Sim-sepsis: improving sepsis treatment in the emergency department?

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INTRODUCTION

Sepsis is a time-critical medical emergency that is estimated to account for 37 000 deaths annually in the UK. It is an adverse systemic host response to infection that can lead to multiple organ failure and death where timely administration of specific clinical interventions reduces mortality.[1] Despite internationally focused awareness campaigns and clinician-friendly bundles of care, compliance with all six steps (sepsis 6) within the first hour of admission remains poor.[2] Simulation-based education (SBE) uses high-fidelity-guided patient experiences to develop learnt behaviours for unexpected critical incidents. While SBE has been shown to improve participant satisfaction and knowledge, there is limited evidence that demonstrates a change in participants' behaviour and patient outcome. Such evidence is key as it demonstrates translation of learning into practice. Our study, assessing the effectiveness of an in-house SBE programme using the Kirkpatrick learning evaluation model[3] in a cohort of emergency department (ED) physicians, indicates such a change may be achievable.

METHODS

Using a locally written sepsis teaching programme, participants attended two didactic seminar sessions covering the fundamentals of sepsis management and human factors. Focused multiple choice and short answer pre-seminar and post-seminar assessment were completed by attendees (Kirkpatrick level 2). Following the seminars, two separate in situ sepsis scenarios were run within the ED clinical area, with a live video link allowing all attendees to either observe or directly participate. A structured debrief was completed following each scenario after which individual feedback was collected using Likert scales.

To assess changes in behaviour following intervention, we compared times to delivery of each element of the sepsis 6[1] (table 1) by attending physician participants for 2 weeks preceding and succeeding the SBE.

Kirkpatrick's learning evaluation model was used to measure the educational validity of these sessions. This model describes four levels of increasing educational impact:

- level 1: participant satisfaction
- level 2: knowledge
- level 3: behavioural change
- level 4: results namely patient outcomes

Level 1 data were measured through postprogramme written feedback assessing participant views on delivery, content and relevance using Likert scales. Level 2 data were assessed by measuring improvement of knowledge using a focused preprogramme and postprogramme questionnaire. Behaviour change (level 3) was evaluated using time to completion of each of the sepsis 6 steps for all patients coded as 'septic' treated by participants for the 14 days preceding and 14 days succeeding the SBE programme. These data were obtained from the hospital's patient management software and electronic records. Statistical significance was measured using the χ^2 test (one degree of freedom).

RESULTS

Kirkpatrick level 1: participant satisfaction

In total, 14 ED doctors, including senior house officer and middle-grade physicians, and 3 nurses attended the SBE. Participants were given protected training time to attend without distraction. Overall satisfaction was high with averages of 4.5/5 for the sepsis seminar and 4.3/5 for the human factors seminar.

Kirkpatrick level 2: knowledge

Eight medical participants completed both pre-seminar and post-seminar assessments. Knowledge of sepsis improved from a mean pre-test score of 64% to post-test score of 88%, an improvement of 24%.

Kirkpatrick level 3: behaviour change

In total, 37 patients with sepsis were treated 2 weeks prior to the intervention and 15 patients with sepsis were treated within the two weeks following the SBE by course participant physicians. Documented delivery of all sepsis 6 components was achieved in 32% (pre) and 53% (post) (P=0.17). Documented delivery of all six components within 1 hour was achieved in 8% (pre) and 33% (post) (P=0.0001).

DISCUSSION

Cronshaw *et al* found that despite internationally focused educational campaigns compliance with delivering the 'sepsis 6' within 1 hour remains poor.[4] There is also limited evidence of SBE programmes impacting beyond level 2 of the Kirkpatrick model. Where data suggest this, surrogate markers, such as the acquisition of new technical skills, have been used to illustrate a behavioural change.[5] While our programme demonstrates the acquisition of knowledge immersed within an enjoyable experience, it also demonstrates a statistically significant

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Table 1 Sepsis 6 resuscitation bundle

Give targeted high-flow oxygen	Take blood cultures
Commence intravenous fluid resuscitation	Measure serum lactate
Give intravenous antibiotics	Monitor urine output

improvement of 'sepsis 6' delivery within 1 hour. These data provide confirmation of a short-term behavioural change insinuating a translation of learning from the classroom to the clinical workplace. While this study did not directly measure patient outcomes, there is a direct link between timely delivery of the 'sepsis 6' and patient survival. Given this current evidence, it is likely that our programme would have an impact at Kirkpatrick patient outcome level (level 4).

It should be noted that the small numbers of this study and short follow-up period heed cautious interpretation of our data. It is unclear whether the programme as a whole or a specific combination of a subset of educational components were responsible for the difference in performance. Moreover, the importance the SBE played over and above the didactic teaching was not analysed. Our analysis does not establish how much better performance was or quantify which variables within this study influenced the result. In particular, the quality of the facilitator, the combination of high-fidelity resources and the individual patient scenarios may affect reproducibility. It is unclear whether this programme would have a similar impact among other allied healthcare professionals involved in the chain of delivering sepsis-related care. Finally, the prospective observational design of this study meant no control group was identified to standardise the complexity of sepsis cases, availability of resources such as antibiotics and staffing ratios pre and post intervention. Further studies are warranted to resolve these discussions.

With the almost ubiquitous availability of simulation resources in hospitals throughout the developed world, a sepsis-focused simulation experience may be an affordable and effective educational intervention to improve compliance with what has proved to be an efficacious but difficult to deliver time-sensitive clinical bundle of care.

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