TITLE (SHORT, 200 CHARACTERS MAX.):

DERIVED INDICES OF MECHANICAL VENTILATION POST-CARDIAC ARREST

MAIN HYPOTHESES TESTED (2 MAX)

Is there an association between driving pressure (DP), mechanical power of ventilation (MP) or the composite model (CM), defined by the equation (RR + 4DP), and outcome in cardiac arrest patients? Does increasing DP, MP and CM display a temporal or cumulative relationship with outcome?

The above-derived indices of mechanical ventilation have been demonstrated to be independently associated with outcomes in ARDS patients. The relationship between these newer derived indices of mechanical ventilation and outcome in the cardiac arrest cohort of patients was studied by D. Grieco *et al* from the previous TTM trial database. This *post hoc* analysis demonstrated that RR, driving pressure and MP were independently associated with mortality, additionally DP, and RR were associated with poor neurological outcomes. Finally, the CM was associated with both mortality and poor neurological outcome. D. Grieco *et al* assessed associations between mechanical ventilation variables from the first 72 hrs and outcome data. We propose that as the average time to wake up for survivors in TTM was day 5, data is collected for the first 120 hours on mechanical ventilation variables from the STEP-CARE study

There are two parts to this sub-study:

Firstly, is there a crude association between measured variables of mechanical ventilation and associated physiology (Respiratory rate, tidal volume, plateau pressure, peak pressure, mean pressure, PEEP, Fio2, P/F ratio, PaCO2 and pH) and newer derived indices of mechanical ventilation namely DP, MP and CM and outcome in cardiac arrest. The outcome data includes mortality, duration of mechanical ventilation, length of ICU stay and neurological outcome.

Secondly, based on a previous trial by Urner *et al* which demonstrated a temporal relationship between the derived indices of mechanical ventilation and outcome, in that cumulative exposure to high mechanical power or driving pressures was associated with the worst outcomes, we propose that the temporal relationship between these indices and outcomes is also investigated in cardiac arrest patients.

SINGLE CENTER [ ], MULTICENTER [X]

PICO

Patients:

A multi-centre sub-study of the STEP-CARE trial. All patients recruited into the STEP-CARE trials at participating sites will be eligible for inclusion into the substudy

I**ntervention/Exposure/Prognostic factor:**

Exposure to measured and derived indices of mechanical ventilation measured every 4 hours for the first 120 hours and outcome :

Measured mechanical ventilation indices:-

Respiratory rate, tidal volume, plateau pressure, peak pressure, mean pressure, PEEP, Fio2, P/F ratio, PaCO2 and pH

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1

Derived mechanical ventilation indices:-

Driving Pressure calculated by   DP= Pplat - PEEP

Mechanical Power calculated by   MP= 0.098 X RR X Vt X (DP/ 2)

Composite Model calculated by   CM = RR x 4DP

Outcome variables:-

Mortality (time of death from time to enrollment), duration of mechanical ventilation, length of ICU stay, the neurological outcome (measures by mRS).

Comparison:

This is a prospective observational trial to assess the association between ventilation variables and outcome. It will involve the entire cohort of the CARE-STUDY

Outcome:

Associations between mechanical ventilation variables in OOHCA and the outcome variables listed above.

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

Mechanical Ventilation Data - respiratory rate, peak pressure, plateau pressure, PEEP, Tidal Volume, Fio2, P/F ratio, pH and PaCO2

Outcome data - Mortality data, length of stay in ICU, duration of mechanical ventilation, time to extubation or decannulation, the neurological outcome at 6 months by modified rankin scale (mRS)

LOGISTICS – HOW WILL ADDITIONAL DATA BE GATHERED?

All mortality, and length of stay data will be collected as part of the STEP-CARE CRF.

BRIEF STATISTICAL ANALYSIS PLAN AND SAMPLE SIZE ESTIMATE

No formal sample size will be calculated as we will use all eligible patients in STEP-CARE.

Exclusion criteria will include:-

Ventilation with novel modes of ventilation where DP and MP cant be calculated such as; APRV, HFOV

We plan to perform statistical analysis with three arms; an initial univariate analysis, subsequent multivariate analysis and finally non-linear analysis. The non-linear analysis is designed to find inflexion points which may be clinically relevant (such as DP < 15 in ARDS or DP < 18 in acute cor pulmonale)

FUNDING (IF APPLICABLE)

None

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