- Describe the initial management of a patient with acute dyspnea.
- Describe the basic principles of positive pressure ventilation, including indications for initiation.
- Describe the pathophysiology of non-cardiogenic pulmonary edema.
- Define Acute Respiratory Distress Syndrome (ARDS) and list at least 4 clinical disorders that can potentially trigger ARDS under each of the major categories of direct lung injury and indirect lung injury.

Shock

By the end of the session, the medical student will be able to identify a patient in shock, initiate emergency management and describe key features on history, physical examination and investigations that could be used to determine the underlying etiology of the shock.

Specific Knowledge Objectives:

By the end of the session, the medical student will be able to:

- Define shock.
- Describe the role of cardiac output and systemic vascular resistance in the regulation of blood pressure and how changes in these parameters leads to the clinical manifestations of the different categories of shock.
- Describe the effect of prolonged tissue hypoperfusion on cellular function.
- List the four broad categories of shock, and give at least two etiologies for each.
- Describe potential clinical manifestations of a patient presenting in shock.
- List initial investigations that can be used to help determine the etiology of the shock.

- Be able to differentiate, based on information acquired through the history and clinical examination, the four categories of shock.
- Using hemodynamic parameters as a guide, describe the underlying pathophysiology of the different categories of shock.
- Describe parameters (clinical and laboratory) that can be used to monitor the success of the resuscitation process.
- Describe the initial resuscitation of a patient in shock, **taking into consideration the underlying etiology**. Specifically comment on how manipulation of preload, cardiac contractility, heart rate, cardiac rhythm, afterload and content of the blood can be used in the resuscitation process.

Cardiac Arrest

By the end of the session, the medical student will be able to identify a patient suffering from a cardiac arrest, initiate emergency management and simultaneously identify key features on history and physical examination and order investigations that could be used to help determine the underlying etiology of the arrest.

Specific Knowledge Objectives:

Given a patient presenting in cardiac arrest, by the end of the session the medical student will be able to:

- Rapidly and accurately recognize a patient who is in cardiac arrest.
- Describe the initial management of a patient in cardiac arrest.
- Describe the appropriate technique of cardiopulmonary resuscitation (CPR).
- When presented with an ECG rhythm strip, correctly identify the following rhythms:
 - ventricular fibrillation
 - ventricular tachycardia
 - torsades des pointes /polymorphic ventricular tachycardia
 - asystole
 - pulseless electrical activity (PEA)
 - marked bradycardia
 - supraventricular tachycardia, including unstable atrial fibrillation, atrial flutter, AV nodal re-entrant tachycardias, and AV re-entrant tachycardias.
- For each of the above rhythms, list potential precipitating factors that may be implicated in the initiation and/or prolongation of the cardiac arrest.
- For each of the above rhythms, list appropriate investigations to order to help elucidate the underlying cause of the arrest.
- In general terms, describe the prognosis of patients suffering a cardiac arrest.

Pharmacology

By the end of the session, the medical student will be able to demonstrate an understanding of the medications used in the resuscitation of a patient in shock.

Specific Knowledge Objectives:

By the end of the session, the medical student will be able to:

- Describe the role that the sympathetic and parasympathetic nervous systems play in modulating blood pressure.
- Describe, using knowledge of the adrenergic receptors (α and β), a rationale for using each of the following vasoactive medications in the setting of the four different categories of shock or in the setting of a cardiac arrest:
 - dopamine.
 - epinephrine.
 - dobutamine.
 - atropine.

Acid-Base Review

By the end of the session, the medical student will be able to determine the etiology of an acid-base disturbance in a critically ill patient.

Specific Knowledge Objectives:

By the end of the session, the medical student will be able to:

- Describe the effect of a significant acid-base disturbance on the cardiovascular and respiratory systems.
- Demonstrate an approach to the interpretation of the results of an arterial blood gas.
- List potential underlying etiologies for each of the following acid-base disturbances:
 - acute respiratory acidosis.
 - acute respiratory alkalosis.
 - metabolic acidosis.
 - metabolic alkalosis.
- List initial investigations that can be used to help determine the etiology of the acid-base disturbance.
- Calculate an anion gap and interpret the results.
- Describe a plan of initial management for a patient with an acid-base disturbance.

Hands-on Sessions

Acute Dyspnea: simulator session

When presented with a clinical scenario of acute dyspnea using the human patient simulator, by the end of the session the medical student will demonstrate the ability to:

- Identify clinical signs and symptoms that would be suggestive of impending respiratory failure.
- Order and interpret the appropriate investigations to help in determining the underlying etiology of acute dyspnea
- Undertake initial management

Cardiac Arrest/Shock: simulator session

When presented with a clinical scenario of cardiac arrest or shock using the human patient simulator, by the end of the session the medical student will demonstrate the ability to:

- Identify clinical signs and symptoms that would be suggestive of cardiac arrest or shock
- Order and interpret the appropriate investigations to help in determining the underlying etiology of the cardiac arrest or shock
- Undertake initial management

Airway Management Station

By the end of the session with an airway mannequin, the medical student will demonstrate the ability to:

- Appropriately position the patient to optimize orotracheal intubation.
- Perform orotracheal intubation using a laryngoscope.

Ventilation Station

By the end of the session with the invasive and non-invasive ventilators, the medical student will demonstrate the ability to:

- Describe the basic mechanism of positive pressure ventilation.

Chest x-ray Station

By the end of the chest x-ray session, the medical student will demonstrate the ability to:

- Approach chest x-ray interpretation in a systematic fashion.
- Identify the following signs on chest x-ray:
 - Atelectasis/lobar collapse
 - Consolidation
 - Free air in the abdomen
 - Pleural effusion
 - Pneumothorax
 - Pulmonary edema
 - Traumatic injuries

Electrocardiography Station:

By the end of the ECG session, the medical student will demonstrate the ability to:

- Approach ECG interpretation in a systematic fashion.
- Identify patterns suggestive of the following diagnoses on ECG:
 - Atrial fibrillation
 - Atrial flutter
 - Atrioventricular block (first, second and third degree)
 - Acute current of injury
 - Myocardial ischemia
 - Sinus tachycardia
 - Sinus bradycardia
 - Pericarditis
 - Ventricular fibrillation
 - Ventricular tachycardia

PEDIATRIC CARDIOLOGY

Introduction to Pediatric Cardiology

1. Perform a complete clinical cardiac examination
2. Identify innocent murmurs
3. Understand the significance of pathological heart sounds and murmurs
4. Appreciate the different testing routinely used in pediatric cardiology assessments (ECG, echocardiography, Holter monitoring, exercise stress testing, cardiac catheterization)
5. Understand the common causes of chest pain in children.

Obstructive Defects

1. Understand transitional physiology and how it relates to the presentation of obstructive defects.
2. Recognize the signs and symptoms of severe left ventricular outflow tract obstruction in children.
3. Understand the differences in presentation of left ventricular outflow tract obstruction in neonates, children and adolescents.
4. Recognize the signs and symptoms of significant right ventricular outflow tract obstruction in children.

Principles of Right-to-Left Shunts

1. Describe the anatomy, physiology and physical findings of each of the main types of acyanotic congenital heart disease:
 - a. Transposition
 - b. Tetralogy
 - c. Tricuspid atresia
 - d. Ebstein malformation
 - e. Truncus arteriosus
 - f. Total anomalous pulmonary venous return
 - g. Hypoplastic left heart syndrome
2. Recognize and treat a hypercyanotic event ("Tet spell")
3. Differentiate between pulmonary and cardiac causes of cyanosis
4. Describe the physiology of and perform a hyperoxic test for evaluation of cyanotic heart disease
5. Consider the use of IV prostaglandin for treatment of cyanotic heart disease, and recognize the side effects of prostaglandin.
6. Recognize that cyanotic heart disease, both repaired and unrepaired, is associated with long-term complications that the physician must prevent, assess or manage, including:
 - a. residual hemodynamic abnormalities,
 - b. arrhythmia,
 - c. embolic events,
 - d. growth and development delays,
 - e. endocarditis
 - f. insurability and employment

Principles of Left-to-Right Shunts

1. Describe the anatomy, physiology and physical findings of each of the main types of cyanotic congenital heart disease:
 - a. Atrial septal defect
 - b. Ventricular septal defect
 - c. Atrioventricular septal defect
 - d. Patent ductus arteriosus

2. Appreciate the differences in congestive heart failure due to pump failure versus large shunting lesions.
3. Understand the differences in presentation of congestive heart failure in the neonate, child and adolescent.
4. Identify, assess and manage congestive heart failure in a pediatric patient.
5. Understand the etiology of Eisenmenger syndrome.

Acquired Heart Disease

1. Know current guidelines for who should receive IE prophylaxis.
2. Know clinical features of Kawasaki Disease (KD).
3. Know Jones criteria for acute rheumatic fever (ARF).
4. Identify long-term complications of ARF and need for secondary prevention.

Pediatric Arrhythmias

1. Appreciate normal variants of pediatric ECGs.
2. Recognize, assess and manage pediatric SVT.
3. Have an appreciation of when to refer a patient to a pediatric electrophysiologist.
4. Identify common causes of palpitations and syncope in pediatric patients.

RESPIROLOGY OBJECTIVES

Chest X-Ray Radiology

(Authors: J. MacGregor & K. Fraser & S. Weeks)

- Given a normal PA and lateral chest X-ray the student will be able to:
 - Identify the three lobes of the right lung and the two lobes of the left lung as well as the fissures that separate these lobes
 - Identify the normal boundaries of the lung, counting ribs anteriorly & posteriorly
 - Identify the cardiac silhouette
 - Identify the ascending aorta, arch of the aorta, and descending aorta
 - Identify the right and left pulmonary arteries
- Given a patient with a pleural effusion the student will be able to:
 - Interpret a PA and lateral chest X-ray and identify the location of the effusion
- Given a patient with a pneumothorax the student will be able to:
 - Interpret a PA and lateral chest X-ray and identify the extent of the air in the pleural space
 - Identify a complete lung collapse with shifting of the mediastinal structures indicating a possible tension pneumothorax
- Given a patient with enlarged hilar structures, the student will be able to
 - name three major structures constituting the hila
 - Develop a differential diagnosis for hilar enlargement
 - unilateral
 - bilateral

Given a patient with a mediastinal mass the student will be able to:

- Interpret a PA and lateral chest X-ray and identify whether the mass is most likely to be in the anterior, middle, or posterior mediastinum
 - List 4 causes of anterior mediastinal mass
- Given a patient with an abnormal x-ray, explain how deviation of the trachea may assist in diagnosis
- Given a patient with diffuse parenchymal lung disease on chest X-ray, the student will be able to:
 - Differentiate between interstitial disease (lines and dots) and airspace disease (confluence, air bronchograms, silhouette sign)
- Given a patient with interstitial lung disease on CXR, the student will be able to identify features that aid in the differential diagnosis including:
 - Distribution of disease (upper lobes vs. lower lobes)
 - Predominantly nodular (cancer, sarcoid, silicosis)
 - Kerley B lines (CHF or lymphangitic spread of cancer)
 - Effusions (infections, CHF)
 - Reduced lung volumes vs. preserved lung volumes (sarcoidosis)
- Given a patient with an air fluid level within the lung or the pleural space the student will be able to:
 - Identify the abnormality
 - Interpret the clinical significance of this finding (within the lung → a lung abscess; within the pleura → a hydropneumothorax)

- Given a chest X-ray the student will be able to identify the following cardiovascular structures
 - Right atrium
 - Left atrium
 - Aorta
 - Left Ventricle
 - Right Ventricle
- Given a patient with congestive heart failure the student will be able to interpret a PA and lateral chest X-ray and identify the typical findings:
 - Cardiomegaly
 - Kerly B lines
 - pulmonary edema
 - pleural effusions
- Given a patient with an air fluid level within the lung or the pleural space the student will be able to:
 - Identify the abnormality
 - Interpret the clinical significance of this finding (within the lung → a lung abscess; within the pleura → a hydropneumothorax)

Clinical Presentation: Chest Pain

Pulmonary Embolism

- List four (4) common presenting symptoms of pulmonary embolism
- Given a patient with suspected pulmonary embolism, outline how you would investigate this patient
- List four (4) risk factors for pulmonary embolism
- given a patient with a moderate clinical probability of pulmonary embolism, justify your recommendation for the next step in management if the patient has the following results on lung scan:
 - Normal
 - Low probability
 - Indeterminate
 - High probability
- Given a patient with a confirmed diagnosis of pulmonary embolism who has no previous history of thromboembolic disease, describe the appropriate therapy

Thoracic Surgical Emergencies

- To review the diagnosis and treatment of tension pneumothorax.
- To review the diagnosis and treatment of hemothorax.
- To review the diagnosis and treatment of chest wall injuries.
- To review the diagnosis and treatment of injuries to the diaphragm.
- To review the diagnosis and treatment of blunt injuries to the aorta.
- To review the diagnosis and treatment of esophageal perforation

Clinical presentation: Dyspnea

Given a patient complaining of chronic (> few days) dyspnea, the student will:

- Obtain the relevant history and perform a focused physical exam that will provide the basis for classifying the patient as likely to have a pulmonary, cardiac, or non-pulmonary/non-cardiac cause
- List three non-pulmonary/non-cardiac causes of chronic dyspnea
- Describe the relative importance of the following factors in the generation of the sensation of dyspnea:
 - Arterial oxygen saturation

- Lung volume
 - Arterial CO₂ level
 - Muscular effort required for ventilation
 - Mechanoreceptors
- Describe the most likely cause of a patient's sensation of dyspnea based on an understanding of pathophysiological mechanisms
- Where the etiology is suspected to be pulmonary, justify how the patient could be classified as having:
 - An obstructive profile
 - A restrictive profile
 - Low DLCO
 - Normal PFT
- Give two examples of each.

Gas exchange

Ventilation

Students will be able to:

- Differentiate between anatomical and physiological dead space
- Draw a graph depicting the relationship between PACO₂ and V_A
- Describe the relationship between tidal volume, physiological dead space and alveolar ventilation

Diffusion

Students will be able to:

- List 3 factors affecting the amount of O₂ in a blood sample
- List 3 factors affecting diffusion across a membrane

Pulmonary Circulation

Students will be able to:

- Describe the regional variations in blood flow in the lung; specifically identify characteristics of 3 zones
- List 3 factors affecting blood flow in the lung

Hypoxemia and O₂ Delivery

Students will be able to:

- Describe how oxygen and carbon dioxide are carried in the blood
- Calculate the arterial-alveolar gradient
- Name 5 mechanisms of hypoxemia (physiological categories)
- Define Shunt, Dead space and V/Q mismatch
- Describe how oxygen is delivered to the tissues and the determinants of delivery
- Draw the oxygen-saturation curve and draw the shift caused by changing temperature or pH or 2,3 DPG
- Given a patient who is hypoxemic, calculate and interpret the A-a gradient
- Describe how O₂ is transported in the blood and how this is affected by:
 - Anemia
 - Low output heart failure
 - pH
 - Temperature

Mechanics

Students will be able to:

- Write the equation of motion for the respiratory system, relating pressure, volume, and flow, and indicate the meaning of each of the variables and constants.
- Describe what happens if air is let into the pleural space until pleural pressure is atmospheric.
- Draw and label a diagram showing pressure-volume relations of normal lung and chest wall from zero volume through RV and FRC to TLC.
- Explain why a lung is much easier to expand if the airways are completely filled with saline instead of air and indicate what elastic recoil pressure is due to in the saline-filled lung.
- Explain the importance of surface forces in lung elastic recoil, and in maintaining stability of alveolar size and how they are altered by surfactant.
- Explain how normal values for lung volumes are determined.
- List the kinds of processes that can lead to an abnormally high TLC, low TLC and high RV, and explain the mechanisms by which each of these processes does so.
- Describe how the chest wall is linked to the lungs and the effect this has on pleural pressure, lung volume and ventilation
- Describe how pleural pressure varies from the top to the bottom of the lung and how this affects ventilation
- Draw a maximum flow/volume curve and identify TLC, inspiratory and expiratory flow, peak expiratory flow, mid expiratory flow, and residual volume
- Discuss the determinants of resting lung volumes
- Describe the effect of surfactant on lung volume and surface tension
- Describe how mechanical ventilation affects lung pressures and volumes in contrast to spontaneous ventilation.
- Describe West's zones of the lung and give 2 examples of conditions which can change these theoretical zones

Airways

Students will be able to:

- Name the site of maximal resistance in the tracheo-bronchial tree and identify the determinants of airways resistance
- Explain why increasing effort does not result in increasing airflow at the mouth
- List the factors that affect the rate of airflow through the airways
- List three properties of a "lung unit" affecting its regional ventilation

Pulmonary Function Tests

Students will be able to:

- Define TLC, VC, FRC, and RV
- Describe (draw a figure of) the relationship between the above volumes
- Describe the measurement of each of the above
- Interpret simple Pulmonary Function tests
- Recognize certain common disease patterns on PFT testing, and list two diseases that could cause each of the patterns listed:
 - Obstructive
 - Restrictive
 - Isolated reduced diffusion capacity

Acid-Base

Students will be able to:

- Define terms used in acid/base problems
- Explain how an elevated PCO₂ causes an acidosis and how a low PCO₂ causes an alkalosis
- Describe the concept of compensation and explain the expected compensation for:

- Acute respiratory acidosis
- Chronic respiratory acidosis
- Acute respiratory alkalosis
- Chronic respiratory alkalosis
- Metabolic alkalosis
- Apply a nomogram to determine whether there is appropriate compensation for an acid-base disturbance
- Recognize and solve simple and complex (2 or more) acid-base disturbances
- Given a patient with a simple acid-base disturbance, provide an appropriate differential diagnosis and the most likely cause
- Calculate an anion gap and know the causes of a high anion gap acidosis
- Use the Henderson-Hasselbach equation to calculate missing values for an acid-base problem
- Given a clinical scenario, describe the likely blood gas findings
- **Know the normal values for HCO₃, pCO₂, pH, H⁺**
- Write the equation relating minute ventilation to PCO₂ and define the terms.
- State which is the key controlled quantity in acid-base, and how the respiratory pump contributes to its control.
- List physiological factors that can contribute to respiratory pump failure (respiratory acidosis)

COPD

Given a smoker the student will be able to:

- Provide a working definition of COPD
- Understand that COPD is a preventable and treatable condition
- List risk factors for COPD
- Perform a focused history looking for symptoms suggestive of COPD
- Assess severity of COPD (based on MRC dyspnea scale)
- Perform a physical exam looking for signs of COPD
- Recognize the systemic features of COPD
- Order and justify diagnostic tests including spirometry, full PFTs CXR and ABGs
- Interpret the following:
 - Spirometry showing obstruction
 - Changes in lung volumes consistent with COPD
 - Recognize that a low DLCO (gas transfer) can be caused by emphysema
 - Recognize features of hyperinflation on CXR
- Interpret ABGs that are normal or show hypoxemia, increase A-a gradient, acute respiratory acidosis, chronic respiratory acidosis, and/or elevated carboxyhemoglobin
- Prescribe preventative measures including smoking cessation, vaccines, and self-management plans
- Understand that while COPD, predominantly affects the lungs, it is a **systemic disease** in which there is nutritional, musculoskeletal, immunological and mood (depression) dysfunction
- Recognize the critical role of pulmonary rehab in the management of all COPD patients
- Understand the role of short and long-acting bronchodilators, inhaled corticosteroids and combination therapies in COPD
- Discuss requirements and benefits of domiciliary Oxygen
- Be aware that surgery (bullectomy, lung-volume reduction, transplant) can be considered in severe COPD
- Be aware of resources in community (i.e. websites Canadian Thoracic Society, Alberta Lung Association, **Calgary COPD and Asthma Program**)

Exacerbation of COPD

Given a patient with an exacerbation of COPD the student will:

- Perform a focused history to identify triggers and severity
- List a differential diagnosis for the causes of the exacerbation
- Perform a focused physical exam looking for signs of a severe COPD exacerbation
- Order and interpret initial investigations including EKG, ABGs, CXR
- Outline an initial management plan
- Identify clinical features that indicate patient may need ventilatory support

Smoking Cessation

Given a smoker the student will be able to:

- Discuss the health benefits of smoking cessation with the patient
- Give stage matched advice, education and treatment
- Discuss the benefits of smoking-cessation counseling
- Discuss non-pharmacological and pharmacological smoking cessation aids and their effectiveness
- List contraindications for pharmacologic smoking cessation aids
- Recognize barriers to smoking cessation
- Be aware of resources in community (i.e. websites for Health Canada, Canadian Thoracic Society, Alberta Lung Association, **Calgary COPD and Asthma Program (CCAP), Alberta Quits**)

Asthma

Given a patient with shortness of breath, cough, and/or wheeze and a normal CXR the student will be able to:

- Provide a working definition of asthma
- Identify the aero-allergens responsible for allergic airways disease
- Recognize the association between asthma and allergic rhinitis
- Describe the early and late phases of the asthmatic response
- Describe the role of IgE, mast cells, lymphocytes, and eosinophils in the allergic response
- Take a focused history looking for historical features that suggest asthma including; age of onset, family history, triggers, severity, control, features of occupational asthma, exercise induced asthma, ASA sensitivity, symptoms of allergic rhinitis
- Perform a physical exam looking for signs of asthma, rhinitis and atopy
- Order and justify diagnostic tests
- Advise patients on use of Peak Flow meters, and peak flow monitoring
- The student will be able to correctly perform and *interpret* spirometry that is normal or shows variable obstruction
- List the medications for symptomatic relief and for control of asthma. (SEE PHARMACOLOGY OBJECTIVES)
- List the goals of treatment
- Educate patient with newly diagnosed asthma
- Discuss environmental trigger avoidance
- Write out an action plan
- Be aware of resources in community (i.e. websites Canadian Thoracic Society, Alberta Lung Association, Canadian Asthma Society, **Calgary COPD and Asthma Program**)

Acute Severe Asthma

Given a patient presenting with acute severe asthma the student will be able to:

- List the historical features that suggest a severe exacerbation
- List features on physical exam that suggest a severe exacerbation

- List the features on history/physical examination that indicate the patient requires intubation and ventilatory support
- Describe the blood gas changes in acute severe asthma
- Outline the initial management of acute severe asthma
- Understand when it is safe to discharge a patient from ER who presented with acute severe asthma

Pharmacology of Asthma and COPD

- Understand the physiology and innervation of airways; mediators of airway inflammation; receptor pharmacology relevant to the airways; inflammatory process/responses; role of cyclic AMP (catecholamines), leukotrienes and NO in regulation of airways and pulmonary vascular smooth muscle tone; definition of asthma and COPD; reactivity of airways smooth muscle relative to asthma pathology
- Understand the therapeutic goals: remove triggering agents, adequate oxygenation; treat bronchoconstriction, treat airway inflammation; reduce incidence of exacerbations

Drugs used in the Treatment of Asthma and COPD

- For the following classes of drugs the student will be able to:
 - Describe the mode of action
 - Describe the benefits/side effects in asthma and COPD
 - List the indications for their use in asthma and COPD
 - Demonstrate proper inhaler technique to patient

The classes of drugs are:

- Oxygen
- Bronchodilators:
 - Short-acting β 2-Adrenoceptor agonists (i.e. salbutamol, terbutaline, fenoterol)
 - Long-acting β 2 adrenoceptor agonists (salmeterol, formoterol)
 - Short-acting muscarinic receptor antagonists, also known as anti-cholinergics (ipratropium)
 - Long-acting muscarinic receptor antagonists, also known as anti-cholinergics (tiotropium)
 - Methylxanthines (theophylline, aminophyllin)
- Anti-inflammatory agents:
 - Inhaled corticosteroids (beclamethasone, fluticasone, budesonide, triamcinalone, etc)
 - Leukotriene receptor antagonists (montelukast, zafirlukast)
 - Combination therapies (Advair, Symbicort) - scientific rationale and impact of SMART study)
 - Drugs of the future (PDE4 inhibitors, CCR3 antagonists, ultra-long-acting β 2- adrenoceptor agonists – e.g. indacaterol)

Understand the Medication Categories for asthma

- Relievers (intermittent symptoms): short acting β 2 agonists
- Controllers (maintenance therapy): anti-inflammatory agents, long-acting β 2 agonists, theophylline, tiotropium
- Understand the biological rationale underlying drug actions:
 - Short-acting β 2-adrenoceptor agonists – cascade of events (e.g. activation of adenylyl cyclase) resulting in relaxation of airways smooth muscle
 - Inhaled corticosteroids – intracellular receptors, anti-inflammatory, improve lung function, decrease bronchial hyper-responsiveness, suppress late response in asthma
 - Oral corticosteroids and steroid resistance
 - Leukotriene-receptor antagonists: modify leukotriene synthesis pathway
 - Theophylline: phosphodiesterase inhibition, adenosine receptor antagonist
 - Describe the different formulations; pressurized and dry-powder inhalers, nebulizer suspensions, tablets, liquid suspensions, IV infusions, etc

- Prescribe initial dosage and route of administration for pharmacological treatment of chronic treatment of acute severe asthma in ER; chronic, poorly controlled asthma in physician office; acute exacerbation of COPD in ER; symptomatic COPD in physician office. (
- Understand the **pharmacokinetics** of:
 - Short-acting β_2 agonists - onset 10-15 min, duration 2-6 hrs
 - Long-acting β_2 agonists – sustained (>12 hr) effect
 - Inhaled corticosteroids – poorly absorbed, extensive first pass metabolism, max effect requires ~8 weeks
 - Leukotriene receptor antagonists – rapid oral absorption, peak plasma 3-4 hrs, metabolized
 - 3rd line agents – prophylactic, variable metabolism (theophylline); impact of smoking
- Understand the **side effects** of:
 - Short-acting β_2 agonists: minimal, mild tremor, tachycardia, may lead to tolerance (controversy)
 - Long-acting β_2 agonists – mask deterioration of asthma, tachyphylaxis (salmeterol)
 - Inhaled corticosteroids – less systemic effects than oral, dose dependent, thrush, hoarseness, cough, medium/high dose may affect growth
 - Leukotriene receptor antagonists – GI, mild headache, aminotransferase activity, drug interactions (zafirlukast); few adverse effects & interactions (montelukast)
 - Theophylline – CNS stimulation, tremor, vasodilation, weak diuretic, GIT, drug interactions; monitor plasma levels (55-110 $\mu\text{mol/L}$)
- Be aware of potential of: overdose, drug interactions, tolerance, desensitization

Chronic Cough

Given a patient with chronic cough and a normal CXR the student will be able to:

- Take an appropriate history including looking for features suggestive of post-infectious bronchitis, asthma, post-nasal drip, medication induced cough, reflux disease, COPD and LV dysfunction
- Perform an appropriate physical exam
- Order appropriate tests to identify the cause of the cough including spirometry and methacholine challenge
- Correctly interpret a spirometry which is normal or shows obstruction
- List causes of chronic cough that have normal spirometry
- List causes of chronic cough that show airflow obstruction

Bronchiectasis

The student will be able to:

- Provide a working definition of bronchiectasis
- List causes for bronchiectasis
- Describe the pathological changes in bronchiectasis
- List the clinical features on physical exam and history that suggest bronchiectasis
- Order initial investigations for the diagnosis of bronchiectasis including spirometry, blood work, CXR and CT chest
- List the features on a CXR and CT chest which suggest bronchiectasis
- Outline treatment principles for bronchiectasis, including bronchial drainage, chest physiotherapy, and pharmacological treatments

Sarcoidosis

- Describe the pathogenesis of sarcoidosis
- Describe the radiographic stages of sarcoidosis
- Describe the clinical findings associated with sarcoidosis
- Describe the natural history and treatment of sarcoidosis

Interstitial Lung Disease

Given a patient with interstitial lung disease the student will:

- Compare and contrast the findings on history, physical exam, radiological investigations and pathology for the most common causes of this clinical problem.
- By history, identify important environmental (including occupational) exposures associated with the causes of this condition.
- Examine the patient to elicit signs and complications of interstitial lung disease
- Identify and interpret findings of the skin and joints that can occur in association with some causes of interstitial disease;
- Identify and interpret findings on cardiovascular examination that indicate left sided and right sided congestive heart failure
- Describe the typical chest x-ray findings for the most common causes
- Justify a plan of investigation, including blood tests, CT scanning +/- lung biopsy of a patient with suspected interstitial lung disease.
- Recognize that a multidisciplinary approach (involving clinicians, radiologists, and pathologists) is often required to diagnose diffuse parenchymal lung disease.
- Be aware of some treatment options for the common causes of interstitial lung disease.

Pulmonary Vasculature - Pathophysiology of Disease (N. Hirani)

- compare and contrast the two circulations of the lung with respect to:
 - anatomy
 - systolic and mean arterial pressures
- calculate the Pulmonary Vascular Resistance (PVR)
- describe the effects of an increase in cardiac output on PVR
- give examples of the beneficial and harmful consequences of hypoxic pulmonary vasoconstriction

Pulmonary Hypertension- Approach

- Describe the pathological changes in pulmonary arterioles & arteries and in the right ventricle in patients with long standing pulmonary hypertension
- Given a patient with dyspnea, with no history of cardiac disease and who has a normal vital capacity & FEV1, state the differential diagnosis
- Describe the expected physical findings if the patient has pulmonary hypertension
- List four (4) causes of pulmonary hypertension
- Given a patient with suspected pulmonary hypertension, justify the investigations you would order to confirm a diagnosis and what those investigations would be expected to demonstrate.
- Given a patient with NYHA Class III pulmonary arterial hypertension, describe two medical therapies
- Develop and justify an approach to treatment of a patient with pulmonary arterial hypertension

Hemoptysis

- Provide a differential diagnosis for hemoptysis
- Describe the important features on history and physical exam that will assist you in determining the etiology of hemoptysis
- List the risk factors which would increase the possibility of lung cancer as an etiology of hemoptysis
- Define massive hemoptysis
- Understand the management of massive hemoptysis

Cough/Dyspnea with Fever

The student will be able to:

- Given a patient with pulmonary infection, list the host defense mechanisms which may have failed, and identify for a specific pathogen the most important host defenses.
- Given a specific pneumonia pathogen, list one or more diagnostic tests which could be used to confirm the presence of that pathogen.
- Given a patient with pulmonary infection, choose the most common pathogens from a list of microorganisms.
- Given a picture or a slide of a histopathologic section of lung from a patient with pulmonary infection, differentiate between interstitial infection and air space infection, and correlate this with the expected radiologic pattern.
- Classify pulmonary infection as acute (including “typical” and “atypical” pneumonia), chronic or recurrent, and identify specific pathogens associated with each category.
- Given a patient with community-acquired pulmonary infection, assemble historical and physical examination clues along with relevant laboratory data to assess the severity of the infection, make a decision about hospital admission vs. outpatient management, and choose appropriate empiric antibiotic treatment.
- Given a patient with pulmonary infection who is not responding to empiric treatment, investigate for known complications of pneumonia (including empyema and lung abscess).
- Given a patient with pulmonary infection failing to respond to initial therapy, formulate a differential diagnosis including antibiotic resistance, unusual pathogens, suppurative pulmonary complications, and extrapulmonary septic complications.
- The student will list existing preventative strategies for pulmonary infection and identify the recognized indications for each.
- Recall that the differential diagnosis of pneumonia in the immunocompromised host is exceedingly broad and be able to predict specific etiologies given the nature of the specific immune deficit.
- Recall that *Pneumocystis carinii* is the most common pneumonia pathogen in HIV-infected patients with depressed cell-mediated immunity and be able to formulate a diagnosis and management plan for such a patient.
- Given a patient with pulmonary infection suspicious for tuberculosis, defend an infection control strategy for the patient, choose diagnostic tests and interpret the results, and initiate empiric anti-tuberculous treatment using directly-observed therapy.
 - Plan a public health strategy to manage the exposed contacts of a source patient with tuberculosis.
 - Distinguish between first-line and second-line anti-tuberculous drugs.

Pleural Disease

- Name the two different types of pleura and the structures they cover
- Describe the mechanisms leading to the formation and accumulation of pleural fluid
- List the clinical manifestations of a pleural effusion
- List the 3 criteria used to classify pleural effusions as either a transudate or an exudate (Light's Criteria)
- Given a clinical scenario, use Light's criteria to determine whether the pleural fluid represents and exudate or a transudate
- Using the results derived from pleural fluid analysis (pH, cytology, WBC count and differential, glucose, TG, amylase, Hct) determine the most probable cause of the effusion
- Describe the diagnostic algorithm for parapneumonic effusion and justify your decision to consider chest tube drainage or to perform a thoracentesis
- List the pleural manifestations of asbestos-related lung disease
- Describe 2 mechanisms of how a pneumothorax can develop

- Predict what happens to the lung when there is a pneumothorax and explain why
- Describe the mechanisms and cardiovascular consequences of tension pneumothorax
- Given a patient with primary, spontaneous pneumothorax, describe the presenting symptoms and typical physical signs
- Given a patient with a pneumothorax justify a management strategy including how you would decide what lung was involved
- Describe how a chest tube water seal functions; why it is important in the treatment of pneumothorax and how it indicates if a chest tube can be removed
- Describe how you would determine whether a chest drain is actually in the appropriate position within the pleural space and if it is indeed patent

Solitary Pulmonary Nodule/ Lung Cancer

The student will be able to:

- Describe the importance of lung cancer in North America in terms of incidence and mortality rates for both men and women and in relationship to other common cancers.
- Given the high prevalence and prognosis of lung cancer defend the lack of a population based screening program
- State the major and two other causes of primary lung cancer
- For a solitary pulmonary nodule or mass, categorize the non-malignant causes and provide three examples
- List the two major types of primary bronchogenic neoplasms
- Define paraneoplastic syndrome and list three that are caused by lung cancers
- State the factors that determine the probability that a solitary pulmonary nodule is malignant
- Describe the common sites to which primary lung cancers can metastasize or spread
- List the three basic components of the TNM staging system
- Classify small cell and non-small cell lung cancer with respect to:
 - Staging system used
 - Treatment
 - Prognosis
- Given a patient with a solitary pulmonary nodule, describe indications and contraindications for surgery
- Given a patient who has a solitary nodule or mass on chest x-ray, discuss the radiological investigations, and special procedures which may be useful in the evaluation of the lesion
- List the three primary types of treatment for lung cancer
- Given a patient with advanced, inoperable (stage IIIb or IV) lung cancer discuss factors which may lead to a decision to offer or not to offer chemotherapy or radiation

Mediastinal Disorders

The student will be able to:

- List the three mediastinal compartments
- List the four major causes of anterior mediastinal mass
- Given a patient with a chest x-ray that demonstrates a mass adjacent to the aortic arch, predict the mediastinal compartment it is in
- Given a patient with weakness and a mediastinal mass, predict the location and the pathology of the tumour

Mediastinal Masses & Developmental Anomalies in Children

The student will be able to:

- Identify the key developmental structural event that occurs for each of the four embryonic stages of lung development and name at least one congenital malformation arising from each stage.

- The student will be able to integrate information obtained by history and physical examination of a newborn with respiratory distress and identify those features consistent with a diagnosis of congenital diaphragmatic hernia. The student will be able to discuss the initial approach to the stabilization and management of the infant, in particular, early endo-tracheal intubation, insertion of a naso-gastric tube for decompression of the stomach and bowel and the avoidance of bag-mask ventilation.
- Discuss the differential diagnosis of child presenting with a mediastinal mass
- Identify the most likely benign and malignant tumors arising in each of the following mediastinal segments:
 - Anterior
 - Middle
 - Posterior

PULMONARY PATHOLOGY (Dr. A. Franko)

Students will be able to:

Recognize the macroscopic and microscopic findings for the following pulmonary diseases:

- Asthma
- Emphysema
- Bronchiectasis
- Interstitial Lung Disease (recognizing the distinct pathologic features used to distinguish different types of ILD)
- Occupational/Exposure related lung disease
- Sarcoidosis
- Pneumonia and other lung infections
- Pulmonary thromboembolic disease

Recognize the macroscopic and microscopic features of the following pleural diseases:

- Pleural plaques
- Mesothelioma

Develop an approach to the diagnosis of lung cancer based on the demographics, exposure, macroscopic, and histologic features.

Recognize the importance of biomarker analysis and the role of pathology in the treatment of lung cancer.

PEDIATRIC RESPIROLOGY

Introduction to Pediatric Respiriology/Labored Noisy Breathing in Child

The student will be able to:

- Describe the appearance/physical findings of an infant or child with acute respiratory failure including the presence of the following: tachypnea, pallor, cyanosis, nasal flaring, head bobbing, tracheal tug, substernal indrawing, intercostal indrawing, subcostal indrawing, “anxious-appearing”, lethargy, “sniffing position”.
- Describe the approach to the investigation of stridor in a newborn infant and identify the key features of laryngomalacia including: absence of stridor at birth, increased intensity with effort, no interference with feeding, weight gain or sleep.
- Given a specific clinical scenario of a child with labored, noisy breathing, formulate a differential diagnosis and discuss the plan of investigations.

- The student will be able to discriminate between the following diagnoses and will describe the common features, pathophysiology and microbiology of:
 - Croup (laryngotracheobronchitis)
 - Bacterial tracheitis.

Cough in Child

The student will be able to:

- Define chronic cough in childhood
- Given a child with chronic cough and normal growth; describe clinical findings and investigations that would differentiate asthma from other common causes of chronic cough
- Given a child with chronic cough and poor growth; describe clinical features that would suggest the diagnosis of cystic fibrosis
- Based on clinical findings, differentiate common causes of chronic cough in children (e.g. asthma, cystic fibrosis, pertussis, foreign body aspiration, rhinitis/sinusitis, gastroesophageal reflux disease, congenital malformations)
- Utilize the clinical response to a therapeutic trial of bronchodilators, systemic corticosteroids or antibiotics to differentiate common causes of chronic cough in children.
- Describe the appropriate use of investigations in differentiating the cause of chronic cough in children

Pediatric Asthma

Given a child presenting with wheeze, shortness of breath or respiratory distress the student will be able to:

- Describe the most common presentation of asthma in a toddler, school-aged child and adolescent
- List the most common differential diagnoses for asthma in a toddler, school-aged child and adolescent and describe the key discriminatory features of each. Include finger clubbing, failure to thrive (cystic fibrosis), acute onset focal wheeze (foreign body), coughing and choking associated with feeds in infants (aspiration syndrome), first episode of wheezing, RSV season, infant under 6 months of age (bronchiolitis)
- The student will perform a history and physical examination and based on the obtained information will distinguish between children with acute asthma that require hospitalization for treatment and those that can be treated on an outpatient basis.

Upper Respiratory Tract Infections/Bronchiolitis

The student will be able to:

- Identify 4 host factors that predispose children to the development of complicated upper respiratory tract infections.
- List the characteristics related to attendance at child day care facilities that predispose children to an increased frequency of respiratory tract infections.
- Identify the features of history and physical examination that are suggestive of a complicated upper respiratory tract infection.

Cystic Fibrosis

The student will be able to:

- Describe the genetics, molecular defect and abnormality of epithelial electrolyte transport in cystic fibrosis.
- Describe the common presentations of cystic fibrosis in newborns, infants, children and adults

- Devise a schedule for monitoring and anticipating guidance regarding potential complications of cystic fibrosis on respiratory and extra-respiratory systems.
- Describe the management principles for cystic fibrosis and develop a individualized treatment plan for maintenance of respiratory health.
- Identify the psychosocial complications of cystic fibrosis, and develop counseling strategies to assist patients and their families.
- Influence public policy to assist patients with chronic respiratory disorders and those patient's families
- Discuss the benefits and disadvantages of population and neonatal screening programs for cystic fibrosis.
- List possible future therapeutic strategies to correct the basic defect in cystic fibrosis, including gene therapy techniques and biochemical alterations in epithelial ion transport.
- Describe the rationale for a multidisciplinary approach to care for an individual with cystic fibrosis

Breathing Disorders During Sleep/Sleep Disorders

Sleep Disorders in Adults

- Compare and contrast obstructive and central sleep apnea.
- Given a patient with daytime sleepiness, perform a focused history and physical examination; and justify a plan for further diagnostic testing (if necessary) in the setting of:
 - Insomnia
 - Insufficient total sleep time
 - Obstructive sleep apnea
 - Other sleep disorder
- Define obstructive sleep apnea
- Given a patient with obstructive sleep apnea, determine whether treatment is necessary, and if so, make specific treatment recommendations.
- Recognize the risks of initiating CPAP or oxygen in patients with hypoventilation.
- Discuss treatment options in a patient with chronic hypoventilation.

Sleep Disorders in Children

The student will be able to:

- Compare and contrast obstructive and central sleep apnea.
- Identify specific groups of children at high risk of having hypoventilation
- List five presenting symptoms of obstructive sleep apnea in children.
- Identify specific groups of children at high risk of having obstructive sleep apnea and describe how you will identify those requiring further assessment.

ANATOMY

See Anatomy Notes, uploaded to OSLER