TITLE (SHORT, 200 CHARACTERS MAX.):

ESTIMATION OF TRANSPULMONARY PRESSURES AND THE ASSOCIATION WITH WEANING FROM MECHANICAL VENTILATION

MAIN HYPOTHESES TESTED (2 MAX)

There are three components to this sub-study proposal;-

First, Is there a higher incidence of early spontaneous breathing in the early de-sedation group of STEP-CARE?

Secondly, is there a higher incidence of high estimated transpulmonary pressures in the early desedation group compared to other groups in STEPCARE? We assume in the early desedation group there will be a high prevalence of both pneumonia and aspiration pneumonitis which may lead to higher transpulmonary pressures and the potential for P-SILI.

Finally, Is there an association between estimated transpulmonary pressures and the duration of mechanical ventilation and the incidence of VAP/ALI in all STEPCARE patients post-OOHCA (1).

The second two questions in the substudy rely on the estimation of transpulmonary pressures in spontaneously breathing patients, as described by Bertoni *et. Al.* in 2019 (1).

Background

Patient self-induced lung injury (P-SILI) is a concept whereby a patient's respiratory drive results in intense respiratory effort and worsens pre-existing lung damage. P-SILI is thought to have a number of causative pathophysiological mechanisms. One of these proposed mechanisms is excessive transpulmonary pressure resulting in the over-distension of individual lung units (2).

In 2019 Bertoni described a novel, non-invasive technique of estimating transpulmonary pressures by performing an expiratory occlusion test (see below). This technique involved performing an expiratory airway occlusion and using the corresponding negative inflexion to calculate transpulmonary pressure (ΔP_L).

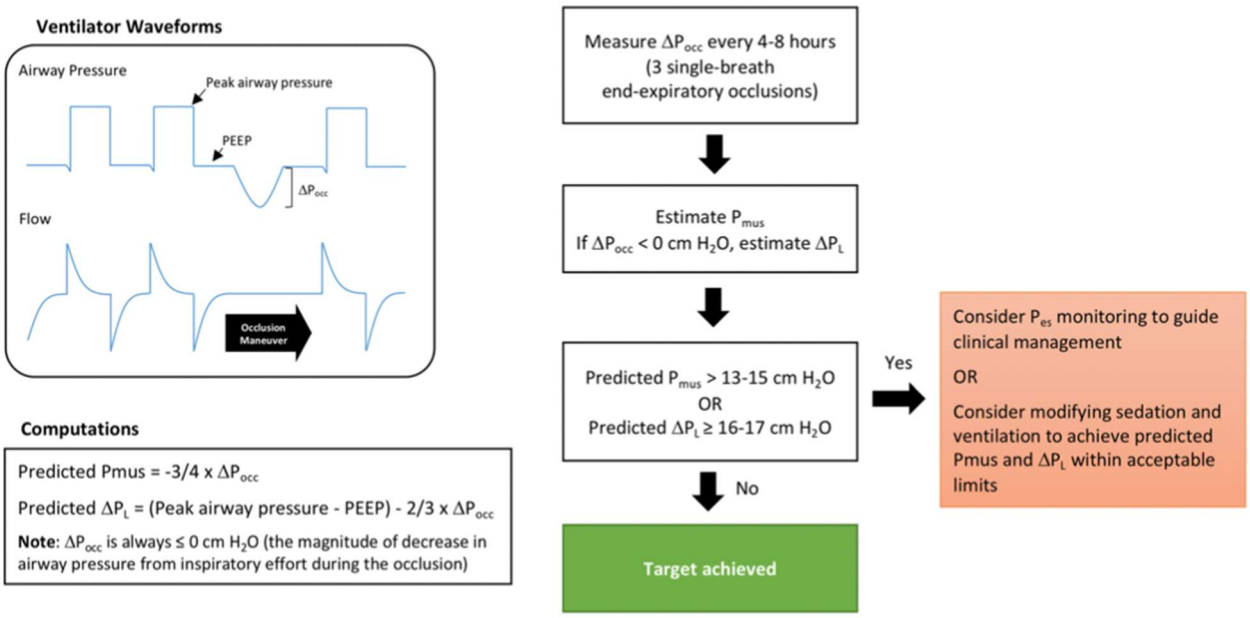

Fig. 4 Proposed clinical algorithm for monitoring respiratory muscle pressure (P_{mus}) and dynamic transpulmonary pressure swings (ΔP_L) based on the negative deflection in airway pressure during an end-expiratory airway occlusion maneuver (ΔP_{occ}). P_{es}, esophageal pressure

We propose that ΔP_L is measured every 8 hours in patients who are breathing spontaneously without any intermittent mandatory ventilatory support in all subgroups of STEPCARE patients who are weaning from mechanical ventilation post-OOHCA.

As calculated by the above equation, the predicted ΔP_L is recorded and analysed to see if there is any correlation between the length of mechanical ventilation, the incidence of VAP/HAP and weaning failure.

SINGLE CENTER [ ], MULTICENTER [X]

Multicenter observational

PICO

Patients – Patients weaning from mechanical ventilation post-OOHCA

Information - ΔP_L (as calculated by the equation ΔP_L = (peak airway pressure – PEEP) – 2/3 x ΔP_{occ}), the ventilatory settings during ΔP_L calculation, length of mechanical ventilation, the incidence of VAP and rate of reintubation.

Consent - observational only

Outcome – Does the measurement of ΔP_L have any associations with weaning failure in OOHCA patients?

DATA NEEDED FOR THE ANALYSIS (SPECIFY VARIABLES AND MOTIVATE ANY PROPOSED ADDITIONS TO THE ECRF)

As above

LOGISTICS – HOW WILL ADDITIONAL DATA BE GATHERED?

Most data will be collected as part of the STEPCARE CRF. Additional information will be needed from participating sites on the measurement of ΔP_L during the weaning phase of mechanical ventilation.

Please send this form as a pdf to ttm2@ttm2trial.org

BRIEF STATISTICAL ANALYSIS PLAN AND SAMPLE SIZE ESTIMATE

We plan to do a simple logistical regression analysis based on the above data.

FUNDING (IF APPLICABLE)

none

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CO-WORKERS:

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References:-

1) M. Bertoni *et. Al.* A novel non-invasive method to detect excessively high respiratory effort and dynamic transpulmonary driving pressure during mechanical ventilation Critical Care 2019 **23**, Article number: 346 (2019)
2) G. Carteaux *et. Al.* Patient-Self Inflicted Lung Injury: A Practical Review J Clin Med. 2021 Jun; 10(12): 2738.Published online 2021 Jun 21. PMCID: PMC8234933 PMID: 34205783