The PREPARE II Trial – Do IVFs During RSI Prevent CV Collapse?

Key Article

Russell DW, et al. Effect of fluid bolus administration on cardiovascular collapse among critically ill patients undergoing tracheal intubation: A randomized clinical trial. JAMA. 2022. Published online June 16, 2022.

Background

- Approximately 2 million critically ill adults undergo intubation each year in the US.
- Hypotension can occur in up to 40% of intubations in the ICU.
- Hypotension results from medication-induced vasodilation and decreased venous return due to increased intrathoracic pressure from positive pressure ventilation.
- Current guidelines and expert recommendations suggest that critically ill adults undergoing intubation receive a fluid bolus.
- Up to 50% of emergency intubations receive a fluid bolus in current practice.
- A recent randomized trial found that a fluid bolus did not affect the risk of CV collapse overall, but suggested a benefit among patients who received BVM or NIV during intubation.

Objective

- Examine the effect of IVF bolus on CV collapse among critically ill adults undergoing intubation with positive pressure ventilation.

Methods

- Multicenter, parallel-group, unblinded, pragmatic RCT
- 11 ICUs across the US
- Patients
    - Included
        - Adults aged 18 years or older
        - Undergoing tracheal intubation
        - Were to receive medications to induce anesthesia
        - Positive pressure ventilation with either a BVM or NIV between induction and laryngoscopy
    - Excluded
        - Pregnant
        - Incarcerated
        - Had immediate need for intubation that precluded randomization
- Intervention
    - Patients randomized in a 1:1 ratio to receive an IVF bolus or not receive IVF bolus
    - Fluid Bolus Group
        - Operators instructed to infuse 500 ml of isotonic crystalloid of choice
        - Infuse as much as possible before induction, and then administer any of the remaining amount after induction and during the intubation.

    - No Fluid Bolus Group
        - Initiation of a new IVF bolus was not permitted except as treatment for hypotension or if the operator determined that IVFs were necessary
    - All other aspects of the intubation were left to the operator
        - Choice of induction agents
        - Use of vasopressors
- Primary Outcome
    - Cardiovascular collapse – 1 or more of the following
        - New or increased receipt of vasopressors between induction and 2 min after intubation
        - A SBP of less than 65 mm Hg between induction and 2 min after intubation
        - Cardiac arrest between induction and 1 hour after intubation
        - Death between induction and 1 hour after intubation
- Secondary Outcome
    - Death prior to day 28
- Sample Size Calculation
    - Determined that enrollment of 750 patients would provide 80% power to detect a between-group absolute difference of 8.75% (relative risk difference of 35%).
    - During an interim analysis the observed incidence of CV collapse was lower than expected. Thus, sample size was increased to 1065 patients.

Results

- In total, 1065 patients were included in the primary analysis
    - Fluid Bolus Group: 538 patients
    - No Fluid Bolus Group: 527 patients
- Patient characteristics well balanced between the groups
    - Median age: 62 years
    - 42% were women
    - Approximately 60% in both groups had sepsis or septic shock
    - Acute respiratory failure with hypoxia was the most common indication for intubation
- Receipt of IVF
    - Fluid Bolus Group
        - 99.4% of group received bolus
        - Majority of bolus was administered prior to induction
        - Medan volume of IVF was 500 ml
    - No Fluid Bolus Group
        - 1.1% of patients received bolus
- Intubation
    - Approach to preoxygenation, choice of induction agents, SBP and SpO2 at induction were not significantly different between groups.
    - Approximately 12% of patients in both groups had a vasopressor bolus or infusion administered between enrollment and induction.
    - Approximately 97.5% of patients in both groups received positive pressure ventilation between induction and laryngoscopy.
- Primary Outcome:
    - Cardiovascular collapse
        - Fluid Bolus Group: 21%

        - No Fluid Bolus Group: 18.2%
        - Did not differ significantly between groups in the sensitivity analysis
        - Did not decrease the incidence of CV collapse in any prespecified subgroup (based on APACHE II score, presence of sepsis or not, or receiving pressors or not)
- Secondary Outcome
    - Death at 28 days
        - Fluid Bolus Group: 40.5%
        - No Fluid Bolus Group: 42.3%
- Exploratory Analysis
    - Incidence of each component of the composite outcome did not significantly differ between groups

Limitations

- Unblinded
- Used a composite outcome
- Approximately 15% of patients screened were excluded due to urgency of the intubation – may not be generalizable to those with cardiac arrest, respiratory arrest, or other urgent needs for intubation.
- Would the results have been different if a volume > 500 ml was used?
- This trial evaluated fluid bolus prior to induction to prevent CV collapse. It did not evaluate a fluid bolus used to treat hypotension during intubation.

Take Home Points

- Among critically ill adult patients undergoing intubation in the ICU, the administration of a 500 ml fluid bolus did not decrease the incidence of CV collapse.