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A Checklist of Key Cardio-Respiratory Interventions for Entry-Level Physical Therapy Students

Introduction

Members of the National Association for Clinical Education in Physiotherapy (NACEP) identified the need to develop a strategy to increase clinical placement capacity in a number of geographical and practice areas. One approach which has received widespread endorsement is the development of a checklist to track key interventions for specific practice areas. Clinical research supports the assessment and treatment of the cardio-respiratory system by physiotherapists as a part of the holistic treatment of most patients. It also provides evidence for such assessments and treatments to be utilized in all practice areas, not simply those which are known to treat CR indicator conditions (e.g. heart failure, chronic obstructive pulmonary disease, diabetes). Recognizing opportunities to assess and promote the ability to perform aerobic exercise and to identify its role in chronic disease prevention will provide the student with repeated occasions to observe and participate in CR clinical experiences. All instances where a student utilizes knowledge and skills related to cardio-respiratory conditions and interventions should therefore be considered as relevant and appropriate cardio-respiratory experiences.

Objectives

The objectives of the CR checklist are: (1) to ensure that physiotherapy students gain experience with essential clinical skills, attitudes and behaviours within CR in order to obtain the minimum entry-level cardio-respiratory competencies prior to graduation, (2) to provide clinical supervisors with guidance as to the practice settings and clinical situations in which competence may be assessed; and (3) to highlight for students, clinical instructors and facilities that any clinical setting has the potential to assist students in acquiring CR competencies.

The checklist has been prepared in such a way as to make it manageable; it is not meant to be an exhaustive list of possible interventions. In no way does it preclude students from obtaining experiences above and beyond those which have been included. Furthermore, each university program is encouraged to use and adapt the checklist in the manner in which it will be of most use. For example, the checklist may be enhanced to include an evaluative component, or modified to reflect provincial scopes of practice.

Development

The checklist was developed by a NACEP working group, following the collection of an inventory of existing documents and checklists from across the country. A nationwide validation survey was conducted, and included input from clinical educators who provide CR services, school of



physical therapy faculty, instructors and lecturers responsible for CR instruction within the Masters-level physical therapy university programs, and representatives from centres of coordinators of clinical education. The Cardio-Respiratory Division of the Canadian Physiotherapy Association reviewed drafts of the document both before and after the validation process was completed.

Consideration was given to two key documents during the development of the checklist. It is recommended that the checklist be used in conjunction with the *Essential Competency Profile* published by the National Physiotherapy Advisory Group in 2009 and the *Entry-to-Practice Physiotherapy Curriculum: Content Guidelines for Canadian University programs* (May, 2009) published by the Canadian Council of Physiotherapy University Programs. The first document outlines the roles and specific competencies required of all practitioners, regardless of practice setting. While the second document provides a list of activities through which the student may demonstrate acquisition and integration of knowledge, skills, and behaviours, it is not written in such a way as to provide measurable indicators.

Contents

Appendix A contains the checklist to be used by students to document CR experiences while in the clinical setting. Students and clinical educators should note that the checklist contains knowledge and elements of practice that are SPECIFIC to CR patients/clients; it does not include interventions that are deemed to be essential with all physiotherapy patient populations (e.g. patient education, assessing response to treatment, interprofessional collaboration etc.) A list of abbreviations and key terms used in the checklist can be found in the glossary at the end of the document. It is recommended that the checklist be reviewed in three years in order to account for changes in practice and/or curriculum and any feedback received.

The checklist is based on the following inventory of knowledge and clinical activities:

A. Foundational Knowledge

The following are curriculum components which are deemed necessary for the preparation of students, and comprise the knowledge upon which all clinical activities should be based.



Cardiorespiratory System –

The response of the upper and lower respiratory tract, lungs, heart, vascular structures, diaphragm, thoracic costal and spinal structures in consideration of the pathophysiology, pathomechanics and functional limitations associated with cardiovascular and respiratory conditions as listed below.

	KEY INDICATOR CONDITIONS	STRUCTURE/FUNCTION
CARDIOVASCULAR	Heart disease/malformation/injury, myocardial ischemia and infarction, heart failure, cor pulmonale, peripheral vascular disease, venous disorders, cardiac transplant, cardiac surgery, relevant laboratory data	Mechanical function of the heart, electrical activity of the heart, hemodynamics, coronary circulation controls, peripheral circulation control, fluid dynamics
RESPIRATORY	Pneumonia, atelectasis, ARDS, IRDS, acute lung injury, asthma, COPD, bronchiectasis, restrictive pulmonary disease (interstitial pulmonary fibrosis) tuberculosis, pleural effusions, pulmonary edema, cystic fibrosis, impact of various surgeries on the respiratory system (thoracic, upper/lower abdominal, vascular)	Defense mechanisms, mechanics of respiration, pulmonary circulation, gas transport, gas exchange, control of ventilation, acid base balance and electrolytes, pressure flow relationships, arterial blood gases, pulmonary function tests, exercise responses

B. Clinical Activities

A list of key activities to which all students should be exposed, either through observation or performance. Activities may be completed using a variety of methods in a number of settings (e.g. practical coursework, laboratories, work with real or simulated patients, clinical placements)

Assessment

- a. Subjective assessment - dyspnea
- b. Chart review
- c. Patient history
- d. Scanning assessment of other systems (neurological, musculoskeletal, integument, renal and fluid balance, immune system)
- e. Scanning assessment related to obesity and diabetes/diabetes complications
- f. Functional status - bed mobility, gait/ambulatory status, transfers, ROM, strength/endurance, MIPs/MEPS, functional performance tests (6MWT)
- g. Cardiovascular endurance testing, sub maximal tests, walk tests, graded exercise tolerance test



- h. Inspection – respiratory rate, rhythm, thoracic shape, hydration, clubbing, breathing pattern, etc.
- i. Palpation – position of trachea, expansion, flexibility, diaphragmatic excursion, tactile fremitus, subcutaneous emphysema
- j. Mediate percussion (percussion effected by the intervention of a finger between the striking finger and the part percussed)
- k. Auscultation
- l. Cough, sputum
- m. Investigations – CXR, lab results, PFTs, ECG interpretations, ABGs
- n. Medications (such as key respiratory and cardiac medications – indications for use and side effects)
- o. Vital signs - e.g. heart rate, oxygen saturation, blood pressure, respiration rate, temperature

Analysis of assessment findings and establishment of a physiotherapy diagnosis and prognosis

Intervention

- a. **Exercise** – best practice exercise prescription for a variety of populations, modification of exercise and activity in the presence of pathology, implementing movement interventions including exercise prescription, prescribing assistive devices
- b. **Airway mobilization and airway clearance techniques** – suctioning, PEP/Flutter, postural drainage, percussion, huff, cough, assisted cough, active cycle breathing, mechanical in-exsufflation, autogenic drainage, vibrations
- c. **Improving gas exchange and managing low lung volumes** – summed breathing, breath stacking/lung volume recruitment, therapeutic positioning, deep diaphragmatic breathing, movement, glossopharyngeal breathing, respiratory muscle training, oxygen titration, modes of ventilation - mechanical ventilation, BiPAP
- d. **Managing dyspnea** – relaxation training, therapeutic positioning, exercise, pursed lip breathing, energy conservation, education
- e. **Safely manipulate tubes and lines during patient mobility** – catheters, including peripheral intravenous catheters, IVs, chest tubes, surgical drains, endotracheal tube



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Appendix A

Checklist of Minimum yet Essential Cardio-Respiratory Interventions for Entry-Level Physical Therapy Students

N.B. Clinical research supports the assessment and treatment of the cardio-respiratory system by physiotherapists as a part of the holistic treatment of most patients. It also provides evidence for such assessments and treatments to be utilized in all practice areas, not simply those which are known to treat CR indicator conditions (e.g. heart failure, chronic obstructive pulmonary disease, diabetes). Recognizing opportunities to assess and promote the ability to perform aerobic exercise and to identify its role in chronic disease prevention will provide the student with repeated occasions to observe and participate in CR clinical experiences. All instances where a student utilizes knowledge and skills related to cardio-respiratory conditions and interventions should therefore be considered as relevant and appropriate cardio-respiratory experiences.

IMPORTANT NOTICE TO STUDENTS

The checklist is a guide for tracking PT student CR experiences. The checklist should be used to guide/maximize a student's CR clinical experience. A student is unlikely to obtain exposure and/or clinical experience in all of the areas listed prior to graduation. The checklist is NOT meant to be used as an evaluation tool or a measure of a student's CR clinical competence.



Assessment Techniques

Cardiorespiratory History/Lab Results: *The student will demonstrate knowledge of relevant history and lab results such as those listed below and incorporate them into assessment and treatment planning, in keeping with the practices of the clinical setting.*

	Completed (✓)	Comments
1. Chart review: accurate & complete for relevant data		
2. ABG interpretation		
3. PFTs / spirometry interpretation		
4. Results of cardiac/pulmonary diagnostic tests (e.g. echocardiography, ECG arrhythmias, pulmonary stress test)		
5. Awareness of CR precautions/contraindications for treatment		
6. Collection of radiographic information		
7. Blood work findings (e.g. WBC, Hb, platelets, INR, PTT, Troponin, BUN, Creatinine, Alkaline Phosphatase, Serum Calcium, Albumin, electrolytes)		
8. Pharmacological implications of medications taken (e.g. ACE inhibitors, B-blockers, respiratory agents) analgesia, PCA, anesthesia)		
Other:		

Subjective: *The student will demonstrate knowledge and/or use of a variety of subjective assessment tools such as those listed below, in keeping with the practices of the clinical setting.*

	Completed (✓)	Comments
1. CR complaints (e.g. SOB, orthopnea, PND, cough, angina, syncope, nausea)		
2. Pain/discomfort (e.g. angina, musculoskeletal, surgical)		
3. Use of patient self-report measures (e.g. McGill pain measure, VAS, CLASP, Quality of Life Measures, Borg Rating of Perceived Exertion)		
4. Patient history , (with focus on respiratory issues such as smoking, etc.)		
5. Recent Activity History		
Other:		



Objective: Inspection/Observation: *The student will demonstrate knowledge and/or use of a variety of objective assessment measures such as those listed below, in keeping with the practices of the clinical setting.*

	Completed (v)	Comments	
1. Lines and Tubes (understand implications)			
2. Understand the implications of and Perform Vital Signs (e.g. heart rate, oxygen saturation, blood pressure, respiration rate, temperature)			
3. Fluid Balance (understand implications)			
4. Jugular venous pressure (distention), peripheries, abdomen (understand implications)			
	Observed/ Discussed (v)	Performed on Patient (v)	Comments
1. Chest Assessment (IPPA)			
<input type="checkbox"/> Inspection (cyanosis, clubbing; rate, rhythm, depth; indrawing, accessory muscle use)			
<input type="checkbox"/> Palpation (e.g. position of the trachea, diaphragmatic excursion, sites of chest pain/tenderness)			
<input type="checkbox"/> Percussion (resonant, hyperresonant, dull)			
<input type="checkbox"/> Auscultation (e.g. vocal sound, breath sounds, adventitia)			
<input type="checkbox"/> Cough (effective, ineffective)			
<input type="checkbox"/> Sputum (colour, consistency)			
2. Mobilization (independent; with supervision/assistance)			
<input type="checkbox"/> Bed mobility			
<input type="checkbox"/> Transfers			
<input type="checkbox"/> Gait/Ambulatory status (with/without mobility aid; with supervision/assistance)			
3. Functional Capacity Measures (6 MWT, self-paced walk, shuttle walk)			
4. Balance (sitting, standing, walking)			
5. Posture (affecting chest expansion)			
6. Strength/Endurance (sufficient for safe mobilization)			
7. Range of Motion (e.g. UE/thoracic)			



ROM for thoracic/cardiac/abdominal surgery and COPD			
Other:			

Analysis and Planning

The student will learn to collect and analyze assessment findings and apply these to the identification of goals and the development of treatment plans, in keeping with the practices of the clinical setting.

	Completed (v)	Comments
1. Formulate and articulate evaluation findings		
2. Establish short- and long-term patient-centered goals		
3. Develop effective treatment plans		

Treatment Techniques

The student will become knowledgeable about a number of treatment methods, but may only practice some. All students should endeavour to obtain practice with a variety of treatment techniques, in keeping with the practices of the clinical setting.

	Observed/ Discussed (v)	Performed on Patient (v)	Comments
1. Mobilization (e.g. bed mobility; transfers from bed to std., chair; walking within a room; stairs; prescription of mobility device)			
2. Safe management of tubes and lines (including peripheral intravenous catheters, IVs, Foley, chest tubes, surgical drains, endotracheal tube)			



3. Oxygen titration			
4. Improved ventilation / breathing exercises - may include: <ul style="list-style-type: none"> <input type="checkbox"/> Mobilization <input type="checkbox"/> Deep Breathing (e.g. thoracic expansion exercises - diaphragmatic breathing, lateral costal breathing) <input type="checkbox"/> Volume augmentation (e.g. sniffing, breath stacking) <input type="checkbox"/> Facilitated Breathing / Manual Techniques (e.g. rib springing, basal lifts, Kolakowski techniques) 			
5. Secretion mobilization may include <ul style="list-style-type: none"> <input type="checkbox"/> Mobilization <input type="checkbox"/> Active Cycle Breathing Technique (ACBT), <input type="checkbox"/> Forced expiratory technique/huffing, autogenic drainage, <input type="checkbox"/> Postural drainage, percussions (manual/mechanical), vibrations <input type="checkbox"/> Devices (e.g. PEP, Flutter) 			
6. Secretion clearance – may include: <ul style="list-style-type: none"> <input type="checkbox"/> Huff, cough, manual assisted cough <input type="checkbox"/> Suctioning – non-intubated, with/without oral or nasal airways <input type="checkbox"/> Suctioning - intubated, tracheal/stoma cough assist <input type="checkbox"/> In-exsufflation/Cough assist 			
7. Managing dyspnea – may include: <ul style="list-style-type: none"> <input type="checkbox"/> Purse lip breathing, <input type="checkbox"/> Positioning for SOB, <input type="checkbox"/> Energy conservation <input type="checkbox"/> Relaxation training 			
8. Implement Exercise Training. Prescription of adapted programs appropriate for special CR populations such as the critically ill, acutely ill, chronic respiratory and cardiac patients – may include: <ul style="list-style-type: none"> <input type="checkbox"/> Aerobic exercise prescription <input type="checkbox"/> Resistance exercise 			
9. Thoracic mobility (e.g. AROM, AAROM, PROM)			
Other:			



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Complete the following to track your experiences: CR Patient Diagnoses seen on Placement (list)	Settings / CR Environments (list)

Clinical Instructor (CI) : Please review the student checklist outlining the interventions completed *during this placement* . Please sign below if the items indicated by the student as completed, observed and/or performed *during this placement* are accurate.

1. _____
Clinical Instructor (signature) (date, placement)

2. _____
Clinical Instructor (signature) (date, placement)

3. _____
Clinical Instructor (signature) (date, placement)

4. _____
Clinical Instructor (signature) (date, placement)



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GLOSSARY OF TERMS / LIST OF ABBREVIATIONS

2MW / 6MW Test – 2 and 6 minute walk tests

AAROM – active assisted range of motion

ABG – arterial blood gases

Accessory muscle use - typically only used when the body needs to process energy quickly (e.g. during strenuous exercise, or during an asthma attack). When a breathing pattern disorder exists (e.g. COPD) accessory muscle use may be used as their regular breathing pattern.

Adventitia – adventitious breath sounds; abnormal breath sounds

Angina – chest pain that occurs when the heart muscle is not getting enough oxygen-rich blood

ARDS – acute respiratory distress syndrome

AROM – active range of motion

Breath Stacking - A special chest technique used in patients who are unable to fully inflate their lungs due to weakness or paralysis of the respiratory muscles. The equipment consists of an ambu bag fitted with a one-way valve, a mouthpiece and nose clip. The one-way valve is used to help build up volume in the patients lungs by allowing air to get in but not out. This technique is used to help prevent lung and chest wall stiffness and to keep lungs clear of secretions.

BUN – blood urea nitrogen test

Cardiorespiratory physiotherapy (or physical therapy)

Cardiorespiratory physiotherapy (or physical therapy) is a component of primary health care which focuses on maximizing functional independence and well-being, when these are threatened by problems in oxygen transport, using primarily noninvasive interventions including exercise and mobilization, body positioning, breathing control and coughing maneuvers, relaxation and energy conservation, and airway clearance interventions. It applies a patient-centered model of care incorporating multisystem assessment, evidence-based interventions and a significant education component to promote healthy active lifestyles and community based living¹.

Cardiovascular - relating to the circulatory system, which comprises both the heart and the blood vessels and their functions.

CLASP – Coalitions Linking Action and Science for Prevention

¹ The Gas Exchange, Oct 1998; 8(3):5.



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Clubbing – an abnormal enlargement of the distal phalanges with a flattening of the curvature of the nail margin at the cuticle, where the nail meets the cuticle; usually associated with cyanotic heart disease or advanced chronic pulmonary disease.

COPD - chronic obstructive pulmonary disease

CR - cardiorespiratory

CXR – chest x-ray

Cyanosis – a physical sign causing bluish discoloration of the skin and mucous membranes; caused by a lack of oxygen in the blood.

ECG - electrocardiogram

Hb – hemoglobin (abbreviated Hg or Hgb) – iron-containing oxygen-transport metalloprotein in the red blood cells; carries oxygen from the lungs to the rest of the body where it releases the oxygen. It then collects carbon dioxide and returns it to the lungs.

Huffing [also known as forced expiratory technique (FET)] forced chest expirations with an open glottis to aid in secretion clearance

Indrawing – an abnormal breathing pattern where the lower ribs on both sides of the chest and /or intercostal spaces are pulled in when the person breathes in

INR – prothrombin time (PT) and its derived measures of prothrombin ratio (PR) and international normalized ratio (INR) are measures of the extrinsic pathway of coagulation; clotting tendency of the blood.

IPPA – Chest assessment: Inspection, Palpation, Percussion, Auscultation

IRDS – infant respiratory distress syndrome

McGill Pain Measure – test for the measurement of pain

MEP – maximum expiratory pressure (also PEmax)

MPI – maximum inspiratory pressure (also PImax)

Orthopnea – respiratory condition in which breathing is possible only when person sits or stands in erect position

Oxygen saturation – SpO₂; amount of oxygen bound to hemoglobin in the blood expressed as a percentage of the maximal binding capacity; measured by pulse oximeter.



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PCA – patient controlled analgesia

PEP – positive expiratory pressure device

PFT – pulmonary function test

PND – paroxysmal nocturnal dyspnea (acute dyspnea caused by lung congestion and edema that results from partial heart failure and occurring suddenly at night, 1 to 2 hours after falling asleep)

PTT – partial thromboplastin time. It is a blood test that looks at how long it takes for blood to clot. It is useful with bleeding or clotting problems.

Respiratory - of, relating to, or affecting respiration or the organs of respiration.

Self-paced walk test – assesses the time it takes for a person to walk a specified distance; the person is asked to walk quickly and safely without overexertion

SOB – short of breath

Syncope – fainting; transient loss of consciousness due to inadequate blood flow to the brain

Troponin – a cardiac-specific troponin I or T test, ordered when a person has a suspected heart attack. Because troponin is specific to the heart, even slight elevations may indicate some degree of damage.

VAS - visual analog scale for pain

WBC – white blood cells

Definitions primarily obtained from the following references

<http://medical-dictionary.thefreedictionary.com/>; Taber CW: Taber's Cyclopedic Medical Dictionary (FA Davis)

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