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Surveillance of central venous catheter bloodstream infections in critical care units in England: results from the sentinel study May 2016-April 2017

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INTRODUCTION

Bloodstream infections (BSI) from central venous catheters (CVC-BSI) in critically ill patients in intensive/critical care units (ICUs) increase morbidity and mortality, have high economic impact and are potentially preventable.[1-3]

Substantial reductions in CVC-BSI rates have previously been reported in England in a two-year study (2009-11). A key outcome was the need for a professionally-owned, standardised, national infection surveillance programme in ICUs.[4,5]

In 2011, the Infection in Critical Care Quality Improvement Programme (ICCQIP) was developed, representing a national collaboration of all professional organisations involved in adult, paediatric and neonatal intensive care, microbiology and infection control.[6]

Here we present the results from the first year of the ICCQIP CVC-BSI surveillance programme.

METHODS

Surveillance

- A web based data capture system (DCS) was launched in May 2016 to collect patient-level data (patient and specimen details, clinical signs and symptoms at the time of the first positive blood culture (PBC), whether antibiotics were administered to treat the PBC, CVC-related data) on all PBCs in participating ICUs and unit-level data on bed-days and CVC-days.[7]
- Case definitions were based on the Centers for Disease Control and Prevention (CDC) and European Centre for Disease Prevention and Control (ECDC) protocols.[8,9]
- Episode length was 7 days, and PBCs with the same organism(s) within this period were excluded

Participation

- NHS Trusts (hospitals under the same management) in England who had pre-registered their interest (n=43) were invited to participate in the voluntary sentinel phase of the CVC-BSI surveillance programme.
- In November 2016, the invitation was extended to all NHS Trusts in England, and participation encouraged by the Chief Medical Officer

Analysis

- All descriptive analyses were carried out using Stata[TM13].
- Only data from units that provided infection (including nil returns) and denominator data are presented here

RESULTS

Surveillance participation

- 127 of 151 NHS Trusts provided at least 1 unit name to be registered onto the DCS
- 101 Trusts (n=147 ICUs) had at least one Local Administrator (LA) registered onto the DCS between 01/05/2016-31/04/2017 (Figure 1)
- 57 Trusts (84 ICUs) entered data (72 adult, 7 paediatric and 5 neonatal ICUs) during the first year of the surveillance

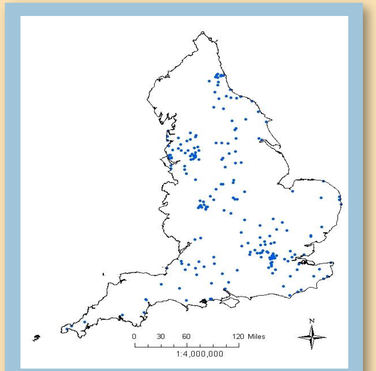

Figure 1. NHS Trusts with at least one LA registered onto the DCS

Species distribution

- Top 10 organisms isolated from ICCQIP PBCs and National PBCs reported to PHE's SGSS programme differ in make up and ranking.
- Coagulase-negative staphylococci (CoNS) were found in ~40% of all PBCs, compared to ~20% of PBCs reported nationally (Figure 2).
- Conversely, *E. coli* was most prevalent in PBCs nationally (24.7%), but only found in 9.4% of PBCs in ICCQIP surveillance
- Most commonly isolated species in ICU-associated BSIs were *E. coli* (12.1%), *E. faecium* (10.8%) and CoNS (9.1%)

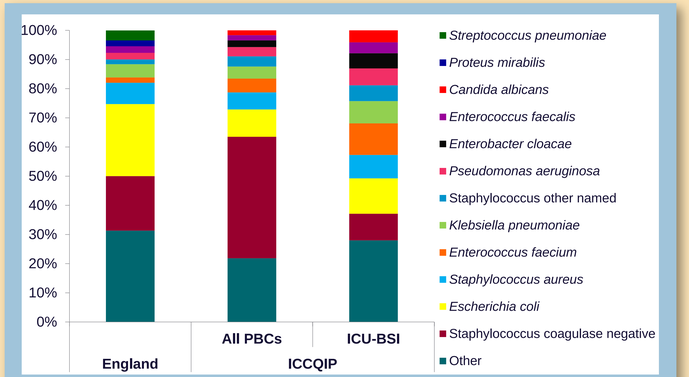

Figure 2. Top 10 isolated species reported via ICCQIP DCS and Public Health England's Second Generation Surveillance System (SGSS) Communicable Disease Reports

Counts and rates of PBCs and ICU-associated BSIs in ICUs

Table 1. Counts and rates of ICU-associated BSI and ICU-associated CVC-BSIs in adult, paediatric and neonatal intensive care units, May 2016 -April 2017

	(May 2016-April 2017)		
	Adult	**Paediatric**	**Neonatal**
Number of ICU-associated BSIs	433	19	11
Number of patient days, amongst patients in the ICU>2 days	88,411	8,958	14,955
Rate of ICU-associated BSI per 1,000 ICU-patient days	4.9	2.1	0.7
Number of ICU-associated CVC-BSIs	124	6	5
Number of CVC days, amongst patients in the ICU>2 days	53,913	5,002	3,304
Rate of ICU-associated CVC-BSIs per 1,000 ICU-CVC days	2.3	1.2	1.5
CVC utilisation	61.0%	55.8%	22.0%

- A total of 1,417 (poly-/mono-microbial) PBCs were reported from participating ICUs: 1,292 from adult, 72 from paediatric and 53 from neonatal ICUs.
- The observed rate of PBCs per 1,000 patient bed-days was 10.3 in adult, 3.5 in paediatric and 3.3 in neonatal ICUs, and varied considerably, especially amongst adult ICUs (Figure 3).
- 56.0%, 41.7% and 30.2% of PBCs in adult (724/1,292), paediatric (30/72) and neonatal (16/53) ICUs fulfilled BSI definitions, respectively.
- In adult, paediatric and neonatal ICUs, 33.5% (443/1,292), 26.4% (19/30) and 20.8% (11/53) of PBCs were defined as ICU-associated BSI (occurred >2 nights after admission to ICU), respectively.
- Almost half (45.5%) of ICU-associated BSIs in neonatal units (5/11) met CVC-BSI definitions, while the percentage was markedly lower in adult (28.6%,124/433) and paediatric (31.6%, 6/19) ICUs.
- However, the rate of ICU-associated CVC-BSIs was the highest amongst adult ICU patients (2.3/1,000 ICU-CVC days), followed by those in neonatal (1.5/1,000 ICU-CVC days) and paediatric (1.2/1,000 ICU-CVC days) CCUs (Table 1, Figure 4).
- There was a wide variation in CVC-BSI rates and within adult ICUs in particular (range: 0-18.3 ICU-associated CVC-BSI per 1,000 ICU-CVC days) (Figure 4).

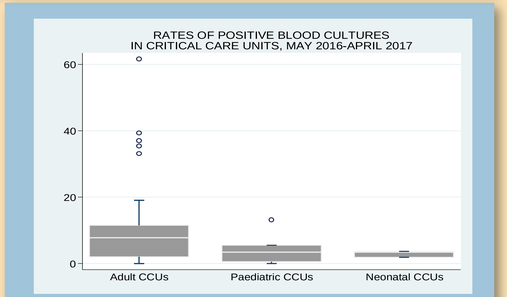

Figure 3. Rates of PBCs per 1,000 patient bed-days in adult, paediatric and neonatal ICUs, May 2016-April 2017

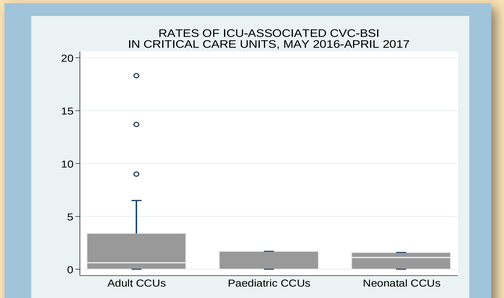

Figure 4. Rates of ICU-associated CVC-BSIs per 1,000 ICU-CVC days in adult, paediatric and neonatal ICUs, May2016-April 2017

DISCUSSION

Sixty-six percent of NHS Trusts have signed up to the surveillance programme since its national launch. However, not all signed-up Trusts have had the resources to actively participate.

CoNS were the most commonly found organisms in all PBCs across the three CCU types. This contrasts with the national data with *E. coli* being reported most commonly, in 25% of cases.

The overall rates of ICU-associated CVC-BSI were higher in adult ICUs than the rates at the end of the Matching Michigan study (2.3 vs. 1.5/1,000 ICU-CVC-days), but lower in paediatric ICUs (1.2 vs. 2.9/1,000 ICU-CVC-days), although methodological differences may affect the comparability.

The difference in rates between units noted from the ICCQIP programme highlight the importance of providing a national standardised surveillance system for benchmarking and to determine the causes.[4]

With the surveillance scheme now out of its sentinel phase, work on facilitators and identification of barriers to participation will be assessed in order to increase the number of Trusts in England providing data.

Collaboration with other quality improvement programmes such as ICNARC, PICANET and BadgerNet is underway, and wider engagement will be encouraged by Care Quality Commission, and professional networks.

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