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.1,2 Substantial reductions in CVC-BSI rates have been previously reported in England in a ten year study (2005-15). A key outcome was the need for a professionally-owned, standardised, national infection surveillance programme in ICUs.3

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

METHODS

• A web-based data capture system (CDCS) 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.5

• Case definitions were based on the Centers for Disease Control and Prevention (CDC) and European Centre for Disease Prevention and Control (ECDC) protocols.6

• Episode length was 7 days, and PBCs with the same organ(s) within this period were excluded.

• 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.

• All descriptive analyses were carried out using Stata™.7

• Only data from units that provided infection (including nil returns) and denominator data are presented here.

RESULTS

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

<table>
<thead>
<tr>
<th>BSI Type</th>
<th>Adult</th>
<th>Paediatric</th>
<th>Neonatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU-Associated BSI %</td>
<td>4.38</td>
<td>6.04</td>
<td>5.62</td>
</tr>
<tr>
<td>Number of BSI cases</td>
<td>88,411</td>
<td>6,958</td>
<td>5,022</td>
</tr>
<tr>
<td>Number of patient-days</td>
<td>2,050</td>
<td>2,045</td>
<td>5,254</td>
</tr>
<tr>
<td>Rate (per 1,000 patient-days)</td>
<td>4.38</td>
<td>6.04</td>
<td>5.62</td>
</tr>
</tbody>
</table>

• A total of 1,417 (only-mono-microbial) PBCs were reported from participating ICUs: 1,230 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 (72/412,920, paediatric (38/307) and neonatal (163/653) fulfilled BSI definitions, respectively.

• In adult, paediatric and neonatal ICUs, 33.5% (443/1,321, 26.4% (19/73) 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 were in neonatal units (51/114) and had CVC-BSIs, while the percentage was markedly lower in adult (28.6%, 243/843) and paediatric (21.6%, 619) ICUs.

• However, the rate of ICU-associated CVC-BSIs was the highest amongst adult ICU patients (2,310,100 ICU-CVC days), followed by those in neonatal (1,515,100 ICU-CVC days) and paediatric (1,127,100 ICU-CVC days) ICUs (Table 1, Figure 4).

• There was a wide variation in CVC-BSI rates and within adult ICUs in particular (range 6.183 ICU-associated CVC-BSI per 1,000 ICU-CVC days (Figure 4).

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

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, May 2016-April 2017

DISCUSSION

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

CoNS were the most commonly found organisms in all PBCs across the three ICU types. This contrasts with the national rate, with CoNS being reported most commonly, in 25% of cases.

The overall rates of ICU-associated CVC-BSI were higher in adult ICUs then the rates at the end of the Michigan study (2.3 vs. 1.51/1000 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.8

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 comparability.

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

ACKNOWLEDGEMENTS

We are very grateful to the staff in all participating units for providing data in the surveillance scheme now out of its sentinel phase. Furthermore, we thank ICCQIP Board Members who provided feedback on this manuscript.

REFERENCES