1519

SIMULATION FOR IDENTIFICATION OF KNOWLEDGE GAPS AMONG TRAINEES IN CRITICAL CARE SCENARIOS

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Learning Objectives: Simulation plays an important role in modern day medical training, particularly for rare and high-stakes events. Here, we employ simulation not only for education of internal medicine residents at a large academic hospital, but also to identify and measure knowledge gaps in both scenario-specific medical management and general crisis resource management.

Methods: Teams of two to four residents were presented with two different simulation scenarios. The scenarios were those that would typically trigger a rapid response team: unstable arrhythmia, and unstable anaphylaxis. Video release consent was obtained from participants, and the sessions were recorded. A total of twenty simulations were recorded, with ten from each scenario. 28 different trainees of various years in training participated during study sessions. A list of medical competencies was generated for each scenario, as well as a list of crisis management skills applicable to both scenarios. An MD observer from the anesthesiology department scored all twenty scenarios based on fulfillment of each competency.

Results: We observed certain areas in which medicine residents performed proficiently. In the unstable arrhythmia scenario, trainees demonstrated facility with identification of rhythms (90% of teams), administration of sedation (78%), and indications and implementation of cardioversion (89%). However, they were less proficient in the medical management of unstable bradycardia (only 70% using appropriate first-line agent). In the anaphylaxis scenario, trainees identified the need for epinephrine (100% of teams), but often selected inappropriate doses for a given route of epinephrine (with 33% of teams using inappropriate dose). In both scenarios, trainees showed hesitation to identify a team leader (22% of scenarios) and use cognitive aids (11% of scenarios). Crisis resource management skills tended to improve from the first scenario to the second scenario after feedback, demonstrating that repeated simulations coupled with targeted debriefing sessions can lead to improved acute care response. Areas of deficiency were presented to the leadership in the residency program and are being used to guide future educational efforts.

Conclusions: In this study, we demonstrate that simulation can be both an effective teaching modality as well as a tool to identify areas on which to focus future educational efforts.

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1520

END POINTS OF RESUSCITATION: INACCURATE ESTIMATES OF INTRAVASCULAR VOLUME IN SURGICAL SUBJECTS?

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Learning Objectives: The optimization of intravascular blood volume (BV) is associated with improved outcomes. We previously reported on improved survival when subjects were resuscitated to a BV target of 0 to 16% deviation from a predicted norm (Yu, M. et al, Shock 2011;35:220). BV can be measured using an FDA-approved, single radioisotope dilution technique (BVA-100, Daxor Corporation, NY, USA). In subjects requiring multiple blood transfusions over a short time interval, conventional indices of euvolemia (blood pressure, heart rate, urinary output) and/or endpoints of resuscitation (clearance of lactate, minimal/no vasopressor requirements, or adequate mixed venous oxygen saturation) may not be reflective of euvolemia when compared to BV measurements.

Methods: A retrospective chart review identified critically-ill surgical subjects from 2010 to 2014 who received ≥ 6 units of PRBC transfusions within a 48-hour time period, who also had a BV analysis after completion of resuscitation that was within 48-hours of the last transfusion. The BVA-100 Analyzer uses I-131-radiolabeled-albumin that is injected into the peripheral circulation with timed measurement of 5 serial blood samples obtained to measure plasma volume (PV). Simultaneous laboratory hematocrit measurement allows for the estimation of Red Blood Cell Volume (RBCV), where total BV = PV + RBCV. Definitions of hypovolemia, euvolemia and hypervolemia using the BVA-100 Analyzer was <0% deviation, 0-16% deviation, and > 16% deviation, respectively, from predicted norms.

Results: 98 patients constituted the study group. Demographics were: Age 58 ± 18 years; 69 males: 29 females; APACHE II 25 ± 6; average length of stay 37 ± 36 days; and disease processes that included septic shock (22.5%), severe sepsis (33.7%), hemorrhagic shock (16.3%), cardiogenic shock (10.2%) and cardiac disease (47%). After completion of resuscitation and transfusion, BV analysis showed that 24% of the subjects were hypovolemic, 30% were euvolemic and 46% were hypervolemic. Overall mortality was 22%.

Conclusions: Conventional clinical parameters of intravascular volume status and resuscitation completion may not accurately reflect intravascular volume, as determined by BV analysis, in subjects who receive multiple blood transfusions over a short time interval.

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