Physiotherapy secretion removal techniques in people with spinal cord injury: a systematic review
Reid WD, Brown JA, Konnyu KJ, Rurak JM, Sakakibara BM

CRD summary
This review concluded that evidence supporting the use of secretion removal techniques in spinal cord injury was limited and mostly low level; they also concluded that treatments that increased respiratory muscle force were promising airway clearance techniques. These conclusions reflect the evidence presented but limitations of the evidence suggest that the conclusion regarding respiratory muscle force treatment may be overstated.

Authors' objectives
To evaluate the effectiveness of secretion removal techniques for increasing airway clearance in people with chronic spinal cord injury.

Searching
MEDLINE, CINAHL, EMBASE and PsycINFO were searched from inception to May 2009 for publications in English. Search terms were reported. Google Scholar and references of relevant articles were searched.

Study selection
Eligible studies assessed use of physical therapy secretion removal techniques for increasing airway clearance in individuals with chronic tetraplegia or high paraplegia (individuals who were extubated or on chronic modes of ventilation). To be included, 50% or more of study populations had to contain individuals with spinal cord injury. Studies that did not report on respiratory outcomes related to secretion removal (stated in the review) and those with a sole focus on pharmaceutical interventions were excluded.

Most participants were male (84%). The mean age of participants was 31 years (range 15 to 70 years). Most studies reported that their participants had sustained cervical level spinal cord injury, two studies reported that participants had thoracic level spinal cord injury and no studies included people with paraplegia. Most studies examined the immediate effects of various components of cough.

Two reviewers independently selected the studies for inclusion; any discrepancies were resolved by discussion and by involvement of a third reviewer where necessary.

Assessment of study quality
The quality of randomised controlled trials was assessed using the PEDro Scale (scores of 10 indicated the highest quality). The quality of studies with other designs was assessed using the Downs and Black tool (scores of 27 indicated the highest quality). Studies were assigned levels of evidence using a modified version of the Sackett Scale.

Quality assessment was performed independently by three reviewers; any discrepancies were resolved by discussion or by a fourth reviewer.

Data extraction
Four reviewers extracted data on the outcomes.

Methods of synthesis
Data were presented in a narrative synthesis that was divided into sections according to the technique/intervention used.

Results of the review
Twenty-four studies were included in the review: two randomised controlled trials, three prospective controlled studies, nine pre-post studies, three retrospective case series and seven case reports. Sample sizes ranged from one to 40. No information on quality assessment results was reported.
Secretion removal techniques (level 4 and 5 evidence): One case series and one case report demonstrated that mucus plugging in people with cervical spinal cord injury can be successfully managed with vigorous chest physiotherapy. Another case report found that the use of PARI PEP (an expiratory flow device) and inspiratory muscle training for one year decreased occurrence of respiratory infections, hospitalisation resulting from infection and suctioning.

Interventions affecting cough (levels of evidence ranged from 1 to 5): Two pre-post studies, one case series and two case reports found that glossopharyngeal breathing exercises (with or without neck accessory muscle breathing) improved cough in patients with cervical spinal cord injury (level 4 and 5 evidence). One prospective controlled trial and two pre-post studies (level 1 and 4 evidence) reported positive benefits for assisted breathing with the use of abdominal binders in patients with the same type of spinal cord injury. One case study and one high quality randomised controlled trial (14 participants) demonstrated that respiratory infections occurred less and that inspiratory muscle strength and endurance improved following use of inspiratory muscle training (level 1 and 5 evidence). Evidence from two pre-post studies and two case reports showed that electrical stimulation of the lower thoracic-lumbar spinal cord or abdominal wall muscles helped to improve expiratory flow rates during cough (level 4 and 5 evidence). Two prospective controlled trials and one pre-post trial reported that manual abdominal compression led to improvements in cough expiratory flows (level 2 and 4 evidence).

Further results (including some data on adverse events) were reported in the review paper.

Authors' conclusions
Evidence supported the use of secretion removal techniques in spinal cord injury but it the evidence was limited and mostly low level. Treatments that increased respiratory muscle force showed promise as effective airway clearance techniques.

CRD commentary
The review question and inclusion criteria were defined clearly. Relevant sources were searched. The restriction to studies in English meant that some relevant studies may have been missed. All review processes were performed by multiple reviewers independently which reduced the likelihood of reviewer error or bias. Appropriate quality assessment criteria were used but the results were not reported fully so levels of possible bias within the included studies were unclear. Adequate study details were not reported for all of the included studies but differences in techniques and outcomes investigated by the included studies suggested that the narrative form of synthesis was appropriate.

The review authors acknowledged that the included studies did not adequately describe the specific chest physiotherapy techniques that they reported using. They also stated that the evidence base consisted of only a small number of studies, with small sample sizes, weaker designs and differences in the aspects of airway clearance that they investigated.

The authors’ conclusions reflect the evidence presented but the limitations of the evidence base suggest that their conclusion regarding treatments that increase respiratory muscle force may be overstated.

Implications of the review for practice and research
Practice: The authors stated that clinical use of secretion removal techniques were highly recommended in people with chronic spinal cord injury, especially given the high incidence of pulmonary complications. Therapists should be prudent when applying the manual assisted cough technique in this population and should monitor accordingly.

Research: The authors stated that further investigation into use of mechanical insufflation-exsufflation and other airway clearance techniques (additional ones not included in this review) in people with spinal cord injury was warranted.

Funding
Not stated.

Bibliographic details
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.