Education in Sepsis: A Review for the Clinician of What Works, for Whom, and in What Circumstances

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Abstract

Sepsis is a major cause of morbidity and mortality in both the general and obstetric populations. Concerns have been raised regarding some cases of substandard care in the management of the septic and there is a real need for continuing multidisciplinary medical education in the recognition and management of the pregnant patient experiencing sepsis. This review aims to summarize studies on medical education in sepsis to both inform clinicians working in obstetrics and gynaecology and to assist in planning educational programs.

Résumé

La septicémie est une cause importante de morbidité et de mortalité dans la population générale comme dans la population obstétrique. La qualité des soins dispensés aux femmes enceintes atteintes soulève des inquiétudes; il existe un réel besoin de formation médicale continue et multidisciplinaire sur la détection et la prise en charge de ces patientes. Cette revue cherche à résumer les études sur l'enseignement médical relatif à la septicémie pour guider les cliniciens en obstétrique et gynécologie et orienter la planification de programmes de formation.

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INTRODUCTION

Sepsis is a major cause of morbidity and mortality, one of the most prevalent diseases, a leading indication for admission to the ICU,[1,2] and one of the main causes of death among hospitalized patients.[2] In Canada in 2011, 1 in 18 of all deaths involved sepsis.[3]

Pregnancy is no protector; sepsis remains the leading cause of direct maternal death in the United Kingdom and Republic of Ireland, with mortality rate in pregnancy of 1.13 per 100 000.[4,5] Major degrees of substandard care were identified in a majority of cases reported, particularly related to both the lack of recognition of sepsis and guidelines on management.

Some of the most frustrating issues in the management of sepsis for the clinical teams are the myriad ways that patients may present during the development of sepsis and the lack of a clear protocol on how to care for the patient experiencing sepsis. Two high profile campaigns, the Surviving Sepsis Campaign (SSC)[6,7] (Table 1) and the Sepsis Six,[8] have introduced "bundles" and "packages" of care (Table 2), though studies have shown that the tasks are rarely achieved.[9] Neither of these care bundles has been specifically examined in pregnancy.

The purpose of this review was to study the evidence on medical interventions, aiming to educate multidisciplinary teams on how to recognize and manage the patient experiencing sepsis. Rather than focusing on the self-evident question of whether educational interventions are effective, the review instead aimed to focus on interventions that may influence obstetric pedagogy; that is, the review aimed to focus first on recognition of sepsis (including definitions) and then thematically report the educational methods ("how"), also covering relevant factors ("for whom" and "when"), and the evidence base for each. The review concludes with practical strategies that have been used to implement guidelines.

METHODS

Extensive searching of multiple sources was performed by three authors (N.F., L.H., M.H.) to minimise bias; all have formal training in searching. Sources included databases

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Table 1. SSC 6- and 24-hour bundles[7]

Sepsis resuscitation bundle	To be accomplished as soon as possible and scored over the first 6 hours
1. Serum lactate measured. 2. Blood cultures obtained prior to antibiotic administration. 3. From the time of presentation, broad-spectrum antibiotics administered within 3 hours for ED (emergency department) admissions and 1 hour for non-ED ICU admissions. 4. In the event of hypotension and/or lactate >4 mmol/L (36 mg/dL): a. Deliver an initial minimum of 20 mL/kg of crystalloid (or colloid equivalent). b. Apply vasopressors for hypotension not responding to initial fluid resuscitation to maintain mean arterial pressure >65 mm Hg. 5. In the event of persistent hypotension despite fluid resuscitation (septic shock) and/or lactate >4 mmol/L (36 mg/dL): a. Achieve central venous pressure (CVP) of >8 mm Hg. b. Achieve central venous oxygen saturation of >70%.[a]	
Sepsis management bundle	**To be accomplished as soon as possible and scored over first 24 hours**
1. Low-dose steroids administered for septic shock in accordance with a standardized hospital policy. 2. Drotrecogin alfa (activated) administered in accordance with a standardized hospital policy. 3. Glucose control maintained > lower limit of normal but <150 mg/dL (8.3 mmol/L). 4. Inspiratory plateau pressures maintained <30 cm H_2O for mechanically ventilated patients.	

ED: emergency department.

[a]Achieving a mixed venous oxygen saturation of 65% is an acceptable alternative.

(Medline, Embase, Cochrane, and CENTRAL); hand searching (*Journal of Obstetrics and Gynaecology of Canada*, *British Journal of Obstetrics and Gynaecology*, *American Journal of Obstetrics and Gynaecology*, *Australian and New Zealand Journal of Obstetrics and Gynaecology*, *Obstetrics and Gynaecology*); guidelines; conference proceedings; and literature reviews. Online searching was performed to include literature published from 1981 to March 2016. Hand searching was performed for 1 year of published journals, 3 years of conference proceedings, and citation pearl indexing of identified papers. Abstracts were reviewed and authors contacted for further information.

Search Strategy

For the PubMed database, the search used the PICO (participants, intervention, comparison, outcome) framework. Free text search terms were as follows: participants (patients, patient, pregnant, pregnancy, parturient, sepsis, septic, sepsi, infection, infectious); intervention (education, interventions, teaching, lecture, tutorial, internet, online, interactive, multifaceted); outcome (death, mortality, morbidity, admission, ICU, High Dependency Unit (HDU), perinatal mortality/morbidity, [severe] maternal mortality/morbidity). MeSH terms were also searched. No language restriction was applied. Authors were contacted for clarification as required. There was a predefined plan of how to translate papers not in the English language, but none was identified on searching. Studies were included if they reviewed an educational intervention specific for sepsis.

Data were extracted by the researchers from appropriate full-text articles using a paper version of a data abstraction form, based on Best Evidence Medical Education.[10] Quality assessment was performed by assessing data collection, analysis, validity, reliability, and external validity based on applicability to teaching in a developed world obstetric unit. Validity was reported as low, moderate, or high quality, and criteria were set for each of these ratings. Qualitative synthesis of evidence was by thematic analysis. Quantitative synthesis (e.g., meta-analysis) was not considered, given the anticipated heterogeneity of data. Evidence synthesis was reported as per the STORIES (STructured apprOach to the Reporting In healthcare education of Evidence Synthesis) statement.[11]

ABBREVIATIONS

EGDT	early goal directed therapy
SRT	sepsis response team
SSC	Surviving Sepsis Campaign

Table 2. Sepsis Six[8]

Diagnostic and therapeutic steps	Aim to achieve within 1 hour of diagnosis
1. Deliver high-flow oxygen. 2. Take blood cultures. 3. Administer empiric intravenous antibiotics. 4. Measure serum lactate and send full blood count. 5. Start intravenous fluid resuscitation. 6. Commence accurate urine output measurement.	

RESULTS

Only one study was identified specific to pregnancy,[12] which evaluated a scoring system for sepsis in obstetrics. The remainder of studies related to general medicine.

What Is Sepsis? The Challenge of Definitions

A majority of physicians believe that others within their specialty define sepsis differently, and no more than 17% agreed on one definition.[13] Table 3 shows some of the different definitions of sepsis, including the most up-to-date definitions.[14] Within the English-speaking world, the only educational colleges that currently have published a guideline specific to sepsis in pregnancy are those of the United