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Early recognition and treatment of non-traumatic shock in a community hospital

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Expanded Abstract

Citation

Sebat F, Johnson D, Musthafa AA, Watnik M, Moore S, Henry K, Saari M: A multidisciplinary community hospital program for early and rapid resuscitation of shock in nontrauma patients. Chest 2005, 127:1729-1743. [1]

Objective

To determine the effect of a community hospital-wide program enabling nurses and prehospital personnel to mobilize institutional resources for the treatment of patients with nontraumatic shock. The hypothesis was that a systems-based approach to early recognition and treatment of shock decreases hospital mortality.

Methods

Design and setting: Prospective historically-controlled single-center study in a 180-bed community hospital.

Subjects: Patients in shock who were candidates for aggressive therapy.

Interventions: From January 1998 to May 2000, patients in shock received standard therapy (control group). During the month of June 2000, intensive education of all healthcare providers (pre-hospital personnel, nurses and physicians) took place. From July 2000 through June 2001, patients in shock (protocol group) were managed with a hospital-wide shock program. The program used a systems-based team approach that consisted of five components: staff education to enhance early recognition and treatment of shock; empowerment of non-physician providers to mobilize hospital resources; rapid use of protocol-directed therapy; early involvement of intensivists; and prompt transfer of patients to the ICU. Goal-directed treatment protocols were utilized based on the "VIPPS" approach to shock, including: early support of ventilation and oxygenation; rapid infusion of volume; pharmacologic therapy, such as antibiotics and vasopressors; and disease specific interventions.

Outcomes: The primary endpoint was hospital mortality. Secondary endpoints were the identification of shock patients, times to interventions, length of stay, and discharge location.

Results

Eighty-six and 103 patients were in the control and protocol groups, respectively. Baseline characteristics were similar. The protocol group had significant reductions in the median times to interventions, as follows: intensivist arrival, 2:00 h to 50 min ($p<0.002$); ICU/operating room admission, 2 h 47 min to 1 h 30 min ($p<0.002$); 2 L fluid infused, 3 h 52 min to 1 h 45 min ($p<0.0001$); and pulmonary artery catheter placement, 3 h 50 min to 2 h 10 min ($p=0.02$). Good outcomes (ie, discharged to home or to a rehabilitation center) were more likely in the protocol group than in the control group ($p=0.02$). The hospital mortality rate was 40.7% in the control group and 28.2% in the protocol group ($p=0.035$).

Conclusion

Similar to current practice in patients who have experienced trauma or cardiac arrest, the empowerment of nonphysician providers to mobilize hospital resources for the care of patients with shock is effective. A community hospital program incorporating the education of providers, the activation of a coordinated team response, and early goal-directed therapy expedited appropriate treatment and was temporally associated with improved outcomes. Randomized multicenter trials are needed to further assess the impact of the shock program on outcomes.

Commentary

Shock is a syndrome, which is characterized by inadequate tissue perfusion. Shock can have a variety of underlying causes, including hypovolemia, sepsis, cardiac pump dysfunction, and anaphylaxis. Shock is a common cause of morbidity and mortality. Septic shock, for instance, is the 10th leading cause of death in the United States, and is associated an annual total costs of $16.7 billion [2]. Early recognition and treatment, believed to reduce subsequent multi-organ failure and death [3], is often hampered by inadequate knowledge, experience, and skills of care providers operating in a system that was not necessarily designed with speed in mind.

In the current study, Sebat and colleagues investigated whether a systems-based team approach to early recognition and treatment of shock reduced time to intervention and hospital mortality [1]. The implementation of the shock program at Redding Medical Center was a significant undertaking. For three years prior to its inception, a multidisciplinary design team developed the educational program, procedures for activation of shock alerts, and resuscitation protocols. Subsequently, over 500 health care providers completed a standardized teaching package that included a 1-hour slide presentation and subsequent interactive classes. Upon implementation, a dedicated ICU bed was kept available at all times for potential shock patients and one of a group of ten board-certified intensivists rotated on-call for the team at all times. The authors reported a significant mortality reduction and earlier time to intervention after implementation of the shock program.

While no one would argue that prompt recognition and treatment of shock is a laudable goal, there are a number of limitations of this study that should prompt readers to interpret the results with caution. The study was carried out in a single center and was controlled only with historical data. Confounding factors unrelated to the implementation of the shock program, including changes in case-mix, could have biased the study in favor of the intervention. Importantly, the unadjusted p-value (p=0.035) for the study's primary outcome, hospital mortality, was one-sided. The authors explain that a one-sided analytic approach was used because they had no reason to think that outcomes would actually be worse with the intervention. However, the literature is rife with interventions that on the surface seemed like "no brainers," which later proved to be harmful when objectively evaluated. Some of the interventional elements of the shock program, such as central venous or pulmonary artery catheterization, have the potential to cause harm. A two-sided analytic approach would have been more appropriate. Though not clear in the manuscript, a two-sided approach *was* used in the logistic regression analysis (Sebat, personal communication), which showed that after adjusting for baseline illness severity, mortality was significantly lower in the intervention group. To avoid confusion, it would have been better for the authors to have reported two-sided p-values throughout the manuscript.

Assuming that results of the study are robust, a more important concern is the tremendous effort and, likely, expense, that this intervention represented. The authors cite that nine patients would need to be treated to save one additional life and report an initial cost of $8000 per life saved (Sebat, personal communication), a relative bargain in the world of critical care. Whether other institutions, especially those without existing intensivist programs, would experience similar costs, remains to be seen. Since this was a *package* of education and care interventions, it is difficult to know if one particular element was key or whether other less crucial yet more costly elements could be omitted without sacrificing the overall benefit of the package.

Assuming that results of the study are robust, a more important concern is the tremendous effort and, likely, expense, that this intervention represented. The authors cite that nine patients would need to be treated to save one additional life. It would have been helpful for the authors to have given some idea of the cost of the program and, more specifically, the cost per additional life saved, so that institutions considering such a program might judge its merits relative to other life-saving interventions. Furthermore, since this was a *package* of education and care interventions, it is difficult to know if one particular element was key or whether other less crucial yet more costly elements could be omitted without sacrificing the overall benefit of the package.

Recommendation

Although the authors draw comparisons between their shock program and more broadly-based medical emergency, or rapid response, teams, patients in shock comprise a minority of patients in crisis [4,5]. This leads to an important question regarding the field of "crisis medicine." Should a crisis team be sub-specialized? The effort and subsequent indoctrination of this program into the culture of this community hospital should be applauded. Because of the above-mentioned limitations, we recommend a multi-center prospective trial prior to universal adoption of the shock team approach.

Competing interests

The authors declare that they have no competing interests.

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