Title	Author	Year	Type of Article Evidence based guidelines	Summary of Evidence	Source/level of evidence Opinion from single references
Disorders of Ventilation: Weakness, Stiffness and Mobilisation **Article No. 76**	J Bach SW King	2000	Expert Opinion Key note Author	Opinion relating to the role of deep breathing and sighing to stretch the resp structures and maintain lung ROM and that in patients resp muscle weakness the passive recoil of the lungs is diminished which results in an altered optimal length tension ratio. The lungs and chest wall are susceptible to the effects of incomplete / irregular mobilisation. Regular ROM Mobilisation of the lungs and chest walls of patients by delivery of maximal insufflations or breath stacking to the MIC want help maintain lung compliance.	Expert Opinion Key note Author **Level of evidence 4** **(Inform**)
A study of the facilitation of repiration in myotonic dystrohpy **Article No 542**	J Nitz B Burke	2002	RCT	Aim: Study investigating use of PNF and Staged Basal Expansion (SBE) in two different positions (high sit and L side lying) with patients with MD. N=7. Subjects own controls. Subjects randomised to 6 treatment levels (not clear how) - rest high sit, rest L S/L, PNF high sit, PNF L S/L, SBE high sit, SBE L S/L. Outcomes measure – SaO_2, HR, RR and thoraco-abdominal motion. Resp function tests recorded by a Technician blinded from subjects. **Results**: SaO_2 ↑ 2.2% in high sit and 2.6% in L S/L for PNF and SBE. Increase in TAM of 377% in high sit and 556% in L S/L with both techniques. RR ↓ by 15 (high sit) and 30 % (L S/L) and HR 0.2% (high sit) and (L S/L 4.1%. No real statistical testing of data.	RCT Single blinded **Level of Evidence –1** **(Inform)**
The effect of NIPPV during exercise in severe scoliosis. **Article No. 352**	MP Highcock JM Shneerson	2002	RCT	Aim: Investigate whether NIV during exs improves exercise performance. N = 8 severe scoliosis patients. Sub maximal treadmill test performed three times once unencumbered, once with a vent and once with a mouth piece. The subjects were randomised to each vent and were their own controls. Not clear how randomised. Concealment method not clear. Minimum Trigger/timed mode, back up rate and expiatory airways pressure was used for all subjects. The IPAP and Ti were set for patient comfort at rest and not altered during exercise. Four unencumbered walks also took place wit h out monitoring. Outcome Measures: Spirometry and SaO_2 and Distance Walked BP, HR, RR. Results – Unencumbered walking distance – 204m. Mouth piece 140m, with vent – 109m. Group effect – p= 0.048. There was no difference between brands of vents. Significant increases in MV and Tv were seen in the vent pts ($p<0.05$.	RCT **Level of Evidence –1** **(Inform)**

Title	Author	Year	Type of Article Evidence based guidelines	Summary of Evidence	Source/level of evidence Opinion from single references
A preliminary evaluation of a prospective study of pulmonary function studies and symptoms of hypoventilation in ALS / MND Patients **Article no 380**	Jackson CE Rosenfield J Moore DH Bryan WW	2001	RCT	Aim: Early initiation of NIV than current standard care may provide additional benefits in terms of resp function and QoL. Clear inclusion / exclusion criteria for patients but randomisation of subject not true randomisation. N = 20 Group 1 (early intervention) (FVC 70-100% Nocturnal O_2 Desat <90% for 1 min) 7 Group 2 (standard of care) (FVC <50%) 6 Withdrew 2 Control 5. **Results:** 5/6 patients showed increase in vitality score on SF-36 10.7 v 13.0 p=0,071 and also improvements in pulmonary symptoms score 72.7 v 80.8 p=0.04. Small subject group, not clear on randomisation to treatment, no blinding and subjective data.	RCT **Level of Evidence –1 (Background)**
Effect of intrapulmonary percussive ventilation on mucous clearance in DMD Patient: A preliminary report. **Article No 731**	Toussaint M De Win H	2003	Randomised cross over study.	Aim: Compare 2 different assisted mucous clearance techniques (ACMT) with and without IPV. N = 8 5 pts with mucous hyper secretion (30ml/d) 2 Rx sequences – each pt had 5 days of Rx x 3 per day and then swap. Sequence 1 IPV- ACMT - (FET/Assisted cough), Suction, - %ml nebs of NaCl, for 5min, 2nd ACMT, Suction, 45 min after neb a 3rd ACMT and suction. Sequence 2 IPV+ Same but IPV combined with neb delivery. In patient with hyper secretion the weight of the secretions were significantly greater in IPV+ p=0.01. Hr, RR, SaO_2, $PETCO_2$, PEF, Raw did not alter significantly in +IPV group. Small patient group, no data on how recruited, inclusion and exclusion criteria, wet weight of sputum, no clear on rationale behind treatment sequence/ regime.	Randomised cross over study. **Level of evidence +2 (Inform)**
Effect of an Abdominal Binder on the Efficacy of Respiratory muscles in Seated and Supine Tetraplegic Patients. **Article No 124**	Boaventura CM	2003	Case control study	Aim: Evaluate the effects of an abdominal binder on resp muscle performance in tetraplegics in seated and supine. N=10. Pts recruited from Paraplegia Association – clearly defined inclusion / exclusion criteria. Blinded study – 3 researchers trained to collect data. Outcome measure MEP, MIP and FVC taken at 0, 4, 8 and 12 weeks in sitting and supine. Values of FVC were higher in supine than seated. MEP and FVC showed higher values in the seated postn when the binder was used ($p<0.05$). Small sample group, limited info on selection, inclusion, exclusion criteria and demographic information. Patients own controls	Case control study **Level of evidence -2 (Inform)**

Title	Author	Year	Type of Article Evidence based guidelines	Summary of Evidence	Source/level of evidence Opinion from single references
Effects of abdominal Strapping on Forced Expiration in tetraplegic Patients. **Article No 254**	Estenne M Van Muylem A	1998	Case Control	Evaluation of the effects of abdominal strapping on the paradoxical expansion of the abdomen. N=8 patients acts as own controls. Method- Pts seated in W/C – FRC, VC, TLC, Pes, Vexp, Rv recorded. Then 2 0r 3 elastic straps placed around abdomen and tests repeated. **Results:** strapping produced insignificant changes in Vexp and Pes which the researchers felt meant that strapping would not improve cough in this patient group. Rigour: small sample group, varied time between injury and study, intersubject variation in the tightness of strapping tolerated, no blinding.	Case control study **Level of Evidence –2** **(Inform)**
117th ENMC Workshop: ventilatory Support in Congenital NMD- Congenital Myopathies, Congential Muscular Dystrophy and SMA II **Article No Extra**	Wallgren-Pettersson C Bushby K Mellies U Simonds A	2004	Expert Opinion	18 World Experts representing various disciplines with experience in respiratory management of patients with NMD met to agree upon and report minimum recommendations for the investigation and treatment of respiratory involvement with congenital disorders. DMD patients excluded and all participants were to read and assess published literature in the field but its in not clear what tool or method was used to review or grade the evidence. Topics: Assessment methodologies in childhood resp impairment – Lung & Resp Muscle Function. Includes PCF Respiratory muscle training and assisted coughing includes IPPB and MI-E. HMV and Sleep Studies. Further Research. Paeds focused but extrapolates info from adult studies.	Expert Opinion **Level of evidence 4** **(Inform)**
Efficacy of GPB for a Vent Dependant, High level Tetra patient after cervical cord tumour resection and Tracheotomy. **Article No 117**	Bianchi C Grandi M Felisari G	2004	N=1 Case Report	Aim; describe the use and limitations of GPB by a vent dependant, tracheostomised 6 year old boy after a cervical tumour resection. Learnt GPB independent at 7 and used it for vent free episodes – helped with schooling. Pt monitored over a 16 year period his GPB efficacy improved to the point where his VC = 670ml and GPB Breath Capacity = 3300ml. Although had air leak from trachey. GPB permitted up to 12 hours per day of vent free breathing and decreased his hospital admissions. Main point GPB effective in presence of trachey.	Case Report **Level of evidence 3** **(Inform)**
A Case of Frog Breathing **Article No 511**	Moloney E Burke CM Doyle S Kinahan J	2002	N=1 Case Report	Report describing the use of GPB by a 58 year old man with resp muscle weakness 2ndary to polio. Uses NIV but uses GPB to take Beep Breaths and to give him time off the vent. Study assessed the effect of GPB in relation to FVC and % Pred. The purpose was to assess the number of breaths required for max effect in increments of 5 manoeuvres to 25. Results; Subject obtained 60-80mls per gulp of air. There was little benefit to FVC after 15 breaths-which was near to TLC for the subject. Discusses finding from previous studies in relation to benefits i.e. enhances VC, PEF, and pulmonary compliance. Clinical significance – time off vent, stronger cough, louder voice, clearance of secretions. Limitations no evaluation of articles referenced, single pt study, no statistical testing and poor methodology.	N=1 Case Report **Level of Evidence 3** **(Inform)**

Title	Author	Year	Type of Article Evidence based guidelines	Summary of Evidence	Source/level of evidence Opinion from single references
An analysis of chest wall and diaphragm motions in patients with idiopathic scoliosis using dynamic breathing MRI **Article No 414**	Kotani T Minami S *Et al*	2004	N=27 Cohort Study	**Aim:** analysis of chest wall and diaphragm motions in patients with idiopathic scoliosis using dynamic breathing MRI. N=27. Normal Subjects- 9 Scoliosis Pts – 18. **Method:** Dynamic fast called echo sequences were used (chest wall and diaphragm motions) and evaluated using cineloop view and a fusion view of max inspiratory and expiratory images. **Results:** Chest wall movements significantly restricted in patients with scoliosis ($p<0.05$) although diaphragm movement was normal. Correlation between VC and chest wall motion ($p<0.05$). **Concerns:** Mixed subject, peads and adults 11-20years old. Data analysed quantatively. Not clear how diagnostic quality determined. Nor how subjects recruited.	Cohort Study **Level of Evidence 2+ (Background)**
Effect of URT Infection in Patients with NMD **Article No 580**	Poponick JM, Supinski JG DiMarco AF	1997	Cohort Study	**Aim:** Respiratory muscle strength during acute URT infection was assessed in patients with various forms of NMD. 13 episode of URT infection occurred in 10 individuals. RFT were assessed pre and 24-36 hours post onset of symptoms. **Methodology N=25**. Patient followed for 15/52 period prior to study. Outcomes measured assessed when pts stable in sitting on two separate days. Family instructed to alert investigators if signs of URTI – cough, fever, sore throat, rhinorreoa. 13 episodes of URTI occurred in 10 patients –typically those with severe muscle weakness and limited mob. Outcomes reassessed at 24-36 hours post onset of symptoms and every other day until symptoms resolved. **Outcome Measures**: Baseline PFTs: VC O_2 Sats, End Tidal PCO_2, MIP, MEP **Results:** Baseline VC 1.6l, MIP 49.2, MEP 35.5, During URTI VC 1.01l, MIP 37.1, MEP 25.5 ($p<0.05$). PCO_2 Baseline 39.1 URTI 43.9 ($p<0.05$). Patients reported dyspnoea as a symptom with onset of URTI. **Conclusion:** Patients with various forms if MND develop reduction resp muscle strength in association with URTI. These decrements in resp muscle function may result in SOB, decreased VC and acute hypercapnia. **Concerns**: Mixed Pathology, Mixed Study – Peads and Adults, Varied Ability/Mobility, Adequacy of Outcome measures as dependent on patient ability / effort.	Cohort Study **Level of Evidence 2– (Inform)**

Title	Author	Year	Type of Article Evidence based guidelines	Summary of Evidence	Source/level of evidence Opinion from single references
Prevention of Pulmonary Morbidity for patients with NMD. **Article No 738**	Tzeng AC Bach JR	2000	Cohort Study (Retrospective)	**Aim:** To evaluate the effects of a respiratory muscle aid protocol on hospitalisation rates for respiratory complication of NMD. **Method N=94** 47 Group 1 Pre Protocol. Group 2 Protocol Access. 1 year period. A home protocol developed in which desaturation was prevented or reversed using NIV or MI-E as needed. Patients who had more than 1 episode of desaturation of resp failure before having access to the protocol were considered to have had pre protocol periods (Group 1). Other patients were given access to the protocol when their PCF < 270l.min. before any episode of resp distress. **Outcome measures:** RFTs, Number of Hospitalisations, Days Hospitalized, and avoided hospitalizations were identified as episodes of need for continuous vent support and desaturation was reversed by assisted coughing. Data was segregated by protocol and extent of baseline vent use. **Results:** Group 1 1.06 +- 0.84 hospitalisations, 20.76 +- 36.1 days per year. Group 2 0.03 +- 0.11 hospitalisations, 0.06 +- 0.20 days per year. Part Time Vent Use. Group 1 1.40 +- 1.96 hospitalisations, 20.14 +- 41.15 days per year. Group 2 0.08 +- 0.17 hospitalisations, 1.43 +- 3.71 days per year. Intubated Group 1 0.75 +- 1.48 Group 2 0.09 +- 0.38 Days Intubated Group 1 9.21 +- 17.06 Group 2 2.85 +- 13.37. Full Time Vent Use. Group 1 0.97 +- 0.74 hospitalisations, 10.39 +- 8.66 days per year. Group 2 0.07 +- 0.14 hospitalisations, 0.39 +- 0.73 days per year. Intubated Group 1 0.25 +- 0.45 Group 2 0 Days Intubated Group 1 4.25 +- 9.85 Group 2 0. All pre and protocol rate comparisons were statistically significant at ($p<0.04$). **Conclusion:** Patients have significantly fewer hospitalisations per year and days per year when using the protocol as needed. The use of inspiratory and expiratory muscle aids can significantly reduce hospitalisation rates for respiratory complications. **Concerns:** Lacks clear methodology and reviewer lacked clear understanding of study and subjects as a result.	Cohort Study Retrospective **Level of Evidence –2** **(Inform)**

Title	Author	Year	Type of Article Evidence based guidelines	Summary of Evidence	Source/level of evidence Opinion from single references
Chiropractic and Pilate's therapy for treatment of adult scoliosis. **Article No 123**	Blum CL	2002	Expert Opinion **(Exclude)?**	Report describing the use of Pilates and sacro-occipital techniques in the management of a 39 year old woman with scoliosis who had undergone spinal fusion many years earlier. The patient had progressive severe LBP that had worsened over many years after her surgery had prevented her from activities such as carrying her son or equipment that was necessary for her job. The patient was provided with a series of Pilates exercises used to overcome her chronic habituation and muscle weakness. Although this therapy went on for sometime she did begin to stabilise and increase physical activity although she still exhibits some symptoms from her scoliosis.	Case report N=1 **Level of evidence 3** **Background –** **Exclude ? Relevant to Respiratory Managment more MSK and Chiropractic / Pilates not PT**
Body Ventilators – Equipment and Techniques **Article No 298**	Gilmartin ME	1996	Expert Opinion	Lengthy overview of the invention and the history behind the use of body ventilators and brief overview of negative pressure ventilation. Cover the use of the iron lung, cuirass (chest shell), wrap devices and the (dis)advantages of their use. Overview of the application of negative pressure with neuromuscular and chest wall diseases and its origin in the polio-epidemic. It goes on to look at ventilatory assist devices i.e. rocking bed and abdominal pressure ventilators, diaphragmatic pacing and GPB. Mentions use of GPB and high VT – high tracheal pressure may lower BP. Recommend lowering VT to less than a litre as some patients VT can go as high as 2-2.5l. Explains the main use of GPB is assisting in the mobilization of secretions.	Expert Opinion **(Level of evidence 4)** **Background**
Respiratory Muscle Assessment in MND **Article No 526**	Mustfa N Moxham J	2001	Expert Opinion	A summary of tests which can be used in assessment of MND patients to determine respiratory status and prognosis. It points out that respiratory muscle weakness leads to an insidious onset of symptoms. Yet early intervention can be effective and beneficial if respiratory muscle weakness is identified early. Outlines the tests available i.e. VC and LFT, Static Mouth Pressures, SNIP, Poes, Pes, Pdi, ELBG, Sleep Studies and PCF. Identifies use of PCF of 160l/min can be used to assess the adequacy of a patients cough hence ability to clear secretions.	Expert Opinion **(Level of evidence 4)** **Background**
Respiratory Therapists are key members of the treatment team when SCI affects respiration. **Article No 560**	Parsons KC	2002	Expert Opinion	Brief description of impact of SCI on respiratory function and role of respiratory therapists. A very simple assessment description including use of VC and impact on cough and secretion clearance is given. Treatment options are also described i.e. deep breathing exercises, assisted coughing, MI-E. It goes on to describe role in monitoring for potential aspiration and need for ventilatory assistance, tracheotomy management and weaning.	Expert Opinion **Level of evidence 4** **(Inform)**