Appendix 1. MCT Treatment Protocol

Appendix 2. Contra-indications and risk factors for MCT

Appendix 3. MCT treatment positions

Appendix 4. MCT treatment definitions

MANUAL CHEST THERAPY TREATMENT PROTOCOL
This treatment protocol provides a generic tool for the evaluation of MCT. The content, number and duration of treatments will be at the discretion of the physical therapist applying the therapy and varied according to clinical need within the bounds set by this protocol.
1.0 IDENTIFYING PATIENTS SUITABLE FOR MCT
1.1 Identify possible contra-indications and risk factors for MCT (refer to Appendix 2)
1.2 MCT is recommended if the patient's condition gives cause for concern and the following apply: 1.2.1 Clinical evidence of sputum retention (e.g. on auscultation and/or chest x ray) 1.2.2 Arterial blood gases: pH less than 7.26 1.2.3 Arterial blood gases: rising CO_2 1.2.4 Already receiving controlled oxygen therapy 1.2.5 Already receiving other supportive treatment(s)
1.3 On the basis of 1.1 & 1.2, make clinical judgement as to patient's suitability for MCT
2.0 PRIOR TO MCT
2.1 Implement universal infection control precautions 2.2 Observe any additional patient-specific precautions posted 2.3 Record baseline oxygen saturation 2.4 If receiving, patient to continue on controlled oxygen therapy 2.5 If available, obtain continuous oximetry data during intervention 2.6 Record any additional vital signs deemed necessary
3.0 DELIVERING MCT
3.1 Auscultate patient 3.2 Select 2 most appropriate positions according to clinical findings (refer to Appendix 3) 3.2.1 Turn patient to position 1 3.2.2 Use pillows to support patient as required 3.2.3 Place light towel (one layer) on area of chest to be percussed 3.3 Encourage patient to breathe deeply during treatment
3.4 Percuss* thorax with cupped hand(s) directly over the lung segment(s) being drained. 3.4.1 Use both/one hand as deemed necessary 3.4.2 Adapt rate, depth and force of technique to meet individual needs
3.5 Vibrate* chest over percussed area using two hands 3.5.1 Vibrate on each exhalation 3.5.2 Adapt rate, depth and force of technique to meet individual needs
3.6 Encourage **cough*** (spontaneous, directed, FET, manually assisted as deemed necessary) 3.6.1 Provide patient with pot to collect expectorate 3.6.2 Repeat alternate percussion and vibration in short bursts 3.6.3 Encourage cough between each cycle 3.6.4 Repeat till 2 consecutive attempts at cough produce no further expectorate
*** For definitions and descriptions of percussion, vibration & cough, refer to Appendix 4.**
3.7 Turn patient to position 2 3.8 Repeat 3.4 to 3.6
3.9 Modify treatment within above parameters depending on patient's condition/tolerance 3.10 Select further position(s) if deemed necessary 3.11 After last position, return patient to original/suitable position
3.12 Record main treatment parameters (i.e. positions & total time taken to deliver MCT) 3.13 Record major deviations from treatment protocol with brief explanation 3.14 Monitor and record oxygen saturation until return to baseline

4.0 ADVERSE EVENTS	OBSERVATION
4.1 If the patient shows signs of increased intracranial pressure 4.1.1 Stop therapy 4.1.2 Start emergency Medical Procedure as per organisational policy	Disorientation, loss of consciousness, enlarged pupils, headache, vomiting
4.2 If the patient shows signs of acute hypotension 4.2.1 Stop therapy 4.2.2 Start emergency Medical Procedure as per organisational policy	Pallor, sweating, decreased consciousness.
4.3 If the patient suffers a pulmonary haemorrhage 4.3.1 Stop therapy 4.3.2 Start emergency Medical Procedure as per organisational policy	Visible loss of blood
4.4 If the patient shows signs of dysrrhythmia 4.4.1 Stop therapy 4.4.2 Start emergency Medical Procedure as per organisational policy	Pallor, sweating, chest pain, decreased consciousness.
4.5 If the patient vomits & aspirates 4.5.1 Stop therapy and position patient appropriately 4.5.2 Clear airway and suction as needed 4.5.3 Administer oxygen 4.5.4 Maintain airway 4.5.5 Contact appropriate physician	Visible vomit, harsh breathing, oropharyngeal sounds, prolonged coughing.
4.6 If the patient becomes hypoxic 4.6.1 Stop therapy 4.6.2 Administer controlled oxygen therapy 4.6.3 Return patient to previous/suitable resting position 4.6.4 Contact appropriate physician 4.6.5 Ensure adequate ventilation	Falling O_2 sats. tachpnoea, blue lips, tachycardia, confusion
4.7 If the patient shows signs of bronchospasm 4.7.1 Stop therapy 4.7.2 Return patient to previous/suitable resting position 4.7.3 Consider administering/increasing oxygen delivery 4.7.4 Consider use of broncodilators 4.7.5 Consult appropriate physician	Tight chest, audible wheeze, abdominal paradox.
4.8 If the patient suffers pain or injury to muscles, ribs, or spine 4.8.1 Stop therapy associated with pain or problem 4.8.2 Exercise care in moving patient 4.8.3 Consult appropriate physician if deemed necessary	Patient verbal and/or non verbal response to MCT treatment.
For all adverse events follow organisational policy on incident reporting	

CONTRA-INDICATIONS FOR MCT

The following conditions are contra-indications for MCT. Observe the patient and consult their medical notes and other sources of medical information to ascertain whether any are present.

CONTRA-INDICATION	YES	NO	NOT KNOWN
Unstable head/neck injury			
Frank haemoptysis			
Bronchial hyper-reactivity			
Osteoporosis			
Respiratory system malignancy			
Recent spinal surgery/injury			
Raised intracranial pressure			
Uncontrolled hypertension (diastolic > 110)			
Pulmonary Embolism			
Coagulopathy (platelets <50)			
Coagulopathy INR >3			
Bronchopleural Fistula			
Subcutaneous Emphysema			
Left Ventricular Failure as primary diagnosis			
No evidence of excess sputum production *			

* If it is difficult to assess whether the patient does/does not suffer from excess sputum production, apply the following screening questions:

- Do you normally produce phlegm?
- Are you producing more phlegm than you do when you are well
- Do you feel you have phlegm on your chest?

RISK FACTORS FOR MCT

The following risk factors impact on patient suitability for MCT. Assess their likely presence/ absence and use you clinical judgement to decide whether MCT is appropriate for this patient.

RISK FACTOR	NO	NOT KNOWN	YES	Suitable for MCT? (√ , x)	Reason (brief explanation for decision)
Pleural effusion					
Pulmonary TB					
Empyema					
Lung contusion					
Rib fracture					
Flail Chest					
Wound/healing tissue on thorax					
Recent spinal infusion/anaesthesia					
Distended abdomen					
Patient reports chest-wall pain					
Patient confused and/or anxious					

Contra-indications and risk factors taken from:
AARC Clinical Practice Guideline, Postural Drainage Therapy, Respiratory Care 1991;36(12):1418-26.

APPENDIX 3: MCT TREATMENT POSITIONS	
According to clinical findings, select TWO most appropriate positions. Further positions from this list can also be selected if deemed necessary If an alternative position is chosen, record the position and reason for protocol deviation.	
1. Propped - right [Insert position 1 image here]	**2. Propped – left** [Insert position 2 image here]
3. Flat - right [Insert position 3 image here]	**4. Flat - left** [Insert position 4 image here]
5. Tipped* – right [Insert position 5 image here]	**6. Tipped* - left** [Insert position 6 image here]
*** range 15^0 - 20^0**	

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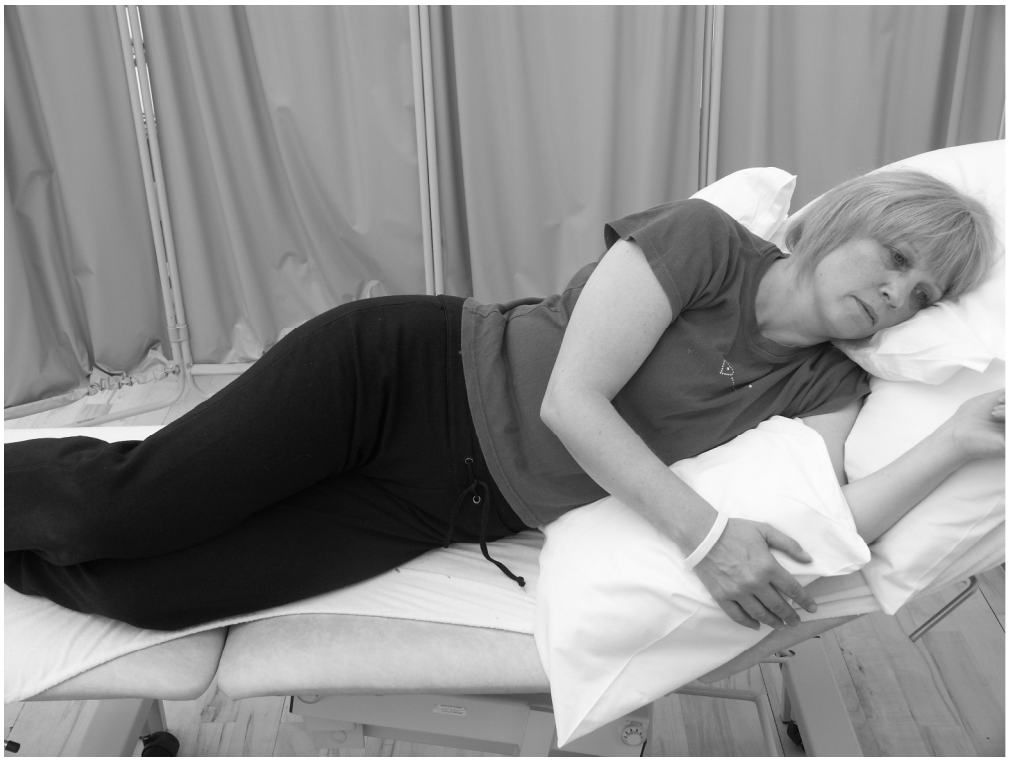

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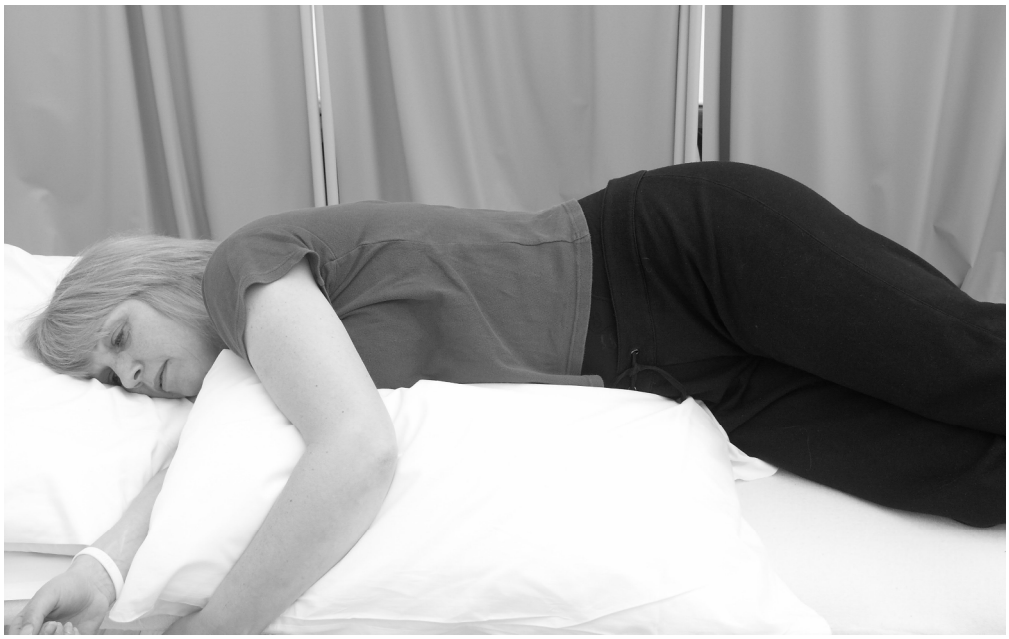

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Appendix 4: Manual Chest Therapy – treatment definitions

1. Turning

Turning is the rotation of the body around the longitudinal axis to promote unilateral or bilateral lung expansion (1,2) and improve arterial oxygenation (3,4). Regular turning can be to either side or the prone position (5) with the bed at any degree of inclination (as indicated and tolerated). Patients either turn themselves, are turned by the therapist or using a special bed or device (2,3,6-8).

2. Postural drainage

Postural drainage is the drainage of secretions by the effect of gravity, from one or more lung segments to the central airways where they can be removed by cough or mechanical aspiration (9-17). Each position consists of placing the target lung segment(s) superior to the carina. Positions are generally held for 3-15 minutes but may be held for longer in particular situations (10, 12, 13, 16-21). Standard positions are often modified by the therapist depending on the patient's condition and tolerance.

3. Percussion

Percussion involves the external manipulation of the thorax. It is also referred to as cupping, clapping, and tapotement. The purpose of percussion is to intermittently apply kinetic energy to the chest wall and lung. This is accomplished by using a cupped hand (Figure 1) with rhythmical flexion and extension action of the wrist.

Figure 1. Cupped hand position adopted during percussion

The force of percussion should be adapted to suit the individual. The technique is often done with two hands but, depending on the lung segment being drained, it may be more appropriate to use one hand. No conclusive evidence demonstrates the superiority of one method over the other (10,13,22-25).

To minimise the risk of desaturation in patients with moderate or severe lung disease, it is recommended that percussion is performed in 15-20 second 'bursts' with pauses for 5 seconds or longer between bouts (26).

4. Vibration

Vibration involves the application of a tremorous action over the area being drained. This is performed by manually pressing with both hands (Figure 2) in the direction of the normal movement of the ribs during expiration. The vibratory action may be coarse or fine. No conclusive evidence supports the efficacy of vibration or an optimum frequency of delivery (9,10,12,19,20,27-33).

Figure 2. Hand position adopted during vibration

5. Cough

A *spontaneous effective cough* is a reflex mechanism utilizing maximum forced exhalation to clear irritants or secretions from the airway. The forced exhalation is preceded by a maximal inspiratory effort followed by closure of the glottis. Contraction of expiratory muscles produces increased intrathoracic pressures against the closed glottis, which culminates in an explosive release of gas at high velocity as the glottis opens (34).

Directed cough seeks to mimic the attributes of an effective spontaneous cough to help to provide voluntary control over this reflex and to compensate for physical limitations. For example; by increasing glottic control, inspiratory and expiratory muscle strength, coordination, and airway stability (34).

Forced Expiratory Technique (FET), also known as "huff coughi ng," consists of one or two huffs (forced expirations) from m id-to-low lung volum es with the glottis open followed by a period of relaxed, controlled diaphragm atic breathing (34). Th e process is repeated until maxim al bronchial clearance is obtained. It can be reinforced by self-compression of the chest w all using a brisk adduction movement of the upper arms.

Manually assisted cough is the external application of m echanical pressure to the ep igastric region or thoracic cage coordinated with forced exhalation (34).

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