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| **Model-based non-invasive assessment of respiratory muscle strength.** |
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| **Introduction/Aim:**  Maximal inspiratory and expiratory pressures are current clinical indicators of muscular strength, but highly technique dependent. It is hypothesized muscular work of breathing (WOB) trends will show a strength dependent response to a challenge (e.g. load, resistance, or PEEP). This study aims to develop a simple method of assessing muscular WOB, which could then be analysed in relation to strength in clinical testing.  **Method:**  Pressure and flow sensors record respiratory data as a person breathes normally through a tube with a shuttered occlusion every 0.02s for 0.20s during expiration. Passive lung mechanics are identified based on the interrupter technique. Muscular and overall WOB is calculated using a clinically validated single compartment lung model and second-order b-splines. A mechanical test lung with set compliances of 0.03 and 0.05 L-1cmH2O, a 5cmH2O parabolic resistor (2.70 cmH2O at 1 L-1s), and tidal volumes of 0.5, 1.0, 1.5, and 2.0 L (10 hand actuated breaths at each combination) is used for validation with identified mechanics compared to set values.  **Results:**  Median identified compliances were 0.0348 and 0.0521 L-1 cmH2O, for 0.03 and 0.05 L-1cmH2O settings, with differences likely caused by manual spring-setting error and non-linearity in spring elastance with extension/tidal volume. Identified resistances ranged from 1.6-3.4 cmH2OL-1s, which are within expected ranges for the expiratory flow range (0.0-2.9 L-1s). Absolute model-identified muscular WOB increased with increased tidal volume and elastance (Figure 1).  A graph with a diagram  Description automatically generated with medium confidence  **Figure 1**: Distribution of muscular WOB, generated by hand-actuation (lifting bellows) on the mechanical lung.  **Conclusion:**  Mechanical test lung results provide proof-of-concept validation for a normal breathing test method to assess muscular breathing effort and WOB. Future clinical testing of known cases of respiratory muscle weakening against a control group would characterise relationships between muscular strength and recruitment and further validate potential clinical monitoring utility.  **Key Words:** Work of Breathing, Muscular Strength, Mechanics, Remote Monitoring  **Grant Support:** Te Tītoki Mataora MedTech Research Translator Research Acceleration Programme Stage 1 Project. |