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A survey of critical care nurses' practices and perceptions surrounding early intravenous antibiotic initiation during septic shock

Russel J. Roberts[a,b,*], Abdullah M. Alhammad[c], Lindsay Crossley[d], Eric Anketell[d], LeeAnn Wood[d], Greg Schumaker[e], Erik Garpestad[e], John W. Devlin[b,e]

[a] Department of Pharmacy, Tufts Medical Center, 800 Washington Street, Box 420, Boston, MA 02111, USA
[b] School of Pharmacy, Northeastern University, 360 Huntington Ave, R218 TF, Boston, MA 02115, USA
[c] Department of Pharmacy, King Khalid University Hospital, P.O. Box 2457, Riyadh 11451, Saudi Arabia
[d] Department of Nursing, Tufts Medical Center, Boston, MA, USA
[e] Division of Pulmonary, Critical Care and Sleep Medicine, USA

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ABSTRACT

Background: Delays in antibiotic administration after severe sepsis recognition increases mortality. While physician and pharmacy-related barriers to early antibiotic initiation have been well evaluated, those factors that affect the speed by which critical care nurses working in either the emergency department or the intensive care unit setting initiate antibiotic therapy remains poorly characterized.
Aim: To evaluate the knowledge, practices and perceptions of critical care nurses regarding antibiotic initiation in patients with newly recognised septic shock.
Methods: A validated survey was distributed to 122 critical care nurses at one 320-bed academic institution with a sepsis protocol advocating intravenous(IV) antibiotic initiation within 1 hour of shock recognition.
Results: Among 100 (82%) critical care nurses responding, nearly all (98%) knew of the existence of the sepsis protocol. However, many critical care nurses stated they would optimise blood pressure [with either fluid (38%) or both fluid and a vasopressor (23%)] before antibiotic initiation. Communicated barriers to rapid antibiotic initiation included: excessive patient workload (74%), lack of awareness IV antibiotic(s) ordered (57%) or delivered (69%), need for administration of multiple non-antibiotic IV medications (54%) and no IV access (51%).
Conclusions: Multiple nurse-related factors influence IV antibiotic(s) initiation speed and should be incorporated into sepsis quality improvement efforts.

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Implications for Clinical Practice

- Despite the implementation of severe sepsis management protocols that advocate rapid antibiotic therapy initiation, delays in antibiotic administration still frequently occur at institutions around the world.
- Critical care nurses play a key role in defining the speed by which antibiotics are initiated and administered to patients with newly recognised severe sepsis given their established role in patient assessment, care triaging and drug administration.
- Multiple nurse-related factors influence IV antibiotic(s) initiation speed and should be incorporated into sepsis quality improvement efforts.

* Corresponding author at: Department of Pharmacy, Tufts Medical Center, 800 Washington Street, Box 420, Boston, MA 02111, USA.
E-mail addresses: russelrx@gmail.com (R.J. Roberts), aalhammad@ksu.edu.sa (A.M. Alhammad), lcrossley@tuftsmedicalcenter.org (L. Crossley), eanketell@tuftsmedicalcenter.org (E. Anketell), lwood@tuftsmedicalcenter.org (L. Wood), gschumaker@tuftsmedicalcenter.org (G. Schumaker), egarpestad@tuftsmedicalcenter.org (E. Garpestad), j.devlin@neu.edu (J.W. Devlin).

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Introduction

Severe sepsis is commonly encountered in both the emergency department (ED) and intensive care unit (ICU) and is associated with significant mortality (Angus et al., 2001; Linde-Zwirble and Angus, 2004; Martin et al., 2003; Miller et al., 2013). The 2012 International Surviving Sepsis Campaign guidelines for the management of severe sepsis and septic shock recommend that effective, broad-spectrum antibiotic therapy be initiated within the first hour of severe sepsis or septic shock recognition given that multiple reports have demonstrated that mortality increases with each hour that the initiation of antibiotic therapy is delayed (Barochia et al., 2010; Castellanos-Ortega et al., 2010; Dellinger et al., 2013; El Solh et al., 2008; Ferrer et al., 2009; Gurnani et al., 2010; Kumar et al., 2006; Larsen et al., 2011; Puskarich et al., 2011).

Despite the implementation of severe sepsis management protocols that advocate rapid antibiotic therapy initiation, delays in antibiotic administration still frequently occur at institutions around the world (Castellanos-Ortega et al., 2010; Ferrer et al., 2009; Ferrer et al., 2014; Gaieski et al., 2010; Levy et al., 2010; Puskarich et al., 2011). Physician-related barriers to early antibiotic initiation include delays in severe sepsis recognition, a failure to order antibiotics in a timely fashion and a lack of leadership regarding severe sepsis protocol implementation and compliance (Barlow et al., 2007; Barlow et al., 2008; Cullen et al., 2013; Dee et al., 2010; Kanji and Dumaresque, 2012; Natsch et al., 1998; Rollins et al., 1994). Pharmacy-related barriers include delays in physician order verification and intravenous (IV) antibiotic preparation and delivery (Dee et al., 2010; Kanji and Dumaresque, 2012; Mitchiner and Hutto, 2007; Rollins et al., 1994).

Critical care nurses (CCN) who work in either the ED or ICU setting play a key role in defining the speed by which antibiotics are initiated and administered to patients with newly recognied severe sepsis given their established role in patient assessment, care triaging and drug administration (MacRedmond et al., 2010; Tazbir, 2012; Winterbottom, 2012). Despite the important advocacy role that CCNs can play by ensuring timely antibiotic ordering, the rapid delivery of first antibiotic dose(s) to the bedside and the presence of adequate IV access to facilitate rapid administration, there is a paucity of data surrounding the current perceptions and practices of critical care nurses regarding rapid antibiotic initiation in severe sepsis.

Prior reports suggest that CCN knowledge regarding current severe sepsis evaluation and management practices may be limited (Burney et al., 2012; Robson et al., 2007). Nurse-related delays in antibiotic initiation may therefore be linked to an unfamiliarity with Surviving Sepsis Campaign guideline criteria and a lack of awareness that patient outcome will be compromised when guideline criteria are not carefully followed (Burney et al., 2012; Robson et al., 2007). Moreover, among potential nurse-related factors that may delay antibiotic initiation in newly recognised severe sepsis, the relative importance of each remains unclear. This information is critical for any institution seeking to formulate new quality improvement interventions in this area.

In 2010, a mulitidisciplinary task force at our academic institution developed and following substantial nurse, physician and pharmacist education, implemented a severe sepsis management protocol. This protocol, similar to those developed in hospitals around the world, recommended that the first-dose of broad-spectrum IV antibiotic therapy be initiated within the first hour of severe sepsis recognition (Appendix A). Although time to antibiotic initiation decreased after the protocol was implemented into the institutional computeried physician order entry (CPOE) system, our institution remains focused on identifying additional strategies, many of which are nurse-related in an effort to further reduce the time to antibiotic initiation in patients presenting with severe sepsis or septic shock.

Aim

To determine the practices and perceptions of CCNs surrounding early antibiotic initiation in patients with newly recognied septic shock in terms of their knowledge regarding practice standards in this area, their current antibiotic initiation practices and their perceived barriers to early antibiotic therapy initiation in the severe sepsis population.

Methods

Design and setting

A descriptive survey design was utilized that included a self-reported questionnaire. The survey was conducted at Institutional Review Board (IRB), a 320-bed academic medical center with 24 adult ED beds and 50 adult ICU beds that is similar to many hospitals around the world. The usual nurse:patient ratio in the ICUs is 1:2, whereas in the ED it varies from 1:3 to 1:6 based upon patient acuity. At the time of the survey, antibiotics were available from automated dispensing cabinets in the ED but not in the ICUs. Instead, antibiotics were distributed to each ICU by the department of pharmacy. It is important to note that institutional policy emphasies that all new antibiotic orders are considered to be "STAT" in terms of the verification, distribution and administration processes.

Survey instrument development

The lack of nursing research in this area forced us to develop and validate a new survey instrument. The medical and nursing literature was searched and experts with a research interest in severe sepsis were consulted to identify the key survey constructs relevant to nursing practice in all developed countries. Three constructs were subsequently identified:

1 CCNs' knowledge surrounding severe sepsis practice guidelines, particularly as it relates to patients with septic shock, remains unknown.
2 Current practices of CCNs regarding early antibiotic administration remain unclear.
3 The perceived barriers among CCNs that influence rapid IV antibiotic initiation are unknown and likely unique from those of physicians and pharmacists.

To explore the most important items associated with each construct, a survey instrument was developed through a deliberate step-wise process that included item generation, construction, pilot testing, and clarification (Appendix B). The survey was organised into four sections on the basis of the defined constructs: (1) demographics, (2) severe sepsis management protocol knowledge, (3) antibiotic initiation practices, and (4) barriers to rapid IV antibiotic initiation. Although the institutional severe sepsis protocol addresses the management of patients both with or without shock, only patients with shock were considered for the purposes of this survey given they are: (1) a discrete population of patients that can be clearly characterized in a written survey; (2) at the greatest risk for higher mortality if not administered fluids, antibiotics and other interventions in a rapid and timely fashion; and (3) more likely to be administered at least two different antibiotics. A multidisciplinary critical care focus group (i.e., two attending physiciansthree, nurse managers, and three clinical pharmacists) used the results of the literature review [MEDLINE (1966-December 2015) using the key search terms antibiotics, barriers, critical care, nurse, sepsis, shock

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