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## 118. Respiratory physiotherapy in the intensive care unit and on the ward: breathing exercises and respiratory muscles

P1274

### The inter-observer agreement of handheld dynamometry in critically ill patients

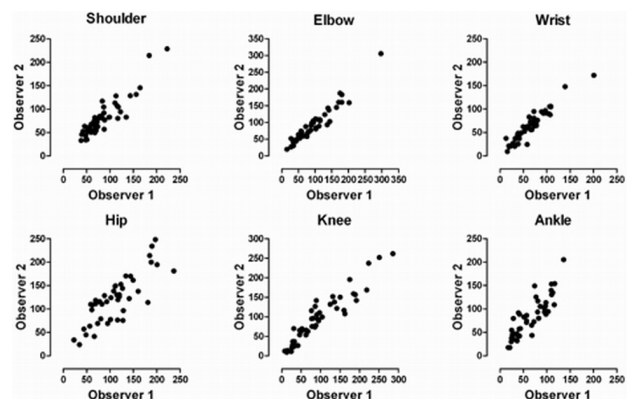
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**Objective:** Muscle weakness is associated with increased risk of morbidity, mortality and limiting functional outcome. To assess muscle weakness reliable measurements are required. The objective is to determine inter-observer reliability of handheld dynamometry (HHD) in awake and cooperative critically ill (CI) patients.

**Patients:** A cross sectional, randomly selected sample of CI patients.

**Measurements:** HHD was performed in CI patients, who had at least a score of 3 on the Medical Research Council scale. 3 Upper limb and 3 lower limb muscle groups were tested at the right hand side. Patients were tested twice daily by 2 independent raters.

**Results:** 51 test-retests were performed in 39 CI patients. Strength was considerably reduced compared to the predicted value: shoulder abduction 43% pred (IQR: 35-58); elbow flexion 38% pred (IQR: 23-58); wrist extension 51% pred (IQR:



34-61); hip flexion 69% pred (IQR: 52-95); knee extension 26% pred (IQR: 11-37); ankle dorsiflexion 25% pred (IQR: 13-38). HHD demonstrated good inter-observer agreement with ICC >0.90 in 4 of the muscle groups tested (range: 0.91 to 0.96) and somewhat less for hip flexion (ICC=0.80) and ankle dorsiflexion (ICC=0.76). **Conclusions:** HHD is a reliable tool for the assessment of muscles that are strong enough to overcome gravity in cooperative critically ill patients. Future studies should focus on the sensitivity of HHD and on the relationship with functional outcome.

#### P1275

##### Effects noninvasive mechanical ventilation on muscle strength, ambulation, and functional performance in the intensive care

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**Aim:** Muscle weakness is a common complication of stay in the intensive care unit (ICU). The aim of this study was to compare the effects of noninvasive mechanical ventilation (NIMV) and standard medical care on muscle strength, ambulation level and functional performance in ICU patients with acute respiratory failure.

**Methods:** Fifteen patients undergoing standard medical care (53.1±15.5 years) and 15 patients undergoing NIMV (59.9±14.4 years) participated in the study. Patients' characteristics, admission findings and length of ICU stay were recorded. An Acute Physiology and Chronic Health Evaluation (APACHE II) score was calculated. Peripheral muscle strength was assessed using the Medical Research Council Scale and handgrip dynamometry. Functional performance was evaluated using the Barthel Index. Ambulation level was recorded as six levels: (1) unsupported sitting in the bed, (2) transfer to chair, (3) sitting in the chair, (4) standing, (5) walking, (6) walking >30 m.

**Results:** APACHE II score was similar in both groups (p>0.05). Barthel Index score, ambulation score, and MRC sum score were significantly lower in patients with NIMV (p<0.05). No significant difference in hand grip force were found between the two groups (p>0.05). Length of ICU stay was significantly longer in patients undergoing NIMV (p<0.05).

**Conclusion:** Patients receiving NIMV had peripheral muscle weakness. These patients had more limitations in their functional performance as compared to patients undergoing standard care. Application of NIMV, similar to invasive mechanical ventilation, results in limitations in functional performance, ambulation, and muscle strength in the ICU.

#### P1276

##### Registry and conformity of endotracheal tube tip distance from carina at a large tertiary hospital

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Physiotherapists are part of the Intensive Care Unit (ICU) team, although their role varies. In Brazil, they participate in endotracheal tube (ETT) management. Artificial airway management is an important part of routine ICU patient care. However, there are few studies about this subject. Objectives were to find out: if ICU staff registered the measured mark of ETT at the lips (ETT mark); if registry was in accordance with real ETT mark; if a specific field for ETT mark registry influenced the filling of patient's file; and if ETT tip distance from carina (ETT-carina distance) was correct according to thorax radiography.

199 cases of patients intubated for over 24 hours, from seven ICUs of Clinical Hospital of Medicine School of University of São Paulo, were included. Data observed: ETT mark, ETT-carina distance, ETT mark registry at patient's files. We found that there was no ETT mark registry neither on medical nor nursing records. Physiotherapists registered it in 55.8% of the cases. ETT mark registry was in accordance with observed in 82 cases (73.9%). Among the cases in which ETT mark was not registered, in most of them (72%) there was not a specific field. ETT-carina distance was correct (from 2.5 to 4.0 cm) in 60.8% of the cases.

In the ICUs analyzed, only physiotherapists registered ETT mark. In an expressive percentage (44.2%) there was no registry of this important information at all. The presence of a specific field may have positively influenced the filling of patient's files. In a significant number of cases (39.2%) ETT-carina distance was incorrect, propitiating risk for intubated ICU patients. Perhaps ETT positioning has not been given the necessary attention.

#### P1277

##### The use of an oxygen concentration 50% above baseline before and after endotracheal suctioning prevents hypoxemia in stable patients

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**Objective:** Few are known about the use of inspired fractions of oxygen less

than 100% (1) to prevent hypoxemia during endotracheal suctioning (ES). The objective was compare the repercussions of using a FiO<sub>2</sub> 50% above the baseline with a FiO<sub>2</sub> of 100% during ES in mechanically ventilated patients.

**Methods:** A randomized trial in 17 patients (55.7±23.9 years) underwent 2 sessions of ES (break of 6 hours) with prior hyperoxygenation by two values of FiO<sub>2</sub>: 50% above the baseline and 100%. The heart rate (HR), mean arterial pressure (MAP), oxygen saturation (SpO<sub>2</sub>) and breath rate (BR) were recorded at baseline, 5 minutes after adjusting the FiO<sub>2</sub>, likewise 1 and 5 minutes after the end of procedures.

**Results:** SpO<sub>2</sub> within the groups increased in all phases of the two protocols, compared to baseline. There was an increase in HR at 1 min after ES in protocol with raising the FiO<sub>2</sub> to 50%, compared to PRE time and baseline, as well as the BR in procedure with FiO<sub>2</sub> of 100%. Already MAP increased only at 1<sup>st</sup> min compared to baseline in the protocol with increase FiO<sub>2</sub> to 50%. In the intergroup analysis, SpO<sub>2</sub> and BR was higher in the procedure with FiO<sub>2</sub> of 100% at 1 min after the ES, but without clinical relevance.

**Conclusion:** The use of a FiO<sub>2</sub> 50% above baseline before and after ES prevented hypoxemia and negative changes in vital signs of stable patients on mechanical ventilation.

#### P1278

##### Non-invasive ventilation (NIV) as an aid to exercise in patients admitted with acute exacerbation of chronic respiratory disease

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**Introduction:** Patients with acute exacerbations of chronic respiratory disease are often too breathless to exercise leading to muscle deconditioning. Using NIV to assist exercise during an exacerbation might prevent this but it is not known if this is acceptable to patients.

**Methods:** 10 in-patients with an acute exacerbation (including COPD, Bronchiectasis, CF) were recruited. If they were unable to cycle for 5 minutes at 20 watts unassisted they then cycled with NIV for up to 20 minutes. NIV settings were adjusted to patient comfort. Oxygen was titrated to maintain SpO<sub>2</sub> 88-92%. Patients were asked to rate their level of distress and willingness to repeat the intervention.

**Results:** Mean age was 52.8 (15.9). 56% male. 67% used NIV at night. All were naïve to NIV during exercise. NIV increased cycle time by 90 seconds (47.8%). All stated they would repeat this type of exercise and most (90%) reported it easier to exercise with NIV.

Table 1. Times cycled and change in parameters with exercise

	Without NIV	With NIV	Difference (95% CI)	p value*
Time cycled (mins)	3.18 (1.35)	4.7 (1.30)	1.52 (0.32 to 2.72)	0.02
Resting SpO <sub>2</sub>	94 (3.89)	96 (2.26)	2 (-4.36 to 0.63)	0.12
Resting HR	102 (14.87)	100 (16.19)	2.50 (-4.42 to 9.42)	0.44
Change in SpO <sub>2</sub>	-3.4 (4.72)	1.90 (3.35)	5.30 (0.89 to 9.71)	0.02
Change in HR	9.1 (7.99)	12.60 (7.35)	3.50 (-4.22 to 11.22)	0.33
End Borg dyspnoea	4.67 (1.86)	3.92 (0.67)	-0.75 (-2.79 to 1.29)	0.39
End Borg RPE	12.50 (2.88)	11.00 (3.16)	-1.50 (-4.05 to 1.05)	0.19

All data presented as mean (SD). \*Paired t-test

**Conclusion:** NIV is well tolerated, feasible and significantly increases exercise capacity in patients hospitalised with an acute exacerbation.

#### P1279

##### Is there a need for training when using an oscillatory positive expiratory pressure device?

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**Introduction:** Oscillatory positive expiratory pressure with Acapella<sup>®</sup> is routinely used to remove secretions. The system uses a counterweighted plug and a magnet to generate pressure and airflow oscillations. To be efficient, this pressure must be higher than 10 cm H<sub>2</sub>O. There is no recommendation about the instructions for the patient and the interface (mouthpiece or facemask) to use with the system. The aim of this study was to measure the pressure generated by subjects after basic instructions.

**Material and method:** Eight healthy subjects (28.7 yrs. ± 8.0) were recruited. They were instructed to breathe through Acapella<sup>®</sup> with two interfaces (mouthpiece and facemask) and with different resistance settings in a randomized crossover design. Continuous recordings of airway pressure and airflow were performed. Sequence was composed by 5 breathes at each resistance setting. Success rate was defined as an expiratory pressure higher than 10cm H<sub>2</sub>O.

**Results:** Depending on interface, significant differences (mouthpiece vs facemask) were measured for Pe max (11.23cm H<sub>2</sub>O±3.6 vs. 10.3cm H<sub>2</sub>O±2.52; p=0.001), Pe mean (6.67cm H<sub>2</sub>O±1.58 vs. 6.2cm H<sub>2</sub>O±1.43; p=0.001), inspiratory (3.04s±0.94 vs. 3.47s±1.11; p=0.001) and expiratory time (5.94s±2.05 vs. 6.23s±2.01; p=0.01). Time spent with Pe ≥ 10cm H<sub>2</sub>O (1.24s±1.33 vs.

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1.19s±1.48; p=0.69) was similar between interface. Success rate was low (59%). Neither difference in success rate (p=0.896) nor resistance (p=0.563) was observed depending on interface. Time with a pressure higher than 10cm H<sub>2</sub>O was only 20% of total expiratory time.

**Conclusion:** Without specific training, efficient expiratory pressure (higher than 10cm H<sub>2</sub>O) was obtained in less than 60% of breathing.

#### P1280

**Validation of a time-frequency wheeze detector in cystic fibrosis: A pilot study**  
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**Background:** Computerised lung-sound analysis can be used to identify and quantify wheezes which are associated with pulmonary diseases. However, this type of analysis requires further validation before it can be implemented routinely in the clinical practice across different respiratory pathologies.

**Objective:** This pilot study aimed to validate a time-frequency wheeze detector (TF-WD) in the cystic fibrosis disease.

**Methods:** Recordings were made in a clinical setting from a stable cystic fibrosis adult outpatient with a digital stethoscope following the CORSA guidelines. Several TF-WD algorithms were tested and the best performance was obtained with the Taplidou et al. (2007) algorithm, which was validated in four sound files. The number, duration and type of wheezes were blindly analysed independently by three experienced respiratory physiotherapists. Their evaluation was then compared with the automatic method. The statistics accuracy of the wheezes detection was quantified through sensitivity, specificity and performance measures using MatlabR2007b. True positives/negatives and false positives/negatives were counted by comparing each point of the sound file.

**Results:** Inter-rater agreement between the physiotherapists was 96.9%. The sensitivity, specificity and performance of the automated method were 77.2%, 98.4% and 87.1%, respectively.

**Conclusion:** The automated method tested shows sufficient reliability to continue the study and implement a future clinical validation with a larger sample. Wheezes detection through computerised analysis can provide an objective measure to assess and monitor cystic fibrosis patients, however further research is needed to validate the most robust algorithm.

#### P1281

**Randomized clinical trial: Effects of controlled breathing exercises on respiratory muscle in the elderly**

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**Introduction:** Respiratory muscle (RM) strength decreases with aging, and in most cases this decrease is associated with functional impairment and disabilities, particularly in the frail elderly. RM training has been shown to be an effective method to improve RM strength. The purpose of this study was to assess the effect of controlled breathing exercises on RM strength among elderly people with disabilities who are unable to engage in general exercise reconditioning. The hypothesis is that controlled breathing exercises will improve RM strength vs. a control group.

**Methods:** Forty-eight elderly were randomly assigned to a control group (n=24) or training group (n=24). A supervised training protocol, consisting of controlled Pranayama breathing exercises, was performed 5 times per week for 6 weeks. Maximum inspiratory pressure (MIP) and maximum expiratory pressure (MEP) were assessed at 4 time points: pre-test, intermediate, post-test and follow-up.

**Results:** The anthropometrics, pulmonary function and RM function data of participants did not show significant differences between groups. ANOVAs revealed significant differences in MIP and MEP between the two groups after the training protocol. For MIP the treatment was effective (F3,138=9,122, p<0.001,  $\eta^2=0.165$ ). Also for MEP is statistically significant (F3,138=9,102, p<0.001,  $\eta^2=0.165$ ).

**Conclusions:** This is the first controlled study in elderly people that reports a significant gain in RM strength due to the Pranayama training program.

#### P1282

**Laryngeal movements during mechanical insufflation-exsufflation**

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**Introduction:** Mechanical insufflation-exsufflation (MI-E) is the most effective approach to increase peak cough flow in patients with neuromuscular diseases, thereby potentially augmenting airway clearance. Co-ordinated movements of the glottis are probably crucial for effect, but laryngeal response patterns to MI-E have not been studied.

**Aims:** Visualize laryngeal response patterns to MI-E in healthy subjects.

**Methods:** Ten healthy volunteers (21-26 years) were examined with video recorded flexibel transnasal fiberoptic laryngoscopy during MI-E (Cough Assist<sup>®</sup>, Respironics, USA) according to a standardized protocol at pressures of ±20 to 50 cmH<sub>2</sub>O. Participants were instructed to inhale during insufflation and to cough or actively exhale during exsufflation. Laryngeal patency and movements during MI-E was assessed from video recordings according to a pre-set scheme.

**Results:** In all subjects and regardless of the applied pressure and instructions, the vocal cords abducted during insufflation and exsufflation. Coordinated glottic closure and opening on instruction to cough was found in 10/10. At exsufflation pressures of -40 to -50 cmH<sub>2</sub>O, hypopharyngeal obstruction was observed in 6/10. Cough presented as sequential glottic closures in the majority. Retroflex movement of the epiglottis, partially occluding the laryngeal entrance, was observed in three subjects during insufflation, irrespective of pressures.

**Conclusion:** The laryngeal response patterns to MI-E in healthy subjects was as described for spontaneous cough. Negative pressures may cause temporary hypopharyngeal obstruction, and retroflex movement of the epiglottis may obstruct airflow. The examination was well tolerated and may be considered for use in patients.

#### P1283

**Alteration in heart rate variability in response to respiratory pressure loads and pursed lips breathing in healthy subjects**

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**Objective:** To study the acute effects of low and moderate inspiratory pressure loads and pursed lips breathing maneuver on heart rate variability in healthy young subjects.

**Methods:** Twenty nine subjects (15 male, mean age: 22.7±0.8 years, IMC: 23.4±0.3 kg/cm<sup>2</sup>) with normal lung function assessed by spirometry and maximal inspiratory pressure were randomized in three groups and performed the pursed lips breathing (PLB) or breathing against inspiratory pressure loads corresponding to 20% of maximal inspiratory pressure (IL20%) or 50% of maximal inspiratory pressure (IL50%). Heart rate variability (HRV) was assessed in a sited position for a period of 5 minutes before and during intervention.

**Results:** During PLB we found a significant increases in LF (m/s<sup>2</sup>) (773±176.3 vs. 4360±1236, p<0.022) and total power (m/s<sup>2</sup>) (2302±391.2 vs. 7375±1149, p<0.001). Subjects in the IL20% group had an increase in mean heart rate (78±2.0 vs. 89.2±1.8, p<0.001) and a decrease in total power (m/s<sup>2</sup>) (5552±1425 vs 2617±594.8 p<0.021). During breathing at IL50% subjects had an increase in LF (m/s<sup>2</sup>) (1048±252.2 vs. 4586±1327 p<0.026), LF/HF index (2.43±0.55 vs. 6.80±1.80 p<0.009), mean heart rate (78.4±3.3 vs. 87.5±4.4, bpm, p<0.009) and total power (m/s<sup>2</sup>) (2504±730 vs. 6976±1678, p<0.036).

**Conclusion:** In healthy young subjects pursed lips breathing tends to increase LF values without changes in sympathovagal balance. Breathing at high inspiratory pressure load (IL50%) induces increase and predominance of sympathetic drive and may be seen as a precaution when used in patients with arrhythmias or ectopy. Financial Support: CNPq

#### P1284

**Use of breath stacking technique as a strategy for redistribution of regional chest wall volume in obese women**

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The effects of obesity on pulmonary function can affect the chest expansion and induce restrictive mechanisms. Maneuvers of respiratory expansion improve the lung ventilation.

**Aims:** To analyze the effects of breath stacking (BS) on compartmental analysis of breathing in obese females.

**Methods:** Clinical blind, randomized controlled trial involving 32 obese women (BMI ≥ 40kg/m<sup>2</sup>) separated into two groups: control (CG) n=16, mean age 41.94±9.38 and intervention (GBS) n= 16, mean age 40.38±10.16. Optoelectronic Plethysmography (OEP) was performed to assess total and regional tidal volume during a breath stacking. For statistical analysis used paired t tests and unpaired.

**Results:** GBS showed an increase in contribution in the rib cage pulmonar (p =

0.037) and decrease in abdomen ( $p = 0.024$ ). Variable of pulmonary ventilation minute ventilation had decrease ( $p = 0.036$ ) in GBS.

**Conclusions:** BS changed the distribution of ventilation, resulting in greater contribution to lung volume in the lower chest wall corresponding to activity of the diaphragm.

**P1285**

WITHDRAWN

**P1286**

**Respiratory muscle strength in individuals with obesity before and after gastric bypass surgery: A 3 year follow-up study**

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**Relevance:** Literature linking body weight loss and maximum respiratory pressures is not consensual.

**Purpose:** To evaluate the maximum inspiratory pressure (MIP) and the maximum expiratory pressure (MEP) in patients with obesity, before and after gastric bypass surgery, and to compare them to a control group.

**Methods:** 30 participants with obesity (24F/6M) aged 32±9 yrs and with body mass index (BMI) of 43±4 kg/m<sup>2</sup>, were evaluated before and one, six and around 36 months after surgery. 30 participants matched by age (31±8 yrs) and sex with normal lung function and BMI of 22±2 kg/m<sup>2</sup> were assessed. An analogic manovacuometer was used to measure MIP and MEP. Student's t-test and ANOVA for repeated measures were used for statistical analysis ( $p < 0.05$ ). This study was approved by the Ethics Committee.

**Results:** Table 1 summarizes the results.

Table 1. MIP and MEP in patients with obesity before and after surgery and a control group

	Control Group	Preoperative (n=27)	1 month after (n=28)	6 months after (n=26)	36 months after (n=17)
MIP (cmH <sub>2</sub> O)	106±47	97±35	100±38	104±33	121±35*
MEP (cmH <sub>2</sub> O)	109±32	108±37	98±30 <sup>†</sup>	100±30	119±38 <sup>†</sup>

\*Significant compared with preoperative, one month and six months (for MIP); <sup>†</sup>significant compared with preoperative and <sup>‡</sup>significant compared with one month and six months (for MEP).

There were no significant differences at baseline between the two groups. MIP increased significantly approximately 36 months after surgery. MEP decreased after one month and increased significantly after 36 months compared with one and six months after surgery.

**Conclusion:** The results demonstrate a positive influence of gastric bypass surgery on respiratory muscle strength.

**Abstract P1285 - Table 1**

PAH etiologies	T0		T1		T2	
	FA/SA	PIMAX/PEMAX	FA/SA	PIMAX/PEMAX	FA/SA	PIMAX/PEMAX
Chronic thrombotic embolic disease (n=7)	28±36/53±31	65±31/96±36	21±36/61±30	58±32*/87±38	35±47/62±33	68±30/96±42
Idiopathic (n=7)	7±12*/57±22*	54±24/91±14	42±16/82±24	46±21*/84±14	46±50*/71±16*	51±18/91±26
Other etiologies (n=8) associated with CTD, left cardiac illness, or sarcoidosis	28±36/60±36	56±23*/74±39	40±44/71±32	67±22*/86±39	27±45/74±32	70±23*/99±43*

FA, functional aspects; SA, social aspects; PIMax, maximal inspiratory pressure; PEMax, maximal expiratory pressure. \* $p < 0.05$ .

**P1287**

**Effect of hyperoxygenation on measurement of the maximum inspiratory pressure (MIP) in critical patients**

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The assessment of the maximum inspiratory pressure (MIP) is used as an indicator of inspiratory muscle strength and may be useful in evaluating the success of weaning from mechanical ventilation. During this procedure it is common that a fall of saturation peripheral O<sub>2</sub> (SpO<sub>2</sub>) occurs, leading to discontinuation of the maneuver, which can underestimate the value of MIP.

The objective of this study is to verify whether the implementation of hyperoxygenation prior to the assessment can mitigate this decline of SpO<sub>2</sub>, increasing the measurement support time (t<sub>0</sub>) and generating a more reliable MIP.

The evaluation of the MIP, occlusion time (OT), SpO<sub>2</sub>, respiratory rate (RR) and heart rate (HR) was carried out randomly on 26 patients, with or without hyperoxygenation prior, maintaining the duration of occlusion of unidirectional valve for an indefinite period. Hyperoxygenation was defined as the use of inspired oxygen fraction (FiO<sub>2</sub>) to 100%, two minutes before the maneuver. The measurement was performed with the patient in the supine position and elevated head with an angle of 60°.

The value of MIP and OT were higher with previous hyperoxygenation (53.77±22.37 cmH<sub>2</sub>O vs 43.38±20.11 cmH<sub>2</sub>O/ $p < 0.001$ ; and 58.69±26.09 sec vs 37.04±15.07 sec/ $p < 0.001$ ; respectively). In addition, there was a smaller drop in SpO<sub>2</sub> after the measurement when the method was performed with hyperoxygenation (93.15±7.24% vs 84.58±9.73%/ $p < 0.001$ ). There was increase in RR and HR independently of the hyperoxygenation.

Implementation of hyperoxygenation prior to the assessment of MIP increase the values obtained, generating a more reliable MIP.

**P1288**

**Effects of expiratory positive airway pressure on the electromyographic activity of accessory inspiratory muscles in chronic obstructive pulmonary disease patients**

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**Background:** Chronic obstructive pulmonary disease (COPD) affect the action of the diaphragm, placing the muscle at a mechanical disadvantage and requiring the recruitment of accessory muscles of inspiration.

**Objective:** To evaluate the electromyographic activity (EA) of sternocleidomastoid (SCM) and of scalene muscles during and after the use of EPAP (expiratory positive airway pressure) in COPD patients.

**Methods:** A clinical single-blind trial involving 13 (57.1±7.1 years; 7M,6F) subjects with normal spirometry (controls) and 12 (57.2±8.3 years; 4M,8F) COPD patients (FEV<sub>1</sub> 44.0±20.0%predicted; FEV<sub>1</sub>/CFV 66.8±17.4). At baseline, we determined EA during spontaneous respiration, lung function parameters, and respiratory muscle strength. Subsequently, 15 cmH<sub>2</sub>O EPAP was applied by face mask for 25 min, during which the EA of the SCM and scalene muscles was recorded every 5 min. A final record was obtained 10 min after the mask removal.

**Results:** We found that the behavior of the EA of SCM and scalene muscles was comparable between the controls and COPD patients ( $p = 0.716$  and  $p = 0.789$ , respectively). However, during the use of EPAP, both muscles showed a trend toward an increase in the EA. In addition, there was a significant decrease in the EA of the SCM between the baseline and final measurements ( $p = 0.034$ ).

**Conclusions:** EPAP promotes a transient increase in EA and scalene muscle SCM, suggesting that use of this modality pressure increases the activity of these muscles. However, after removal of the EA muscle SCM reduces the levels below that obtained at baseline.

**P1289**

**Effects of preoperative inspiratory muscle training (IMT) in obese women undergoing open bariatric surgery: Diaphragmatic excursion**

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**Introduction:** Patients undergoing open bariatric surgery (OBS) have an impaired

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Abstract P1289 – Table 1. Diaphragmatic excursion

Variables	IMT			Control		
	Preop	After Intervention	Postop	Preop	After Intervention	Postop
Area hemidiaphragm R (cm <sup>2</sup> )	51.46±19.62	49.82±20.89	28.74±13.33 <sup>§</sup>	47.51±15.42	48.16±17.77	24.48±12.37 <sup>§</sup>
Area hemidiaphragm L (cm <sup>2</sup> )	49.66±21.14	47.31±19.45	28.28±13.32 <sup>§</sup>	47.38±14.89	50.43±16.21	24.10±12.66 <sup>§</sup>

lung function in the postoperative period. Aiming to attenuate these negative effects, the preoperative IMT may be an alternative.

**Objective:** To determine whether preoperative IMT is able to attenuate the impact of surgical trauma on the diaphragmatic excursion in obese women undergoing OBS.

**Methods:** Thirty-two obese women (35.44±8.75 years and 41.78±3.84 kg/m<sup>2</sup>), undergoing elective OBS were randomly assigned to receive preoperative IMT (IMT group) (n=15) or usual care (Control group - CG) (n=17) 2-4 weeks before the surgery. The diaphragmatic excursion was evaluated using the digitalized image of the radiograph. The area was calculated of the right and the left dome of the diaphragm. The patients were assessed before and after training, and 1 day after surgery.

**Results:** The diaphragmatic excursion of the right and the left dome were not altered by training. In the first postoperative day, there was a significant decrease in both groups. However, the values of diaphragmatic excursion were higher in the IMT group, even though they were not statistically significant.

**Conclusion:** The preoperative IMT appears to attenuate the negative postoperative effects of open bariatric surgery in diaphragmatic excursion.

### P1290

#### Effects of preoperative inspiratory muscle training (IMT) in obese women undergoing open bariatric surgery: Respiratory muscle strength

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**Introduction:** Patients undergoing open bariatric surgery have an impaired lung function in the postoperative period. Aiming to attenuate these negative effects, the preoperative IMT may be an alternative.

**Objective:** To determine whether preoperative IMT is able to attenuate the impact of surgical trauma on the respiratory muscle strength in obese women undergoing open bariatric surgery.

**Methods:** This study is a randomized controlled trial. Thirty-two obese women (35.44±8.75 years and 41.78±3.84 kg/m<sup>2</sup>), undergoing elective open bariatric surgery were randomly assigned to receive preoperative inspiratory muscle training (IMT group) (n=15) or usual care (UC group) (n=17) 2-4 weeks before the surgery. The respiratory muscle strength was carried out by using measurement the Maximal Inspiratory and Expiratory Pressures – MIP and MEP. The patients were assessed before training, before surgery and 1 day after surgery.

**Results:** After training, there was an increase in the MIP only in the IMT group (IMT= 93.33±23.80 to 120±20.35 vs UC= 92.94±18.63 to 91.76±20.38 cmH<sub>2</sub>O - p<0.05). The MEP was not altered by training. In the first postoperative day, there was a significant decrease in MIP in both the groups. However, the MIP was higher in the IMT group (IMT = 63.34±21.60 vs UC= 48.82±19.32 cmH<sub>2</sub>O - p<0.05). The MEP was similar between the groups (IMT = 49.66±22.71 vs UC = 49.70±22.39 cmH<sub>2</sub>O).

**Conclusion:** The preoperative IMT increased the inspiratory muscle strength (MIP) and attenuated the negative postoperative effects of open bariatric surgery in obese women for this variable, though not influencing the MEP.

### P1291

#### Inspiratory muscle strength and endurance in patients with COPD:

**A propose outcome with manovacuometry and PowerBreathe®**  
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**Background:** Reduced respiratory muscle force and endurance are commonly observed in patients with COPD and contributes to dyspnea, oxygen desaturation and reduced exercise capacity, hence respiratory muscle assessment is clinically relevant.

**Aim:** To propose an assessment method of respiratory muscle endurance in patients with COPD and to verify its relationship with maximal inspiratory pressure (MIP) and maximal voluntary ventilation (MVV).

**Method:** 18 patients (GOLD 1-4; 63±9years) performed the MIP and an incremental and constant respiratory muscle endurance test using the PowerBreathe® device. The incremental test started with 10cmH<sub>2</sub>O, increasing 10cmH<sub>2</sub>O each 2min, with 1min of rest between them, which determined the maximal pressure sustained (MPS). The endurance test was 80% of the MPS. The limit time (tlim) was determined. Comparisons and correlations were determined using Paired t-test and Pearson correlation.

**Results:** The MIP was 52±20cmH<sub>2</sub>O, MVV (%pred) 44±15, MPS 48±23cmH<sub>2</sub>O, tlim 10±8 min and 80%MPS 35±21cmH<sub>2</sub>O. The MIP and MPS were not different. Correlation was found between MIP and MPS (r=0.5; p=0.03) and MIP and MVV (r=0.6; p=0.03).

**Conclusion:** The MPS and MIP were similar in the endurance test and showed a relationship with MVV; with suggest to be a reasonable test to assess the respiratory performance in these patients.

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### P1292

#### Respiratory muscle function during and after a severe exacerbation of COPD – Preliminary results

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**Background:** It is known that peripheral muscle function (especially the quadriceps muscle function) is markedly reduced during the course of a severe exacerbation of chronic obstructive pulmonary disease (COPD). However, the function of the respiratory muscles has not been studied in depth in the same context.

**Objectives:** To investigate the respiratory muscle function during and after a severe exacerbation of COPD requiring hospitalization.

**Methods:** Twelve patients with COPD (7 male, 68±14 years, forced expiratory volume in the first second [FEV<sub>1</sub>] 37±22%pred) hospitalized due to an acute exacerbation of COPD were studied. Inspiratory and expiratory muscle strength (P<sub>imax</sub> and P<sub>emax</sub>, respectively) were assessed at day 1 and day 3 of hospitalization and at hospital discharge, as well as at 1 month after discharge (1MD). Lung function was assessed at day 1, at discharge and at 1MD.

**Results:** P<sub>imax</sub> was significantly reduced at day 1, day 3 and at discharge in comparison to 1MD (p<0.05 for all), although it tended to improve overtime during the hospitalization period. P<sub>emax</sub> improved significantly overtime during the hospitalization period, while lung function was not significantly altered. Delta P<sub>imax</sub>%pred (1MD minus day 1) correlated significantly with age (r=-0.72), while delta P<sub>emax</sub>%pred (discharge minus day 1) correlated significantly with PaCO<sub>2</sub> assessed at day 1 (r=0.75).

**Conclusions:** These preliminary data suggest that the respiratory muscle function is markedly reduced at the onset of a severe exacerbation of COPD. However, unlike the quadriceps muscle, respiratory muscles markedly improve their function during the hospitalization period and during the following month.

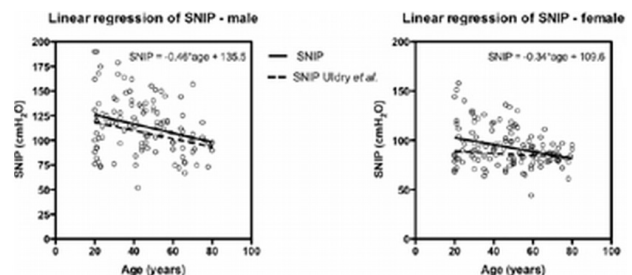
### P1293

#### Maximal sniff nasal inspiratory pressure in Brazilian healthy subjects: A multicentre study

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**Objective:** To propose reference values of SNIP for Brazilian population.

**Methods:** This study was conducted in three centers in Brazil, Natal-RN, Recife-PE and Piracicaba-SP. Subject were evaluated in relation to anthropometrics parameters, physical activity profile and maximal sniff nasal inspiratory pressure follow recommendations of ATS/ERS Statement on Respiratory Muscle Testing. SNIP



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was measured from FRC in the sitting positions using a catheter through a plug occluding one nostril during 10 maximal sniffs through the contra-lateral nostril. For each test the largest pressure measured in cmH<sub>2</sub>O was taken into account. Correlation and multiple linear regressions were used to predicted male and female SNIP equations. Results were compared with previous published studies.

**Results:** We studied 244 subjects (114 male and 130 female) distributed in different age grouped 20-80 years old. We found a significantly negative correlation between SNIP and age for male and female ( $p < 0.05$ ). In a multiple regression analysis age continued to have an independent predictive role with SNIP. The predicted equations found for male and females were respectively  $SNIP = -0.46 * age + 135.5$ , and  $SNIP = -0.34 * age + 109.6$ .

**Conclusions:** The results of this study provide reference equations of SNIP for health Brazilian population from 20 to 80 years old.

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