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Observational study of current use of selective decontamination of the digestive tract in UK Critical Care units

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Editor's key points

- The use of selective decontamination of the digestive tract (SDD) in the UK remains low.
- This survey compared outcomes and infection rates from 205 UK critical care units.
- There were no significant differences in risk-adjusted outcomes between the 9 units using SDD and the 196 units not using SDD.
- Subgroup analysis suggests that there were fewer unit-acquired blood stream infections when an i.v. SDD component was used.
- However, this is based on data from three units.

Background. Evidence supporting selective decontamination of the digestive tract (SDD) is reasonably strong. We set out to determine use in UK critical care units and to compare patient outcomes between units that do and those that do not use SDD.

Methods. A total of 250 UK general critical care units were surveyed. Case mix, outcomes, and lengths of stay for admissions to SDD units (with and without an i.v. component) and non-SDD units were compared using data from the Intensive Care National Audit & Research Centre Case Mix Programme database.

Results. A response was received from all the 250 critical care units surveyed. Of these, 13 (5.2%) reported using SDD on some or all admissions, and of these, 3 reported using an i.v. component. Data on 284 690 admissions (April 2008–March 2011) from units reporting to the ICNARC Case Mix Programme (CMP) were included in the analyses. Admissions to SDD ($n=196$) and non-SDD ($n=9$) units were a similar case mix with similar infection rates and average lengths of stay in the unit and hospital. There was no difference in risk-adjusted unit or hospital mortality. The rate of unit-acquired infections in blood was significantly lower in SDD units using an i.v. component.

Conclusions. Use of SDD in UK critical care is very low. The rate of unit-acquired infections in blood was significantly lower in SDD units using an i.v. component, but did not translate into a difference in acute hospital mortality or length of stay. There is a need to better understand the barriers to adoption of SDD into clinical practice and such work is underway.

Keywords: antibacterial agents; critical care; epidemiology; infection

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Critically ill patients are extremely susceptible to hospital-acquired infections (HAIs) which are associated with an excess mortality, prolonged hospital stays, and a high healthcare resource utilization. It is estimated that ~30% of patients in critical care units are affected by HAIs. Risk factors include use of invasive devices, such as vascular catheters and invasive mechanical ventilation. In addition, certain conditions predispose patients to bacterial colonization, thereby increasing the risk of HAIs.[1]

A number of strategies for preventing HAIs have been suggested, including selective decontamination of the digestive tract (SDD), which involves the application of topical non-absorbable antibiotics to the oropharynx and stomach and a short course of i.v. antibiotics.[2–12] The principle of this treatment is to prevent HAIs by selectively killing the patient's endogenous aerobic Gram-negative bacilli to prevent overgrowth of these organisms, which are known to cause HAIs, such as ventilator-associated pneumonia.

The evidence supporting SDD is reasonably strong.[13] A Cochrane review published in 2009 reported a significant reduction in respiratory tract infections (odds ratio 0.28, 95% confidence interval 0.20–0.38) and total mortality (odds ratio 0.75, 95% confidence interval 0.65–0.87) in patients treated with a combination of topical and systemic antibiotics.[2] More recently, a large cluster randomized trial from the Netherlands reported that SDD reduced 28-day mortality by an estimated 3.5% compared with standard care.[14] Despite the evidence, previous surveys have indicated poor uptake of SDD in critical care units.[15 16] We set out to determine the current use and

delivery of SDD in NHS adult, general critical care units in the UK, and to compare patient outcomes between units that use SDD and units that do not.

Methods

In March 2011, a short email survey was sent to the clinical directors of all NHS adult, general critical care units (including multiple units within the same hospital) in the UK asking about use of SDD in their unit. A general critical care unit was defined as an intensive care unit (ICU) or combined ICU-high dependency unit (HDU). Stand-alone HDUs or speciality critical care units (e.g. neurosciences ICUs, cardiac ICUs, etc.) were excluded. Units were identified from a database of critical care units in England, Wales, and Northern Ireland maintained by the Intensive Care National Audit & Research Centre (ICNARC), and from the Scottish Intensive Care Society Audit Group (SICSAG) database of critical care units in Scotland. Non-responders were followed up with a second email and then a telephone call.

Units reporting adoption of SDD were followed up and asked to complete a short questionnaire, via telephone, about SDD delivery including: the content of SDD and route of delivery; the types of patients receiving SDD; the point at which SDD is commenced and duration of treatment; and the date the unit commenced using SDD (Supplementary Appendix S1). Telephone interviews were conducted with senior nurses or medical consultants. All data collection was completed by August 2011.

The analysis comparing patient outcomes between units that reported using SDD (SDD units) and those that reported not using SDD (non-SDD units) was based on data from the ICNARC Case Mix Programme (CMP) database. The CMP is the national comparative clinical audit for adult critical care units (including ICUs and combined ICU/HDUs) in England, Wales, and Northern Ireland, coordinated by ICNARC. Participation in the CMP is voluntary, and currently 94% of all possible adult, general, critical care units in England, Wales, and Northern Ireland participate in the CMP. The CMP includes the mandated fields for the Department of Health's Critical Care Minimum Dataset for Payment by Results. It is listed as a recognized national clinical audit for inclusion in the Department of Health's Quality Accounts for 2013/14. Trained data collectors collect raw data to precise rules and definitions, which then undergo extensive local and central validation before pooling. The CMP database thus contains pooled case mix and outcome data collected on consecutive admissions to units participating in the CMP and has been independently assessed to be of high quality.[17]

Data were extracted from the CMP database for all admissions to SDD and non-SDD units participating in the CMP between April 2008 and March 2011. Admissions to SDD units were compared with admissions to non-SDD units with regard to case mix, outcomes, and lengths of stay, taking account of the date that SDD was adopted in the unit. Case mix was described by: age; sex; surgical status, based on admission to the unit direct from the operating theatre and categorized by urgency of surgery according to the definitions of the National Confidential Enquiry into Patient Outcome and Death; and acute severity of illness, assessed by the Acute Physiology And Chronic Health Evaluation (APACHE) II Acute Physiology Score, APACHE II Score, and the ICNARC Physiology Score.[18 19] Outcomes, routinely reported as part of the CMP, were: unit-acquired infection rates (identified from clinical microbiological samples taken more than 48 h after admission to the unit); unit-acquired methicillin-resistant *Staphylococcus aureus* (MRSA); unit-acquired vancomycin-resistant *enterococcus* (VRE); critical care mortality; and hospital mortality. Unit-acquired infections reported were: any unit-acquired infection in blood (identified from a blood sample, excluding contaminants, taken through skin venepuncture), and infections because of *Clostridium difficile* (defined as the detection of *C. difficile* toxin in any stool sample taken for microbiological examination 48 h after admission to the unit and while still in the unit). Unit-acquired MRSA and VRE were defined as the presence of MRSA or VRE in any sample taken for microbiological examination 48 h after admission to the unit and while still in the unit. Mortality was assessed at discharge from the original critical care unit and at discharge from acute hospital. Length of stay was reported in the original critical care unit and the total stay in acute hospital, stratified by survival status.

Outcomes were compared between SDD units and non-SDD units using multilevel, random-effects logistic regression models, adjusted for secular trend (linear effect of calendar time), predicted log odds of acute hospital mortality from the ICNARC risk prediction model (2011 recalibration) and random effect of unit.[19]

As a sensitivity analysis, the analyses were repeated comparing units that reported delivering SDD that included an i.v. component with non-SDD units. Units that reported using SDD comprising oropharyngeal nasogastric paste, or both only were excluded from this analysis.

As a subgroup analysis, the analyses were repeated among admissions with a primary or secondary reason for admission to the critical care unit of trauma (identified from the process tier of the hierarchical ICNARC Coding Method).[20] Units that reported using SDD in all admissions or specifically in trauma admissions were compared with non-SDD units. Units that reported using SDD in specific patient groups other than trauma were excluded from this analysis.

Approval from a Research Ethics Committee was not required as the study did not involve recruiting patients or healthcare staff as research participants. Support for the collection and use of patient-identifiable data without consent for the CMP has been obtained under Section 251 of the NHS Act 2006 (approval number PIAG 2–10(f)/2005).

Results

A response to the email questionnaire was received from all the 250 (100%) adult, general critical care units contacted. Of the 250 respondents, 13 (5.2%) reported using SDD in some or all admissions. The type and delivery of SDD as reported by the 13 units are provided in Table 1. Over half of the units ($n=7$) reported using SDD in ventilated patients. Three units reported using SDD in trauma patients only and