

Cardiovascular and Pulmonary Applications in the PT Outpatient Clinic

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Leading Causes of Death in USA

- #1 Heart Disease (for both men and women)
- #2 Cancer
- #3 Chronic Lower Respiratory Diseases
- #4 Accidents
- #5 Stroke
- #6 Alzheimer's Disease
- #7 Diabetes Mellitus
- #8 Influenza and Pneumonia
- #9 Kidney Disease
- #10 Suicide

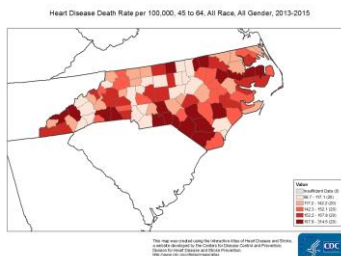
Causes of Death Trends Over Past 5 Years

- **Decreased**
 - Heart Disease 0.4%
 - Cancer 2.0%
 - Stroke 1.9%
 - Alzheimer's Disease 1.3%
- **Increased**
 - Chronic lower respiratory diseases 1.4%
 - Influenza and Pneumonia 10.4%
 - Septicemia 3.9%
 - Liver Disease 3.0%
 - Hypertension 3.7%
 - Parkinson's Disease 4.3%

Heart Disease Risk Factors

- **MAJOR**
 - Hypertension
 - Cholesterol
 - Smoking
- Others
 - Diabetes
 - Obesity
 - Inactivity
 - Family History

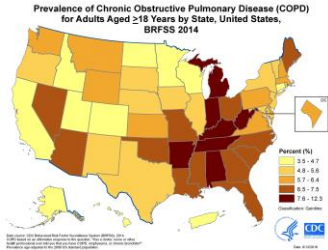
Prevalence of Heart Disease in North Carolina



Pulmonary Disease Risk Factors

- Age
- Smoking
- Environmental Exposures
- Family History
- Allergies and Asthma
- GERD
- Chemotherapy and Radiation Therapy
- Dietary
- Gestational and Childhood Factors
- Periodontal Disease

Prevalence of Lung Disease in USA

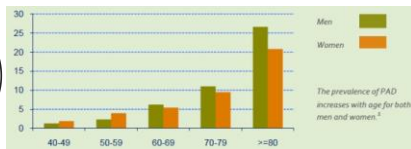


Risk Factors for Vascular Disease

- Smoking
- High Cholesterol
- Inactivity
- Hypertension
- Atherosclerosis
- Older than age 60

https://www.cdc.gov/dhdsp/data_statistics/fact_sheets/fs_pad.htm

Prevalence of Vascular Disease



Cardiac Disease as a Co-Morbidity: What does that mean for my Out-patients?

- Cardiac disease often co-exists with
 - Hypertension
 - No symptoms?
 - Headache?
 - Diabetes
 - Symptoms: lightheadedness, blurred vision,
 - Congestive Heart Failure
 - Shortness of Breath
 - Bilateral LE edema
 - Crackles in lung posterior bases
 - Fatigue
 - Kidney Disease
 - Confusion
 - Edema
 - Blood Pressure abnormal

Cardiac Disease as a Co-Morbidity: What does that mean for my Out-patients?

- Your patient may experience
 - Side effects from medications
 - Low heart rate, slow and low response to exercise (**Beta-blockers)
 - Low Blood Pressure
 - Low activity/ endurance
 - Chest discomfort/Angina
 - Common in Stable Angina
 - May have supplemental Nitroglycerin to take in these situations
 - Not acceptable in Unstable Angina
 - Stop exercise, report to MD
 - Orthostatic Hypotension
 - BP normal in one position, but decreases with change of position; eg. standing
 - Dehydration
 - Low BP
 - Watch for this when weather goes from cool to hot and dry (spring)
 - Edema
 - Bilateral lower extremities, abdomen, hands/fingers, face, lungs
 - if > 2 lb. weight gain over 24 hours, call MD
 - Ask patient if he's taken diuretic regularly and on time
 - Indicates too much fluid on board

How Does Pulmonary Disease Effect My Out-Patients?

- Impairments/Diagnoses that often co-exist with Pulmonary Disease
 - Osteopenia or Osteoporosis
 - Chronic steroid use
 - Age
 - Poor nutrition
 - Diabetes
 - Chronic steroid use
 - Balance Abnormalities
 - Common among pulmonary patients
 - Muscle Weakness
 - Common among pulmonary patients
 - Low endurance/ fear of activity
 - Due to inactivity due to SOB and fear of SOB
 - Shortness of Breath
 - Nature of the disease
 - Anxiety
 - Chest discomfort
 - Rib cage joints
 - Respiratory muscle fatigue
 - Anxiety or Depression
 - Common in this population
 - Edema
 - May indicate Cor Pulmonale

How Will my Vascular Disease Patients Present?

- Leg pain with walking (Claudication)
 - Symptoms of pain, ache, or cramp with walking can occur in buttocks, hips, thighs, calves
 - Up to 40% may not have leg pain!
- Goes away with rest
- Poor hair growth
- Cold extremities
- Muscle atrophy
- Smooth shiny skin
- Decreased or absent pulses in feet
- Non-healing ulcers or sores on legs, feet
- Impaired sensation of distal lower extremities
- Edema (Venus insufficiency)
- Discoloration of skin (Venus insufficiency)

How do you monitor for CVP disease?

- Vital Signs every visit! What is normal?

Value	Normal Range
Heart Rate (HR)	60-100 bpm
Pulse Oxymetry (SpO2)	> 90%
Respiratory Rate (RR)	12-20 bpm
Blood Pressure (BP)	<120/80 mmHg
Rate of Perceived Exertion (RPE)	2-3 light, 4-6 moderate
Dyspnea on Exertion (DOE)	

- What values are alarming?
 - Stoptlight: Red? Yellow? Or Green?

Heart Rate <ul style="list-style-type: none"> ➢ HR >70% APMHR ➢ HR > 20% decrease in resting HR ➢ HR < 40 beats/minute ➢ HR > 130 beats/minute 	Blood Pressure <ul style="list-style-type: none"> ➢ 20% decrease in SBP/DBP ➢ orthostatic hypotension ➢ MAP < 65 mmHg ➢ MAP >110 mmHg
New onset dysrhythmia New MI by ECG or cardiac enzymes	New vasopressor or escalating dose of vasopressor medication
Alertness/Agitation <ul style="list-style-type: none"> ➢ Patient sedation or coma (RASS ≤-3) ➢ Patient agitation requiring addition or escalation of sedative medication (RASS >2) ➢ Patient refusal 	Mechanical Ventilation <ul style="list-style-type: none"> ➢ FOi ≥ 0.60 ➢ PEEP ≥ 10 ➢ Patient-ventilator asynchrony ➢ MV mode change to assist-control ➢ Tenuous airway
Pulse Oximetry/SpO2 <ul style="list-style-type: none"> ➢ 4% decrease ➢ < 88%-90% 	Respiratory Rate <ul style="list-style-type: none"> ➢ RR < 5 breaths/minute ➢ RR > 40 breaths/minute ➢ Patient c/o intolerable DOE

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Monitor: Cardiac Disease

- Monitor at Rest vs Exercise
 - HR should increase unless on beta blocker (-olol)
 - SBP should increase 5-10 mmHg with each 1 MET level
 - DBP should remain the same (± 10 mmHg)
 - RR increases with workload, rapid rate rise after anaerobic threshold
 - SpO2 should remain >90% - stays the same or increases
 - RPE/DOE
 - does the increase match your VS
 - does a mismatch indicate a problem?

Monitor: Cardiac Disease

- Monitor for hypo or hypertension
 - Dehydration will cause hypotension vs meds
 - Is hypertension being controlled by meds vs risk of CVA
- Monitor for signs/symptoms of arrhythmia
 - Palpitations,
 - Valsalva cause cause abnormal rhythms
 - Instruct for breathing with lifting
- How does personality come into play?
 - Pushing self to reach limits vs motivation required to reach "exercise state"

Monitor: Cardiac Disease

- Chest Pain
 - Angina
 - Pericarditis
 - Mitral valve dysfunction
 - Bronchospasm
 - Esophageal spasm
 - Palpitations
- SOB
- Dizziness
- Fatigue

Treatment: Cardiac Disease

- Endurance
- Resistance
- Functional Mobility
- Patient Education
- Outcomes

Endurance Training ^{E-G}

- Warm-up and cool down periods are key
- Increase duration and frequency before intensity
- Goal is to achieve 20–60 minutes of moderate physical activity (RPE 12–14), 4–5 days/week (150 min/week)
- ACA/AHA/ACSM recommendations include:
 - Begin at bouts of 2–6 min with 1–2 min rest at 40–60% $\dot{V}O_2$ max
 - HR less than 120 or HR rest +20 (post-MI) or +30 (post-op)
 - Gradually increase until pt. tolerates 30 min of continuous activity
 - 15–30 minutes, 3–5 days/week at RPE 10–13
- Mode
 - Most studies done with bicycle ergometer
 - Progressive ambulation
 - NuStep

Resistance Training ^{H,I}

- Moderate to slow, controlled speed through complete ROM
- Avoid Valsava
- Should initially be 1 set of 10–15 repetitions at low intensity
 - 30–40% of 1 RM for UE
 - 50–60% of 1 RM for LE
- Involve major muscle groups of both UE and LE
- Frequency: 2x/week with 48 hours between major muscle groups
- Progression
 - Intensity to 50–80% of 1 RM
 - Frequency to 3x/week

Monitor: Pulmonary Disease

- Vital Signs as mentioned
- Facial Expression and Positioning
- Breathing Pattern
 - Chest wall motion
 - Muscles recruited
- Cough, cough production, and phonation
- Lung Auscultation
 - Wheeze, Crackles, Diminished
- Medications
 - Short acting inhalers vs long acting

Monitor: Pulmonary Disease

- COPD - CO₂ retention
- Interstitial Lung Disease - rapid desaturation
- Cystic Fibrosis - bronchial hygiene
- Asthma – use inhalers, extended warm-up
- Pulmonary hypertension
 - Maintain oxygen saturation > 88-90% at all times
 - Avoid Valsalva, high-intensity exercise, forward flexion/bending, and concurrent use of arms and legs
 - Educate patient on Sxs of activity intolerance: lightheadedness, chest pain, palpitations, syncope
 - Close communication with PH MD

Treatment: Pulmonary Disease

- Breathing Mechanics
- Airway Clearance
- Energy Conservation
- Relaxation
- Education
- Exercise

Treatment: Pulmonary Disease

- American Thoracic Society Guidelines ^J
 - 20 minute sessions at least 3x/week to achieve physiologic benefits
 - High-intensity ex. produces greater physiologic benefit; however, low-intensity training is also effective for those who cannot achieve high intensity.
 - Interval training may be useful in promoting higher levels of ex. training in more symptomatic pts.
 - Both upper and lower extremity training should be utilized.
 - The combination of endurance and strength training generally has multiple beneficial effects.

Endurance Training ^J

- Goal: 20-60 minutes of continuous exercise per session
 - Target intensity is > 60% of maximal work rate
 - Borg RPE of 12-14
 - Modified Borg dyspnea or exertion level of 4-6
- Interval training and continuous training appear to be equally effective in patients with COPD
 - May be useful in symptom-limited individuals

Resistance Training ^J

- 1-3 sets of 8-12 reps on 2-3 days/week
- Initial load of 60-70% 1RM or one that evokes fatigue after 8-12 reps
- Increase when the patient can perform the workload for 1-2 reps over on 2 consecutive training sessions
- Incorporate all major muscle groups

Monitor: Vascular Disease

- Symptoms:
 - Calf muscle cramp, pain in buttocks, hips, thighs, feet
 - Other symptoms
 - achy, tired, numb, or heavy limb sensation
 - Cold legs or feet
 - Changes in skin color
 - Hair loss on legs and feet
 - Sores on legs or feet
 - Discomfort disappears with rest
 - Advanced disease: Rest pain
- Patient can grade symptoms based on subjective scale

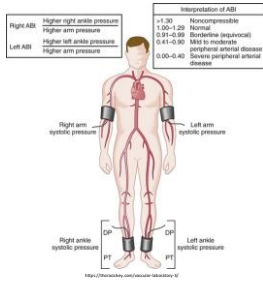
Subjective Grading Scale for PVD

- Grade 1: Definite discomfort or pain but only in initial or modest levels (established but minimal)
- Grade 2: Moderate discomfort or pain from which the patient's attention can be diverted, for example by conversation
- Grade 3: Intense pain (short of Grade 4) from which the patient's attention cannot be diverted
- Grade 4: Excruciating and unbearable pain

Monitor: Vascular Disease

- Encourage good footwear, hygiene, inspection
- Use of Ankle Brachial Index

ABI



Treatment: Vascular Disease

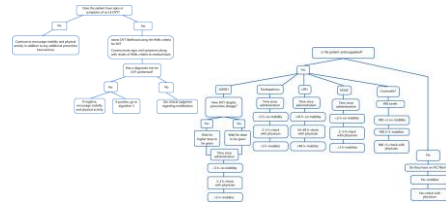
- Lifestyle modification
- Medications
 - Anti-hypertensives, statins, thrombolytics, anti-platelet
- Exercise
- Surgery
 - Percutaneous transluminal angioplasty
 - Bypass graft

Treatment: Vascular Disease

- Exercise to maximum tolerated pain (grade 3)
- Walking is best (specificity, functional)
 - Low intensity such as 2 mph treadmill
- Interval training: alternate exercise with rest (1:2,5:10 minutes)
- Goal is to increase duration (to 30-60 min.) and decrease rest stops, 3-5 days/week.

Monitor/Treatment: DVT

- Monitor: Wells criteria
- Treatment/mobility: Algorithm ^K



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