Increasing the volume of blood received in adult paired blood culture bottles at a regional public health laboratory: results of a quality improvement project to optimise the diagnosis of bacteraemia

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Background: Blood cultures remain the cornerstone of bacteraemia diagnosis in septic patients. It’s well documented that volume of blood received in blood culture bottles affects test sensitivity. The ability of blood cultures to detect bacteraemia is proportional to the volume of blood cultured. Following implementation of a BD BACTEC™ FX blood culture system at Birmingham Public Health Laboratory we undertook a period of baseline measurement and established that mean blood culture fill volume was inadequate.

We embarked on a trust wide quality improvement project. The primary aim was to increase the percentage of adequately filled blood cultures (≥ 5ml) by 20% and increase the percentage of optimally filled bottles (8-10ml) by 10% in six months (by 1st August 2018). Our secondary aim was to increase the mean volume in blood culture bottles to 8ml (by 1st August 2018). We measured the clinical impact of this on test sensitivity by comparing blood culture positivity rate between adequately and inadequately filled bottles.

Materials/Methods: Trends in blood culture volume were tracked through mean, median and interquartile range for departments and clinical areas. Means were collated on a weekly basis, and before and after intervention periods. These were plotted on a run chart over time to assess sustainability of results. Descriptive statistics were performed using Excel.

Following a period of baseline measurement we implemented three phases of plan/do/study/act (PDSA) intervention cycles (including a small test pilot cycle). Interventions were focused around user education/engagement, real time user feedback and laboratory reporting. User questionnaires were administered to investigate knowledge and practice; further informing the interventions.

Results: Between 1st March - 1st August 2018 the mean volume of blood inoculated into culture bottles rose from 5ml (95% CI 4.1-6.0ml) to 7.5ml (95% CI 6.4-8.5ml). The percentage of adequately-filled blood culture bottles increased from 47% to 61% and the percentage of optimally-filled bottles increased from 16% to 29%. The positivity rate in bottles with >5ml blood was 12.2%, compared to 8.2% in those with ≤5ml (p=0.02417).

Conclusions: Although our project didn’t fully meet its aims, we observed a significant and sustained improvement in filling of blood culture bottles.