Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
16	Ram et al, 2004 CDSR		CDSR	Patients with AHRF due to an acute exacerbation of COPD	To determine the efficacy of NPPV in the management of patients with respiratory failure due to an acute exacerbation of COPD	14 studies included in the review. NIV resulted in decreased mortality, decreased need for intubation, reduction in treatment failure, rapid improvement within the first hour in pH , PaCO2 and respiratory rate. In addition, complications associated with treatment and length of hospital stay was also reduced in the NIV group.	1++
23	Ferreira, J. C., Chipman, D. W., Hill, N. S., & Kacmarek, R. M. (2009). Bilevel vs ICU ventilators providing noninvasive ventilation: effect of system leaks: a COPD lung model comparison. Chest, 136(2), 448–56.	0	Experimental bench study	Ventilators	Nine ICU ventilators tested with lung simulator and variable artificial leak	Differences in performance between ICU ventilators in providing NIV	2+
24	Carteaux, G., Lyazidi, A., Cordoba-Izquierdo, A., Vignaux, L., Jolliet, P., Thille, A. W., Richard, J.-C. M., et al. (2012). Patient-ventilator asynchrony during noninvasive ventilation: a bench and clinical study. Chest, 142(2), 367–76.	15	Experimental patient study	Patients receiving NIV	NIV given through ICU (with/without NIV mode engaged) and NIV-dedicated ventilators. Asynchrony was assessed	Dedicated NIV ventilators offered the best synchrony	2-
50	Nava, S., N. Ambrosino,	50	multicenter randomised	AECOPD	assess efficacy of NIV to wean patients with AECOPD from invasive ventilation	Noninvasive pressure support ventilation during weaning reduces weaning time, shortens the time in the intensive care unit, decreases the incidence of nosocomial pneumonia, and improves 60-day survival rates	1+
52				1 RCT (n=13/14 I/C on reduction of NIV duration by positive pressure breathing (Bellone Int care med 2002;28;581)		5 RCTs identified	

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Hill, K., S. Patman, et al. (2010) Chronic Respiratory Disease 7(1): 9-17		Systematic review 1950 - 2009	1 RCT (n=16/17 I/C) on duration of ICU stay twice daily positive pressure breathing (Vargas Crit Care 2005;9;R382)	Effect of airway secretion techniques during COPD exacerbations	Quality scored Positive pressure breathing may be beneficial in reduction in NIV time and ICU stay	2-
59	Jeffrey, A. A., P. M. Warren, et al. (1992) THORAX 47(1): 34-40	95 patients 135 episodes	Single UK centre Prospective observational study following protocol change: Controlled O_2 to above 6.6kPa and doxpram for acidosis	COPD patients with PaO_2 < 6.6 kpa & $PaCO_2$ > 6.6 kPa	Mortality estimate	12% mortality Acidosis major determinant of outcome 4 patients ventilated; all survived; 5 decisions not to ventilate	2-
61	Austin, BMJ, 2010	Pre hospital prospective RCT	405	High flow oxygen v oxygen titrated to SpO2 88 to 92%	Mortality	Overall mortality was 9% (21 deaths) in the high flow oxygen arm compared with 4% (7 deaths) in the titrated oxygen arm; mortality in the subgroup with confirmed chronic obstructive pulmonary disease was 9% (11 deaths) in the high flow arm deaths) in the titrated oxygen arm. Titrated oxygen treatment reduced mortality compared with high flow oxygen by 58% for all the patients with confirmed chronic obstructive pulmonary disease (0.22, 0.05 to 0.91; P=0.04).	1++

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						Patients with chronic obstructive pulmonary disease who received titrated oxygen according to the protocol were significantly less likely to have respiratory acidosis (mean difference in pH 0.12 (SE 0.05); P=0.01; n=28) or hypercapnia (mean difference in arterial carbon dioxide pressure −33.6 (16.3) mm Hg; P=0.02; n=29) than were patients who received high flow oxygen	
63	Padkin and Kinnear, Eur Resp Journal, 1996	11	Physiological study	COPD	assess if there is a difference between o2 delivery in NIV via port or mask	no difference	2+
69	Mukhopadhyay, Journal Crit Care, 2009	19	Physiological / safety study	AECOPD	assess effect of stopping NIV on physiological variables to allow nebulised therapy for the patient	no effect on stopping NIV, ie safe to do so to allow a period of nebulisation	2-
72	Clozeau, ICM 2010	10 most had pneumonia as primary diagnosis	Case series in patients who failed to tolerate NIV Intensive Care Unit	Patients were given target controlled infusion of propofol	Improvement in gas exchange, 3 patients required endotracheal intubation	Propofol used for conscious sedation	3
73	Akada, Anaesth Analg, 2008	10 most patients experiencing post-op respiratory failure	Case series in Intensive Care Unit	Patients were given controlled infusion of Dexmetomidine	No patient required endotracheal intubation	9 patients were given CPAP, only 1 received bilevel support	3
74			Case series in patients who failed to tolerate NIV				

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Constantin, ICM, 2007	13 patients		NIV trial with contimuous sedation with Remifentanil	4 patients required endotracheal intubation	Improved PaO2 and PaCO2	3
		(3 with hypercapnic respiratory failure)	within				
			Intensive Care Unit				
75	Rocco, ICM, 2010	36	Prospective uncontrolled	respiartory failure	assess if remifentanyl sedation could prevent failure of tolerability of NIV and need for IMV	found that remifentanyl reduced need for intubation and allowed better survival compared to those who failed	2+
76	Senoglu, Curr Ther Res Clin Exp, 2010	20 v 20	randomized, double-blind, prospective study	ICU patients with ARF requiring NIV	To compare the effectiveness of dexmedetomidine and midazolam on sedation and their effects on hemodynamics and gas exchange	Dexmedetomidine and midazolam are both effective sedatives for patients with NIV. Dexmedetomidine required fewer adjustments in dosing compared with midazolam to maintain adequate sedation.	1+
77	Devlin, Chest, 2014	16 v 17	double blind placebo controlled RCT	Patients with ARF	The efficacy and safety of early IV dexmedetomidine v placebo added to protocolized, as-needed IV midazolam and fentanyl	Initiating dexmedetomidine soon after NIV initiation in patients with ARF neither improves NIV tolerance nor helps to maintain sedation at a desired goal.	1+
83	Chatwin, Eur Resp J, 2003	41	Case Control study (age-matched controls)	NM disease	Determine the technique that increases peak cough flow the most.	Greatest increase in peak cough flow is after MI:ME	2+
84	Chatwin M. and Simonds A.K. / Respiratory care 2009	8	2 cross-over (in-exsufflation & without in random order in day one and opposite order on day 2).	Mix of children & adults with neuromuscular disorders & chest infection	To determine if airway clearance is more effective with in-exsufflation or without.	Treatments time (beyond 30 mins) was significantly shorter with in-exsufflation than without 0mins vs 17 mins,p=0.03	1+
85	Sivasothy, Thorax, 2001	29	Case control study	NM disease COPD	Effect of manually-assisted cough and MI on PEFR	MAC and MI ↑ PEFR in NM disease patients only	2+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
86	Goncalves, Critical care, 2012	75 (study group n=35 control group n=40)	RCT			Control gp followed conventional extubation path, study gp received above plus 3 x daily sessions MI:E 50% of control pts & 40% study pts required NIV in 48 hrs post extubation. Lower reintubation rate in study gp p<0.05. In the sub group of NIV patients, study group had lower NIV failure & reintubation rate p<0.05.	1+
91	Gursel et al 2012	73	Restrospective cohort series	All comers to ICU but divided into 2 groups defined on BMI >35	NIV with increasing pressures, all full face mask	Obese needed higher PEEP ; obese needed longer time in ICU to get PaCO2 down	2+
92	Murphy et al 2012	50	RCT	super obese patients with CRF	to evaluate role of AVAPS	no differences between automated AVAPS mode and fixed-level PS mode. management of sleep-disordered breathing may enhance daytime activity and promote weight loss in super-obese patients	1++
95	Putensen C, Zech S, Wrigge H. Long-term effects of spontaneous breathing during ventilatory support in patients with acute lung injury. Am J Respir Crit Care Med 2001(164):43-49	30	RCT	Severe multiple trauma patients	To determine whether there might be a benefit in allowing early spontaneous breathing in mechanically ventilated patients.	Early spontaneous breathing required less sedation and improved cardiovascular function and assoc. shorter duration of ventilation and LOS	1-
98	Fougeres, E., et al., Hemodynamic impact of a positive end-expiratory pressure setting in acute respiratory distress syndrome: importance of the volume status. Crit Care Med, 2010. 38(3): p. 802-7	21	Experimental clinical observation	ARDS with LPV	Observe changes in haemodynamics with higher PEEP and then a PLR to increase intravascular volume	A PEEP increase with limited tidal volume and plateau pressure reduced cardiac output by increasing the right ventricular afterload. Passive leg raising restored cardiac output by reducing the transpulmonary pressure difference and the pulmonary vascular resistance.	2+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
99	Tuxen, D.V. and S. Lane, The effects of ventilatory pattern on hyperinflation, airway pressures, and circulation in mechanical ventilation of patients with severe air-flow obstruction. Am Rev Respir Dis, 1987. 136(4): p. 872-9.	9	Experimental clinical observation	Severe COPD and IMV	Effect of difference ventilation patterns on end expiratory lung volume	Various physiological observations (unable to get full paper, only abstract)	2-
100	Leatherman, J.W., C. McArthur, and R.S. Shapiro, Effect of prolongation of expiratory time on dynamic hyperinflation in mechanically ventilated patients with severe asthma. Crit Care Med, 2004. 32(7): p. 1542-5.	12	Experimental clinical observation	severe asthma mechanically ventilated in the assist control mode	Measure effects of decrease in respiratory rate from 18 to 12 and 6 breaths/min	Prolongation of expiratory time decreases dynamic hyperinflation in patients with status asthmaticus, as evidenced by a reduction in plateau airway pressure, but the magnitude of this effect is relatively modest when baseline minute ventilation is <10 L/min, because of the low end-expiratory flow rates	2+
101	Ranieri VM, Suter PM, Tortorella C. Effect of mechanical ventilation on inflammatroy mediators in patients with ARDS. JAMA (1999) 281(1);54-61	37	RCT	Acute Respiratory Distress Syndrome	Whether the cytokine response to mechanical ventilation can be reduced by lung protection strategies	Minimising overdistension and recruitment/derecruit. Attenuates the cytokine response	1-
103	Kregenow, CCM, 2006	861	Secondary analysis of RCT data	ARDS	Determine whether hypercapnic acidosis reduces mortality in patients with ARDS	Hypercapnic acidosis is assoc.↓28-day mortality in 12 ml/kg V_T but not if 6 ml/kg.	1+
104	Amato, NEJM, 1998	53	RCT	Early ARDS	? benefit of a protective ventilation strategy	Protective ventilation assoc. ↑survival at 28 days, ↑rate of weaning from ventilator and ↓barotrauma	1+
105	Adnet F, Plaisance P, Borron SW. Prolonged severe hypercapnia complicating near fatal asthma in a 35-year-old woman. Intensive Care Med (1998) 24: 1335-1338	1	Case Report	Asthma		Severe hypercapnia without sequelae	3
106	Swenson ER					10-20% increase in	

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Carbonic anhydrase inhibitors and ventilation: a complex interplay of stimulation and suppression. Eur Respir J 1998(12);1242-47		Editorial		Ventilatory effects of CA inhibitors	ventilation	4
107	Jones, Cochrane SR database, 2001		Systematic review	COPD	Determine effectiveness and safety of acetazolamide in COPD	Acetazolamide can produce a small ↑PaO_2 and ↓$PaCO_2$ but unknown whether associated clinical benefit	1+
108	Aerts, J.G., B. van den Berg, and J.M. Bogaard, Controlled expiration in mechanically-ventilated patients with chronic obstructive pulmonary disease (COPD). Eur Respir J, 1997. 10(3): p. 550-6.	6	Experimental clinical observation	COPD	effects of an external resistor on lung emptying were studied in six patients with COPD, who were mechanically ventilated whilst sedated and paralysed	**application of an external resistor could decrease effective expiratory resistance by counteracting airway compression**	2-
109	Kondili, E., et al., Pattern of lung emptying and expiratory resistance in mechanically ventilated patients with chronic obstructive pulmonary disease. Intensive Care Med, 2004. 30(7): p. 1311-8	10	Experimental clinical observation	AECOPD on IMV	Measure effects of different levels of PEEP	PEEP decreases respiratory resistance	2+
111	Kress, J.P., M.F. O'Connor, and G.A. Schmidt, Clinical examination reliably detects intrinsic positive end-expiratory pressure in critically ill, mechanically ventilated patients. Am J Respir Crit Care Med, 1999. 159(1): p. 290-4	71	Clinical observation		Compare clinical examination with ventilator waveform detection of iPEEP	Clinical exam is very good for detecting PEEPi at all experience levels	2+
114	Ranieri VM, Giuliani R, Cinnella G, Pesce C, Brienza N, Ippolito EL, Pomo V, Fiore T, Gottfried SB, Brienza A				Effects of PEEP (0 to 15 cm H2O) on respiratory mechanics, hemodynamics, and gas exchange were studied in during controlled	PEEP levels exceeding the 85% of	

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Am Rev Respir Dis. 1993 Jan;147(1):5-13.	9	Experimental clinical observation	COPD patients	mechanical ventilation	PEEPi (Pcrit) caused further hyperinflation and compromised hemodynamics and gas exchange	2+
	Physiologic effects of positive end-expiratory pressure in patients with chronic obstructive pulmonary disease during acute ventilatory failure and controlled mechanical ventilation						
115	Andrea Rossi, Cristina Santos, Josep Roca, Antoni Torres, Miguel A. Felez,	8	Experimental clinical observation	COPD patients	impact of PEEP on pulmonary gas exchange	application of PEEP	2+
	And Robert Rodriguez-Roisin					equivalent to 50% of the initial PEEPi (PEEP-50%) improves pulmonary gas exchange, without adverse effects on respiratory mechanics nor on hemodynamics	
	Am J Resplr Crit Care Med 1994;149:1077-84.						
	Effects of PEEP on VA/Q Mismatching in Ventilated Patients with Chronic Airflow Obstruction						
116	Claude Guerin, Stephane Lemasson, Roland De Varax, Joseph Milic-Emili,	10	Experimental clinical observation	COPD patients	impact of PEEP on compliance and small airway closure	PEEP did not recruit collapsed airways, however at ZEEP the lung volume was less than the lower inflection point. Indeed the pressure required to open lung units could be above iPEEP.	2+
	And Gerard Fournier					ePEEP may prevent atelectotrauma and may need to be above iPEEP. Highly variable between patients	
	Am J Respir Crit Care Med 1997,1SS:1949-1956						

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Small Airway Closure and Positive End-Expiratory Pressure in Mechanically Ventilated Patients with Chronic Obstructive Pulmonary Disease						
117	Caramez MP, Joao B. Borges, Mauro R. Tucci, Valdelis N. Okamoto, Carlos R. R. Carvalho, Robert M. Kacmarek, Atul Malhotra, Irineu Tadeu Velasco, and Marcelo B. P. Amato Crit Care Med. 2005 July ; 33(7): 1519–1528 Paradoxical responses to positive end-expiratory pressure in patients with airway obstruction during controlled ventilation	8	Experimental clinical observation	Obstructive lung disease patients	Impact of PEEP on expiratory flows and volumes	Use of ePEEP above iPEEP resulted in variable and unpredictable responses	2-
118	MacIntyre, Chest, 1997	13	Experimental Clinical Observation	Obstructive lung disease patients, assisted ventilation	Impact of stepwise increases in PEEP on pulmonary mechanics including oesophageal pressure-time product	Decrease in PTP with increases in ePEEP up to iPEEP – offsetting imposed trigger load from iPEEP	2+
119	Nava, S., et al., Respiratory response and inspiratory effort during pressure support ventilation in COPD patients. Intensive Care Med, 1995. 21(11): p. 871-9	10	Experimental clinical observation	AECOPD recovering on PSV	Measure effects of different levels of PEEP and PS	Various physiological observations	2+
120	Guerin C, Milic-Emili J, Fournier G ICM 2000 26:1207-1214 Effect of PEEP on work of breathing in mechanically ventilated COPD patients	10	Experimental clinical observation	Mechanically ventilated COPD patients (paralysed)	Different levels of ePEEP applied and effect on work of breathing (WOB) measured	Decrease in WOB up until ePEEP equals iPEEP, then no further rincreases	2-
124	Kress					DSH superior in:	

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	2000[4] New Engl J Med 342;1471-7	128	RCT single centre study	Sedated ICU patients	DSH v routine sedation management on duration of mechanical ventilation (MV)	Duration of MV (4.9v7.3 days) ICU LOS 6.4 v 9.9 days Hospital LOS 13.3 v 16.9 days	1+
125	Girard 2008[5] Lancet 371;126-34	336	4 centre RCT North America	Ventilated ICU patients	Daily spontaneous awakening trial (SAT) v SAT and daily spontaneous breathing trial (SBT)	Ventilator free days Intervention group had more ventilator free days 14.7 v 11.6; shorter Hospital LOS 14.9 v 19.2 days; lower 1 year mortality 44 v 58%	1+
126	Brook, CCM, 1999	13	Experimental Clinical Observation	Obstructive lung disease patients, assisted ventilation	Impact of stepwise increases in PEEP on pulmonary mechanics including oesophageal pressure-time product	Decrease in PTP with increases in ePEEP up to iPEEP – offsetting imposed trigger load from iPEEP	2+
127	Arias-Riviera, CCM, 2008	356	Prospective study	Medical and Surgical ICU	Evaluate the effect of a nursing-driven sedation protocol on duration of intubation.	A nurse-driven sedation protocol may ↑chance of successful extubation.	2+
129	Hughes CG et al Crit Care Med 2013		Systematic Review	Mechanically ventilated ICU patients requiring sedation	Daily sedation interruption versus targeted light sedation	Both are safe and improve outcomes where these approaches result in reduced sedative exposure and facilitate arousal.	1+
130	Augustes 20111 Anaesth Intensive Care. May;39(3):401	699	Meta-analysis	5 RCTS identified 1996-april 2010 Small numbers per	Outcome of daily sedation holds	No difference in: Duration of MV LOS (ITU or hospital)	1+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Intensive Care. May;39(5):401-9.	699	Meta-analysis	study, significant heterogeneity	Outcome of daily sedation holds	Mortality Reduced risk of Tracheostomy (OR 0.57)	
131	Metha, JAMA, 2012	430	RCT	Critically Ill patients	Compare protocolised sedation with PS+DIS	For patients managed with protocolised sedation, the addition of DIS did not reduce the duration of MV or LOS	1+
133	de Wit, M., et al., Ineffective triggering predicts increased duration of mechanical ventilation. Crit Care Med, 2009. 37(10): p. 2740-5.	60	clinical observation	Mechanically ventilated MICU pts	Assessment of frequency of ineffective triggering of inspiration (ITI) during 10 mins of MV in the first 24h on the ICU	It is common of have >10% of breaths exhibiting ITI and those that do have increased complications	2+
134	Chao, D.C., D.J. Scheinhorn, and M. Stearn-Hassenpflug, Patient-ventilator trigger asynchrony in prolonged mechanical ventilation. Chest, 1997. 112(6): p. 1592-1599.	174	clinical observation	Mechanically ventilated pts in a regional weaning unit	200 were screened for trigger asynchrony (TA)	TA was more common in older pts, those with lower MIP, and those with COPD. TA was improved through adjustment of PEEP and reduction in PS. Associated with adverse outcome from weaning	2+
135	Colombo, D., et al., Efficacy of ventilator waveforms observation in detecting patient-ventilator asynchrony. Crit Care Med, 2011.	43	clinical observation	Ventilator waveform tracings from 24 patients with acute resp failure	Examination of waveforms by experts and non-experts seeking to establish sensitivity and specificity for patient-ventilator asynchrony (PVA)	Prevalence of asynchronies increased at higher ventilator assistance and tidal volumes. ICU physicians (non-expert) are not good at detecting PVA	2+
136	Thille, A.W., et al., A bench study of intensive-care-unit ventilators: new versus old and turbine-based versus compressed gas-based ventilators. Intensive Care Med, 2009. 35(8): p. 1368-76.	13	Technical observational	Ventilator performance assessed	Simulation of patient-ventilator interactions with assessment of technical performance of modern ventilators	Technical performance of trigger function, pressurization capacity, and expiratory resistance differs considerably across new-generation ICU ventilators	2+
137	Richard, J.C., et al., Bench testing of pressure support ventilation with three	22	Technical observational	Ventilator performance	Simulation of patient-ventilator interactions with assessment of	Technical performance of Modern (since 1993) ventilators has improved compared with pre-1993 ventilators.	2+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	different generations of ventilators. Intensive Care Med, 2002. 28(8): p. 1049-57.		[illegible]	assessed	technical performance of modern ventilators		
138	MacIntyre, N.R., et al., Patient-ventilator flow dyssynchrony: flow-limited versus pressure-limited breaths. Crit Care Med, 1997. 25(10): p. 1671-7.	16	Experimental clinical observation	Mechanically ventilated patients - ACV-volume cycled.	Measurement of flow dysynchrony (pressure-time-product) with either flow or pressure targeted ventilation	Variable flow, pressure-limiting breaths reduce flow dyssynchrony in patients with vigorous flow demands	2-
139	Thille, A.W., et al., Patient-ventilator asynchrony during assisted mechanical ventilation. Intensive Care Med, 2006. 32(10): p. 1515-22.	62	Experimental clinical observation	Mechanically ventilated patients – ACV and PSV	Asynchrony index (AI) calculated	Higher AI associated with longer duration of MV. Triggered worse is high PS, insensitive trigger, larger Vt and higher pH. Asynchrony is common, more so in ACV.	2+
140	Passam, F., et al., Effect of different levels of pressure support and proportional assist ventilation on breathing pattern, work of breathing and gas exchange in mechanically ventilated hypercapnic COPD patients with acute respiratory failure. Respiration, 2003. 70(4): p. 355-61.	9	Experimental clinical observation	Spontanously breathing intubated patients wth COPD	PAV vs. PSV at 4 levels of support, applied in random order	PSV was associated with missed efforts and PSV with runaway phenomenon	2-
141	Bosma, K., et al., Patient-ventilator interaction and sleep in mechanically ventilated patients: pressure support versus proportional assist ventilation. Crit Care Med, 2007. 35(4): p. 1048-54	13	Experimental clinical observation	Spontanously breathing ventilated weaning patients	PAV vs. PSV overnight with assessments of synchrony, WOB and sleep quality	PAV resulted in fewer dysynchronies and less disruption to sleep	2+
142	Costa, R., et al., A physiologic comparison of proportional assist ventilation with load-adjustable gain factors (PAV+) versus pressure support ventilation (PSV). Intensive Care Med, 2011. 37(9): p. 1494-500	11	Experimental clinical observation	Spontanously breathing ventilated weaning patients	PAV vs. PSV with assessment of synchrony	PAV resulted in fewer dysynchronies	2+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
143	Xirouchaki, N., et al., Proportional assist ventilation with load-adjustable gain factors in critically ill patients: comparison with pressure support. Intensive Care Med, 2008. 34(11): p. 2026-34.	208	RCT	Intubated and mechanically ventilated patients	Randomised controlled trial PAV+ vs. PSV, for weaning	PAV+ was associated with less dysynchrony but no more successful at weaning	2+
144	Spahija, J., et al., Patient-ventilator interaction during pressure support ventilation and neurally adjusted ventilatory assist. Crit Care Med, 2010. 38(2): p. 518-26.	14	Experimental clinical observation	Non-sedated MV pts (12 with COPD)	Assessment of dysynchrony with NAVA and PSV each at two levels of support	Better synchrony with NAVA, lower WOB	2+
145	Piquilloud, L., et al., Neurally adjusted ventilatory assist improves patient-ventilator interaction. Intensive Care Med, 2011. 37(2): p. 263-71.	22	Experimental clinical observation	Spontanously breathing intubated patients	Assessment of dysynchrony with NAVA and PSV at two levels of support	Better synchrony with NAVA, but more double-triggering	2+
146	Scales et al, CCM, 2008	10,927	Retrospective cohort analysis of 114 Canadian acute hospitals	All GICU patients undergoing tracheostomy between days 3 and 28 of ITU stay	Compare effects of early (<10 days) vs late (>10 days) tracheostomy on patient mortality	Reduction in 90 day, 1 year and study mortality in the early (<10 days) group	2+
147	Rumbak et al, CCM, 2004	120	Prospective randomised control study from 2 centres in the USA	Medical ICU patients projected to need MV > 14days	Compare effects of early (within 48hrs) and late (14 – 16 days) tracheostomy on pneumonia, mortality and length of stay	Early tracheostomy significantly reduced mortality, pneumonia, length of stay and ventilator days compared to late	1+
148	Griffiths et al, BMJ, 2005	406	Systematic review and meta analysis of 5 RCTs	ICU patients requiring prolonged MV from medical, surgical, burns and neurosurgical ICUs	Compare effects of early (<7 days) vs late (>7days) tracheostomy on mortality, pneumonia, length of stay	No benefit in terms of mortality and pneumonia from early tracheostomy. Reduced length of stay and ventilator days in early tracheostomy group	1+
150	Terragni et al, JAMA 2010	419	RCT from 12 Italian ICUs	Patients ventilated for >48hrs thought likely to need tracheostomy	Compare effects of early (5 – 8 days) and late (13 – 15 days) tracheostomy on rates of VAP, and ventilator and ICU free days	No reduction in VAP with early tracheostomy. 64 in the early group (30%) and 119 (57%) of randomised patients didn't require a tracheostomy	1+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
151	Young et al, JAMA, 2013	909	RCT of 87 UK ICUs	Patients predicted by clinician to require 7 days or longer MV	Compare effects of early (day 1 to 4) and late (day 10 onwards) tracheostomy on mortality, sedative use, ICU length of stay	54.5% of those randomised to late tracheostomy successfully extubated before 10 days; no significant difference in 30 day or 2 year mortality	1+
152	Wang et al, Chest, 2011	1,044	Meta analysis of 7 RCTs looking at timing of tracheostomy	Critically ill patients undergoing MV who received an early or late tracheostomy	Compare impact of early versus late tracheostomy on several clinical outcome measures	Reduced use of sedative agents with early tracheostomy; no impact on mortality, duration of MV, rates of VAP or mortality reported	1++
153	Dempsey et al, BJA, 2010 140(6) 1456-65	589	Prospective, single centre cohort study in UK	Critically ill patients requiring tracheostomy	Report incidence of early and late complications relating to tracheostomy insertion	26% rate of "difficulties" (bleeding, desaturation) 3% rate of serious early comps 0.35% procedural mortality	2+
154	Silvester et al, CCM, 2006 34(8) 2145-52	200	RCT	Critically ill patients requiring tracheostomy to enable weaning from MV	Compare bedside percutaneous tracheostomy and surgical tracheostomy for rates of complications on insertion and later problems	13.5% rate of significant early complications reduced rates of infection seen in percutaneous tracheostomy group	1+
158	Conti et al (10)ICM 2002 28(12) 1701-1707	49	RCT single centre Unblinded ICU COPD only	NIV V IMV	Not clear	NIV equivalent to mechanical ventilation for hospital LOS & mortality. NIV is associated with better long term outcome	1^{+}
159	Wood et al (21)	27 (COPD 6)	RCT single centre Unblinded Emergency Dept Mixed, majority non COPD	NIV V Standard Treatment	RR > 25/min pH <7.35, PaC02 >45 mm Hg, Pa02 <55 mm Hg	Trend towards inc mortality in NIV group - Application of NIV in Emergency Department could delay tracheal intubation**	 1^{+}

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
160	Chandra 2012 AJRCCM	7,511,267	Retrospective cohort	Patients hospitalised in USA with AECOPD	To determine the prevalence and trends of noninvasive ventilation for acute COPD.	There was a 462% increase in NIV use and a 42% decline in IMV use. This was accompanied by an increase in the size of a small cohort of patients requiring transition from NIPPV to IMV. In-hospital mortality in this group appeared to be worsening over time.	2++
162	Collaborative Research Group Chin Med J 2005 118(24) 2034 40	342	RCT single centre	NIV		NIV equivalent to IMV for hospital LOS & mortality. NIV is associated with better long term outcome	1+
			Unblinded	V	Not clear		
			ICU	IMV			
			COPD only				
163	Plant 2000 Lancet 355;1931-5	236	RCT of NIV v standard ward treatment	COPD patients with mild to moderate respiratory acidosis admitted to 14 UK hopitals	Reduction in need for intubation as defined by a failure criteria	Significant reduction in need for intubation with NIV (15% NIV v 27% standard)	1+
167	Ucgun 2006	151	Case series	ICU	To identify the possible factors affecting mortality and intubation in COPD patients.	the most important predictors related to hospital mortality were the need for invasive ventilation and complications of MV. Adequate metabolic compensation for respiratory acidosis at admition is associated with better survival. A high APACHE II score and loss of consciousness (low GCS) were independent predictors of a need to intubate patients	2+
168	Scala 2005		Case control AECOPD	Respiratory Monitoring Unit	to determine outcome from NIV with different levels of conciousness		2+
169			RCT Multi centre	NIV	1.patients fulfilling criteria for need for ETI		

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Nava, Age Aging, 2011	82 (COPD 66)	Unblinded	v	2. change in ABG, RR	reduced mortality * and need for ETI.* Improved ABG*, RR*	1^+
			3 Respiratory Care units	standard treatment			
			Mixed, majority COPD				
170	Riario-Sforza, Clin Ter, 2012		case series-observation	mean age 81 years		84% survival	3
171	Miller, Int J Clin Practice, 2012	240	retrospective case series			ph response, low urea predic survival	3
172	Plant, Thorax, 2001	236	RCT	AE COPD	long term survival	NIV -improvessurvival	1+
173	Confalonieri, Eur resp J 2005	1033	Observational	AE COPD	risk stratification	risk score	2+
174	Keenan et al JAMA 2002 287(24) 3238-3244	52	RCT single centre	NPPV for 8, 6 & 4	Hospital LOS trend	NIV was poorly tolerated	1^+
			Unblinded	hours/day	towards reduction p =0.06	in patients with mild exacerbation (pH 7.4) NIV decreased dyspnoea but no difference in LOS	
			Ward	V			
			COPD only	Standard Treatment			
177	Morettiet al 2000	137	Case series	COPD	To determine outcome when deterioration after initial NIV success	Prognosis poor	2+
179	Kramer et al Am J Resp Crit Care Med 1995 151(6) 1799-806	31 (COPD 23)	RCT Single centre	Bilevel	?need for ETI	Reduced intubation rate with use of NIV	
			Unblinded	V			1^+
			ICU	Standard treatment			
			Mixed, predominantly COPD				

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
180	Phua et al Intensive Care Med, 2005	111	Prospective cohort study in the medical intensive care unit of a university hospital	43 COPD remainder other conditions	compared the effectiveness of NIV and the risk factors for failure in AHRF due to COPD vs. non-COPD conditions.	NIV failure, defined as the need for endotracheal intubation, was significantly lower in COPD than in other conditions. High APACHE II score was an independent predictor of NIV failure in COPD (OR 5.38 per 5 points). The presence of pneumonia (OR 5.63), high APACHE II score (OR 2.59 per 5 points), rapid heart rate (OR 1.22 per 5 beats/min), and high PaCO(2) 1 h after NIV (OR 1.22 per 5 mmHg) were independent predictors of NIV failure in the non-COPD group. Failure of NIV independently predicted mortality (OR 10.53).	2+
181	Esteban et al, NEJM, 2004 350(24) 2452-2460	221	RCT	All patients successfully	Compare the effects of NPPV (pressures altered to meet clinical criteria) vs SMT in patients developing respiratory failure following extubation	No difference in reintubation rates	1+
			Multicentre	extubated after being ventilated for 48 hours or longer (therefore not specific to patients with HRF / chronic resp disease)		Increased ICU mortality in NPPV group (25 vs 14%)	
			Unblinded				
			Concluded early (initially powered to include 392				
182	Wildman, BMJ, 2007	832	prospective cohort	COPD +/_ Asthma	predicted and observed outomce		2+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
183	Sumner, K. and G. Yadegafar 2011	115	audit	all patients receiving NIV	To explore the practice of delivering non-invasive ventilation (NIV) in non-designated areas within a large university teaching hospital by critical care outreach nurses.	The mortality rate for the first 2 years data combined (n75) was 57% and attributed to the fact that patients were elderly, acidotic and had diagnoses associated with a poor response to NIV. Resuscitation status (p=0.01) and arterial blood gas improvement within two hours of therapy had a significant effect on patient outcome (p=0.001). Four years later the mortality rate had reduced to 35% Inappropriate use of NIV in non-designated areas is associated with a high mortality. Critical care outreach nurses can play a pivotal role in influencing appropriate patient selection for NIV	2+
184	Celli, NEJM, 2004	625	Validation study	COPD	To validate a multidimensional grading system to predict outcome	The BODE index is better than the FEV1 at predicting the risk of death from any cause and from respiratory causes in patients with COPD	2+
185	Steer, Thorax, 2012	920	Cohort study	AECOPD	Identify prognostic tool for AECOPD	The DECAF score predicts mortality in patients hsopitalised with AECOPD	2+
186	Liu, H., T. Zhang, et al. (2007) European Journal of Internal Medicine 18(7): 542-547	152	Single respiratory ICU China mainland Descriptive case series 2000-2005	COPD with hypercapnia and acute on chronic RF & invasive ventilation > 7 days	Determinants of prolonged ventilation	Age Initial pH APII Organ failure shock	2-

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
187	Goel, J Gen Internal Med, 2003	92	Retrospective cohort study	COPD patients admitted with AECOPD to general medical wards in two hospitals in Vermont, USA between Jan 1995 and june 2006.	To determine the APACHE ii's ability to predict long-term survival of patients with COPD admitted to general medical wards.	An increase of 1.76 was associated with an increase to level 3 care. An increase by 2.58 was associated with long term mortality. After controlling for smoking, comorbidity & admission CO2 APACHE ii was an independent predictor of death at 3 years.	2+
189	Confalonieri, Eur resp J, 1996	48	cohort study with historical matched controls	COPD patients admitted with pH , 7.32 +/- PaO2 < 7.98 +/- pCO2 >7.18 plus signs of respiratory distress.	To investigate the long-term affect of early NIV initiation compared with conventional treatment	Endotracheal intubation decreased, LOS for exacerbations was shorter and less frequent and the survival rate was significantly better (71% vs 50%) in the treatment group	2++
193	Wildman, Thorax, 2009	832	Prospective cohort study	COPD with AHRF admitted to ICU	To examine outcomes	62% survived to 180 days. Many survivors reported similar or better quality of life. 96% would want the same treatment again	2+
194	Brandao, J asthma, 2009	36	RCT ED	Control v 15/5 NIV v 15/10 NIV	Change in spirometry	Greater improvement in PEF, FEV1,	1⁻
195	Holley, Acad Emerg Med, 2001	35	RCT ED	Standard Rx v NIV 10/5	ETI	Shorter hospital stay in NIV group (trial stopped early because bias in recruitment)	1⁻
196	Gupta, Respir Care, 2010	53	RCT Respiratory ICU	Standard Rx v NIV 12/5	Change in spirometry, ICU and hospital LOS	Use of NIV led to a quicker improvement in FEV1 and shorter hospital LOS	1+
197	Soma, Intern Med, 2008	44	RCT ED	Standard Rx v Low pressure 6/4 High pressure 8/6	Change in FEV1	Rapid improvement with NIV	1⁻

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
198	Soroksky, Chest, 2003						
		30	RCT	Standard Rx v	Change in FEV1	Quicker improvement in FEV1 and reduced need for hospitalisation with NIV	1^{+}
			ED	NIV 14/4			
199	Lim, Cochrane SR database, 2012	5 studies	Systematic review			Two intubations in 45 participants on NPPV and no intubations in 41 control patients (risk ratio 4.48; 95% CI 0.23 to 89.13). No deaths in either of these studies. Length of hospital stay was reported in two studies, though meta-analysis was not possible. Hospitalisation was reported in one small study, in which there were three admissions out of 17 on NPPV and 10 admissions out of 16 in control patients (RR 0.28, 95% CI 0.09, 0.84).	1+
200	Meduri, Chest, 1996	17	Case series	Asthmatic patients admitted to ITU with acute respiratory failure over a 3 year period. 10 women and 7 men. Mean age 35.4.	To observe and describe the effectiveness of NIV in patient's with asthma and acute respiratory failure.	NIV appeared well tolerated (only 2 / 17 episodes required sedation. NIV appeared effective, NIV corrected ABG's in all but 2 patients who required intubation	2+
201	Wilson, Med J Aust, 2007	Unclear	Retrospective cohort study	AECOPD/asthma	Identify changes in hospital admission and mortality	Hospital admissions and mortality associated with asthma have fallen. Admission rates for COPD are declining for men, but there is no indication that admission rates for women have reached a peak.	2-
203						No difference in hospital	

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Phua et al Intensive Care Med, 2010	57	Case Series	Non-CF bronchiectasis patients with ARF	Outcomes for ARF treated with NIV c/w IMV	mortality between the 2 groups	3
204	Efrati, Heart Lung, 2010	48	Retrospective cohort study	Mechanically ventilated CF patients	Identify long-term outcomes of CF patients requiring mechanical ventialtion	CF patients requiring mechanical have a poor prognosis	2+
205	Slieker, ICM, 2006	31	Retrospective cohort study	Mechanically ventilated CF patients	Identify outcomes of CF patients requiring mechanical ventialtion	CF patients requiring mechanical have a poor prognosis	2+
206	Sheikh, J Clin Med Res, 2011	14	Retrospective cohort study	Intubated CF patients with T2RF	Identify outcomes of CF patients requiring mechanical ventialtion	Identify outcomes of CF patients requiring mechanical ventialtion	3
210	Texereau, Resp Res, 2006	42	Retrospective multicentre review	Patients with CF admitted to ICU	To establish determinants of mortality for adults with cystic fibrosis admitted to ICU	NIV was used in 57% of cases and was successful in 67% of patients. ETI was implemented in 19 episodes. Overall ICU mortality rate was 14%. Despite advanced lung disease, adult patients with CF admitted in ICU have high survival rate. Endotracheal intubation is associated with a poor prognosis and should be used as the last alternative.	2++
211	Jones et al Respirology, 2013 18(4) 630-6	30	Case Series	Patients with CF requiring intubation	Predictors of outcome evaluated in patients with CF requiring intubation	Good outcome after treatment for haemoptysis or pneumothorax. Poor outcome if intubated for	3
217	Sancho, Thorax 2011	76	Prospective study	Patients with ALS and severe bulbar dysfunction	Determine the need for tracheostomy and issues arising	Good 1-year survival rate. Failure of mechanically-assisted cough the main reason for needing tracheostomy	2+
218	**Chadwick, J Neurol neurosurg Psychiatry, 2011**	30	Case note review	Patients with MND. ETI and IMV for ARF	Examine outcomes	14 weaned to NIV 13 failed to wean, 3 died	3

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
220	Nowbar et al 2004	4332 - 6% (n = 277) of patients were severely obese, of whom 150 were enrolled	Cohort study	Admisisons to internal medicine service	to determine the prevalence and effects of obesity-associated hypoventilation in hospitalized patients	Hypoventilation frequently complicates severe obesity among hospitalized adults and is associated with excess morbidity and mortality	2++
221	**Perez de Llano, Chest, 2005**	54	Retrospective series	NIPPV in OHS	Outcomes	NIPPV resulted in improved clinical status and gas exchange	3
	Perez de Llano, Golpe et al. 2005. Chest 128(2): 587-594	54	Retrospective cohort study	Obesity hypoventilation syndrome	Assess the impact of NIV on clinical status and gas exchnage	NIV effective	2+
222	**Resta, Respir Med, 2000**	89	Case Series	Morbidly obese with OSA	Prevalence and mechanisms of hypercapnia	Hypercapnia frequently associated OSA. Ventilatory restrictions and sleep-related respiratory disturbance correlate to hypercapnia	3
224	Epstein, C.D. and J.R. Peerless, Weaning Readiness and Fluid Balance in Older Critically Ill Surgical Patients. American Journal of Critical Care, 2006. 15(1): p. 54-64	40	Clinical observation	IMV patients aged over 60y on a SICU being weaned	Comparison of clinical parameters between those successful weaned within 14d and those not	Persistent positive fluid balance was associated with prolonged mechanical ventilation	2-
225	Yang et al NEJM 1991 324(21) 1445-50	100 (36 piloted then 64 prospective)	Comparison of two indexes for the accuracy of predicting a successful weaning outcome	100 ventilated ICU patients ready to begin a weaning trial	Data collected on variables related to weaning and then tested for sensitivity and specificity as predictors of	RSBI has highest sensitivity and specificity for predicting successful weaning	2+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
227	Vincent, J.L., et al., Sepsis in European intensive care units: results of the SOAP study. Crit Care Med, 2006. 34(2): p. 344-53.	3147	Clinical observation	sepsis	International multi-centre observational study (SOAP)	sepsis, age, positive fluid balance, septic shock, cancer, and medical admission were the variables for intensive care unit mortality.	2+
228	Wiedemann, H.P., et al., Comparison of two fluid-management strategies in acute lung injury. N Engl J Med, 2006. 354(24): p. 2564-75.	1000	RCT	ARDS	Multi-centre ARDSNet study comparing two fluid management strategies	conservative strategy of fluid management improved lung function and shortened the duration of mechanical ventilation and intensive care without increasing nonpulmonary-organ failures	1+
229	Payen, D., et al., A positive fluid balance is associated with a worse outcome in patients with acute renal failure. Crit Care, 2008. 12(3): p. R74.	1120	Clinical observation	Sepsis and AKI	International multi-centre observational study. Subgroup analysis of SOAP – those with AKI	a positive fluid balance was an important factor associated with increased 60-day mortality	2-
230	Upadya, A., et al., Fluid balance and weaning outcomes. Intensive Care Med, 2005. 31(12): p. 1643-7.	87	Clinical observation	IMV patients being weaned	Prospective collection of data in relation to weaning success	Negative FB was associated with weaning success	2+
231	Mekontso Dessap A, Roche-Campo F, Kouatchet A, Tomicic V, Beduneau G, Sonneville R, Cabello B, Jaber S, Azoulay E, Castanares-Zapatero D, Devaquet J, Lellouche F, Katsahian S, Brochard L. Natriuretic Peptide-driven Fluid Management during Ventilator Weaning: A Randomized Controlled Trial	304	RCT	IMV being weaned	Randomised to 2 different fluid management strategies: standard or BNP-driven	In the BNP-driven group there was a shorter time to successful extubation and increased the number of ventilator-free days but did not change length of stay or mortality	1+
232	Brochard et al Am J Resp Crit Care Med, 1994	109	Prospective RCT Unblinded 3 centres	Ventilated ICU patients who met criteria to wean but failed 2 hr SBT	Compare T piece trials vs reducing PS weaning vs SIMV weaning Primary end point – number of patients still ventilated at 21 days	23% still ventilated in PS group 42% each in T piece / SIMV groups	1+
233			Prospective RCT	Ventilated ICU patients > 7 days	Compare effects of four different	Once daily or multiple daily SBT's more effective than	

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Esteban et al NEJM 1995 332 345-350	130	Unblinded 14 centres	Deemed fit to begin weaning but failed 2 hour SBT	Compare effects of four different weaning methods on successful extubation at 14 days	either PS weaning or SIMV weaning	1+
234	Vitacca et al Am J Resp Crit Care Med, 2001	52	Prospective RCT Unblinded 3 centres	Ventilated COPD patients, ventilated for > 15 days and failed SBT	Compare PS weaning vs T piece weaning	Success of weaning 73% with PS, 77% with T piece LOS, length of vent, mortality same between the 2 groups	1+
235	Frutos-Vivar, F., et al., Risk Factors for Extubation Failure in Patients Following a Successful Spontaneous Breathing Trial. Chest, 2006. 130(6): p. 1664-1671.	900	Clinical observation	IMV patients ready for extubation	International multi-centre study, patients with extubation failure were analysed for predictive markers	Positive fluid balance 24 h prior to extubation, and pneumonia at the initiation of ventilation were the best predictors of extubation failure	2+
236	Esteban, AmJRCCM, 1997	484	RCT	IMV > 48 hrs	Extubation outcome after SBT with T-piece or PSV	No difference	1+
237	Perren et al ICM 2002 28(8) 1058-63	98	Prospective randomised controlled trial	Adult patients ventilated for 48hrs considered ready for SBT	Compare effects of 30min and 2 hour SBT on ability to recognize patients who will successfully extubate	No difference between 30 min and 2 hour trials	1+
238	Ely et al NEJM 1996 335(25) 1864-9	300	Prospective RCT	Adult patients undergoing MV within medical and cardiac ICUs	Compare effects of daily screening for weaning followed by 2 hr SBTs vs screening alone on duration of MV	Daily screening followed by SBT reduced length of MV and rates of complications due to MV compared to screening alone	1+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
239	Vallverdu et al Am J Resp Crit Care Med 1998	217	Prospective cohort study	Patients undergoing 2 hour SBT and weaning process	Identify factors and characteristics that may influence success of weaning and stratify overall success of weaning process	Several factors may predict successful weaning, including: RSBI, duration of MV, age and occlusion pressure	2+
243	Salam, Intensive care Med, 2004 30(7) 1334-9	88	Prospective Observational Study	Med ICU 88 consecutive patients	To determine the degree to which neurologic function, cough peak flows and quantity of endotracheal secretions affected the extubation outcomes of patients who had passed a trial	Cough peak flow of patients who failed extubation lower than the success group (58.1 +/-4.6l/min vs 79.7 +/- 4.1 l/min p=0.03. CPF < 60 l/min	2+
244	Rothaar et al COICCM 2003 9(1) 59-66	n/a	Two author review article		Detailed discussion of the causes of extubation failure and its impact on patient outcomes	SBTs and consideration of airway patency both important in defining safety for extubation	
245	Blackwood et al (Cochrane) BMJ 2011 342 c7237-c7237	1971	Meta analysis of 11 studies	Ventilated ICU patients weaning using SBT's, automated weaning, or PS weaning	Compare the use of weaning protocols against non regimented weaning	Significant reduction in duration of MV, total time spent weaning and ICU LOS in weaning protocols group	1++
246	Piotto et al, Rev Bras Cir Cardiovas, 2011	36	RCT	Coronary Care patients	Determine the effects of a weaning protocol	Better outcomes with protocol: Shorter weaning times, lower re-intubation rates	1+
247	Lellouche et al Am J Resp Crit Care Med 2006 174(8) 894-900	144	Multicentre RCT (5 ICUs in 4 countries)	Patients ventilated for > 24 hours	Compare computerised protocol weaning vs usual care in weaning	Significant reduction in time to extubation and time spent on MV in computer driven	1-
			European	Screened and deemed appropriate to begin weaning	Primary end points: time to extubation and total length of MV	No significant reduction in mortality or reitubation seen	
248	Rose et al ICM 2008 34(10) 1788-95	102	Single centre, unblinded	ICU patients ventilated for > 24 hrs	Compare computer driven weaning vs nurse led protocolised weaning	No significant difference between 2 groups on any end points measured	1+
			RCT	Appropriate to wean	Primary outcome: time to extubation, also studied total ICU and hosp LOS		
			Australian				

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
249	Kilger et al, Med Klin, 1995 90 (supp 1) 26-28	15	Case series	Immunocompromised patients post solid organ transplant not fulfilling predefined criteria for extubation Ventilated > 72 hours and extubated onto NPPV	Evaluate the effects of CPAP 5cmH_20 then NPPV for > 6 X 30 minute sessions per day on the rates of reintubation in the extubated patients	2 of 15 patients reintubated	3
250	Ferrer et al, AmJRCCM, 2003	43	RCT Two centres Unblinded Concluded early (powered to include 82 patients)	Patients predominantly with COPD Failed SBT on 3 consecutive days and ventilated > 72 hours; randomised to	Compare the effects of NPPV (continuous for first 24 hours then reduced) vs IMV and standard weaning on length of stay, time on IMV, pneumonia and mortality	Significant reduction in time spent on MV (9 vs 20 days), ICU and hospital LOS Increased ICU (13 vs 19%) and 90 day survival in NPPV group	1-
251	Girault et al, AmJRCC, 2011	208	RCT 13 French / Tunisian ICUs Unblinded Rescue NPPV used in MV / oxygen groups	Patients intubated for acute HRF Failed SBT on 2 consecutive days; Stabilised on MV for 30 mins following failure of SBT then randomised to: conventional invasive weaning (reducing PS); extubation onto NPPV (6 hours per day); and extubation onto oxygen (maintain SpO_2 > 90%)	Compare the effects of three different management strategies in patients with HRF on rates of reintubation and incidence of post extubation respiratory failure	No significant difference in rates of reintubation between the three groups NIV reduces duration of intubation and may reduce risk of post extubation respiratory failure	1-

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
252	**Burns et al , CMAJ, 2014**	**994**	**Systematic review of 16 tri**	**Comparison of patients faili**	**Study effects of NIV weaning com**	**Significant reductions seen in**	**1++**
253	Ferrer et al, AmJRCCM, 2006	162	RCT	Patients ventilated for > 48 hours with risk factors present for development of post extubation respiratory failure (age >65, CCF, poor cough, APACHE II >12 when intubated)	Compare effects of NPPV applied prophylactically for first 24 hours post extubation vs SMT in prevention of respiratory failure following extubation	Significant reduction in respiratory failure in NPPV group (16 vs 33%); no difference in reintubation rates, ICU and hospital LOS, 90 day and hospital survival between groups	1+
			Two centres	~50% of patients had COPD		Post hoc analysis showed survival benefit in patients becoming hypercarbic post extubation	
			Unblinded				
254	El Sohl et al, Eur Resp J, 2006	62	Case control study with matched historical controls	Obese patients (BMI > 35) extubated following period of IMV	Compare effects of prophylactic nasal NPPV for 48 hours post extubation to the effects of SMT in matched historical controls	Significant reduction in respiratory failure, ICU and hospital LOS in NPPV group	2+
255	Roessler MS et al . Emerg med J 2012 29(5) 409-14	51	Randomised	OOH treatment –SMT or NIV	Safety and feasibility	Less NIV group intubated , and no complications	2-
256	Templier F et al Am J Emerg Med 2012 30(5) 765-9	54% of 218 French mobile ICUs	Online survey	France – assessed NIV and CPAP	Assess current practice	Appropriate protocols for ACPO but otherwise variable use	2+

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
257	Rose L and Gerdtz MF 2009 46(5) 617-23	245	Prospective cohort	Patients admitted to 24 EDs in Australia, who received NIV (185) or CPAP (60)	Patient characteristics and delivery of NIV/CPAP in EDs	AECOPD was indication for NIV in 31% cases. Initial settings for NIV decided by nurse and doctors equally (48% of patients each)	2-
258	Hess DR et al Resp care 2009 54(10) 1306-12	90% of 132 EDs	Survey	Survey tool piloted then used by physician & therapist	Practice re NIV in COPD,CHF and asthma	.Availability of therapists and physician experience affected NIV use . Uncertainty re role in asthma	3
259	Browning J et al erg Med J 2006 23(12) 920-1		Survey	UK EDs with at least 25,000 new patients each year.	Survey the use of NIV, conditions treated, use of protocols and audit activity.	222 out of 233 responded. 148 use NIV. 128 for cardiogenic oedema and 115 for COPD. Only 49 have	2-
260	Sen B et al COPD 2010 7(3) 199-203	55	Prospective	UK EDs	Assessment of proforma based management in COPD	Improvements re diagnosis,02 delivery ,ABG testing and NIV referral	2+
264	Corrado A et al Eur resp J 2002 20(5) 1343-50		European survey	68 Respiratory Units	Census (Nov 1999-Jan 2000) of European Community countries, plus Norway and Turkey on the provision of Respiratory Intermediate Care Units (RICU).	In Europe patients are mechanically ventilated in units with nurse patient ratios as low as 1:4. Where nursing ratio <1:4 only NIV or monitoring or ventilation of stable tracheostomy patients.	3
267						59% reqired NIV , COPD	

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
	Sala E et al Arch Bronconeumol 2009 45(4) 168-72	206	Prospective 6 month case study	Spanish RICU	Systematic assessment of RICU activity	diagnosis in 47% , mortality 9.7% - concluded RICU feasible and effective within resp dept	3
268	Paus- Jenssen ES et al Chest 2004 126(1) 165-72	75	Prospective cohort	Patients in ARF treated with NIV admitted over a 5 month period to 1	Document location where NIV initiated and outcomes	NIV initiated in ED (32%), Critical Care (27%),	2
270	Cabrini L, Idone C, Colombo S , Monti G , et al Intensive Care Medicine 2009 ;35[2] :339-43	129 consecutive treatments	Prospective observational study over	6 months of patients referred to ICU outreach team for ARF in an	Observe effect of anaesthesiology led team providing NIV in ARF outside ICU	Successful in 77.5% , 10.1 % intubated , 12.4 % deceased [all recorded as DNR]	3
273	Momen N et al Thorax 2012 67(9) 777-80	30 papers	Systematic review	Papers reporting on EOL conversations between COPD patients and health professionals	Establish prevalence of conversations, preferences and timings and content	Most patients had not had EOL conversations. Many would want them but others would not. Health professionals find these conversations difficult and many would prefer patients	1+
276	Chakrabarti B et al J Pall Med 2009 12(11) 1029-35	88	Prospective cohort	COPD/AHRF admissions to 1 UK hospital	Assess predictive value of admission hyperglycaemia on outcome from NIV	3 predictors identified: baseline RR, glucose >/=7,	2+
278	Bulow HH and Thorsager B Acta Anaesth Scand 2009 53(9) 1153-7	157	Cohort	NIV patients in ICU. 38 had DNI orders.	Longterm outcome for the DNI patients.	11 died on ICU, 16 died on the ward, 11 survived hospital. 5 died within 6 months, 2 died 2-4 yrs later and 4 were still alive at 5 yrs. Good outcomes only in	2-
279	Rocker GM et al Can resp J 2008 15(5) 249-54	118	Questionaire	COPD in 5 Canadian teaching hospitals	Satisfaction with EOL care	COPD pts less interested in prognosis, CPR, MV than metastatic cancerpts	2-

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
280	Pang SM et al J Pall Care 2005 21(3) 180-7	149	Questionare re QOL in advanced resp illness	.Canadian COPD ,cancer pts	Validated Q'aire tool	SOB dominates COPD , overall QOL perceptions often worse in COPD	2+
					EOL issues		
281	Smith TA et al Respirology 2012 17(2) 300-7	4RCTs	Systematic review RCTs	Australian authors	NIV at EOL	3RCTs found NIV relieved SOB , but methodology issues	1-
285	Aita K and Kai I Jap Soc Sci Med 2010 70(4) 616-22	35	Structured interviews	Japanese physicians working in emergency and critical care.	Attitudes to withdrawing/withholding life sustaining treatments.	Reluctant to withdraw mechanical ventilation. Much more willing to withdraw percutaneous cardiopulmonary support, vasopressor support and liver support.	2-
						Importance socially to achieve a "soft landing" for the dying patient.	
289	Kuhnlein P et al Amyotrophic Lateral Sclerosis 2008, 9(2) 91-98	29	Structured interviews	Care givers for patients who died from Amyotrophic Lateral Sclerosis in Germany	Suicidal thoughts.	5 pts.	2-
					Considered physician assisted suicide.	3 pts and 7 relatives.	
					Symptoms at time of death.	17 deaths were peaceful, 6 bulbar patients appeared to be choking.	
						10 cases	
					GP involvement in EOL Care.	8 cases	
					Palliative medication given.		

Bibliography ref number	Author/Journal	No. patients	Study characteristics	Population	Objectives	Outcomes/Findings	Level of Evidence
294	Manthous et al, AmJRCCM, 1995	27	Prospective RCT Single centre Unblinded	Patients with severe asthma and pulsus paradoxus > 15mmHg and PEFR < 250 30 minutes after nebulisers and steroids randomised to receive 15 mins of room air or 80:20 heliox	Compare the effects of heliox vs room air on pulsus paradoxus (PP) and PEFR	Improvement in PEFR and PP noted in controls (due to medical therapy); however magnitude of improvement of both PP and PEFR with heliox found to be significantly greater	1-
297	Maggiore et al, CCM, 2010	204	Prospective, multicentre RCT	Patients with acute exacerbations of COPD meeting criteria for NIV therapy Randomised to receive either NIV or NIV and heliox	Compare the effect of heliox and NIV vs standard medical therapy and NIV on intubation rates, complications and mortality	No statistically significant difference in rates of intubation, 28 day mortality, duration of IMV and complications relating to treatment between the two groups	1+
298	Gluck et al, Chest, 1990	7	Case series	Patients ventilated for acute exacerbation of asthma with persistent respiratory acidosis and elevated airway pressures	Evaluate efficacy and safety of 60:40 heliox in this patient group	Rapid reduction in airway pressures and CO_2 seen in all 7 patients No adverse effects reported	3
299	Colebourn et al, Anaesth, 2007	Total pt numbers not supplied by authors	Systematic review of 14 studies examining use of heliox in adult patients	Patients presenting with acute exacerbations of asthma or COPD enrolled into studies in which heliox was used	Examine the effects of heliox on various clinical outcomes from a pooled set of data	No evidence to support the use of heliox to treat acute exacerbations of asthma or COPD Heliox may reduce air trapping in patients with COPD receiving IMV but the clinical significance of this is unclear	1-
300	Jaber et al, AmJRCCM, 2001	18	Case series	Patients with no chronic lung disease ventilated for >48 hours and extubated with increased inspiratory effort noted	Examine the effects of breathing heliox for 15 minutes on effort of breathing (transdiaphragmatic pressure), patient comfort and gas exchange	Heliox reduced effort and breathing and increased patient comfort with no effects on gas exchange	3