AUDIT ON LABORATORY HANDLING AND REPORTING OF BLOOD CULTURES IN THE MICROBIOLOGY LABORATORY AT ROYAL LANCASTER INFIRMARY

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The aim of this audit is to provide operational solutions to the challenge of rapid reliable processing of blood cultures in order to optimise outcomes of patients, including reducing length of stay, while providing procedural opportunities to improve antimicrobial stewardship and facilitate seven day working. Many of improvements can be achieved through better utilisation of existing facilities

In 2013 Public Health England published a new standard for blood cultures, introducing target times for the processing of samples. Clinical Pathology Accreditation (CPA) also sets standards for pathology laboratories.

General Objective

To audit the turnaround time of positive blood cultures from sample collection to reporting

To audit the time elapsed from sample collection of the blood culture to uploading into automatic BC incubator at the laboratory

To audit the time of the positive blood cultures from receipt at the laboratory to uploading into automatic BC incubator

To audit the time from blood cultures flagging positive to report Gram stain electronically

To audit the time from flagging positive to final electronic report

To audit the time from reception to final electronic report of the positive blood cultures

Standards are set up according to the SMI and CPA standards. See table 1.-3

Investigative Stage	Standards
Pre-Analytical	Time Period
Collection to Incubation	< 4 hours

Table 1. Pre-analytical standards

Investigative stage	Criteria	Standards
Analytical Flagging positive to Microscopy Identification and Sensitivity	Test if performed	Time Period to Result
	Gram Stain	<2 hr
	Rapid Antigen testing	<2 hr
	Molecular Assays	Same day
	Isolate Identification (Direct/Automated)	<24 hr
	Isolate Identification (Conventional method)	24 – 48 hr
	Isolate Sensitivities (Direct/ Automated)	<24 hr
	Isolate Sensitivities (Conventional Methods)	24 hrs (initial results)
Negative at 36 hours incubation	Preliminary 'negative after 36 hours incubation' report issued	All labs should have this as an automated LIMS facility

Table 2. Analytical standards

Investigative Stage	Criteria	Standards
Post-Analytical Positive Report (from receipt in laboratory to positive reporting)	Preliminary Positive Report	Immediate within 2 hrs
	Final Positive Report	<5 days

Table 3. Post-analytical standards

Methodology

Positive blood cultures were investigated prospectively over three month period against the standards. Data was collected manually from:

blood culture request forms (time and date of sample collection, time and date of reception to lab),

blood culture analyser database (time and date of loading BC bottles, and flagging positive),

laboratory information system and the hospital information system (time and date of reporting Gram -film and final report).

RESULTS

•There were 152 positive blood cultures over 3 month period from 01.07.2016 to 30.09.2016. in RLI

•Six positives were rejected due to the misplacement of request forms and unavailability of relevant data from the request forms.

•146 blood culture positives were audited for blood culture pathway.

•According to audit standards, documentation of sample collection date and time is 100%.

•However, in RLI, sample collection date was recorded only in 87.67% of request forms and it was 84.24% for sample collection time.

•An audit standard for sample reception time and date is 100%.

•Reception time and date stamp were included only 94.52% of request forms because original request forms were not available and day stamp was not visible in photocopies.

Blood culture incubation time and date as well as flagging positive time and date were automatically recorded in the blood culture analyser. Therefore, 100% recordings are available according to the audit standards.

•All positive Gram-film results and final results after authorization were available in the laboratory information system and hospital information system with time and date. So, 100% recording time and date to fulfil audit standards of Gram-stain result time and date as well as final result time and date.

•Recommended national standards for pre-analytical phase from blood culture bottle inoculation to incubation to analyser is less than 4 hours. In this audit result, only 45.52% of samples could reach the recommendation. However, nearly 98% of them were incubated within 24 hours.

•It is important to note that more than 80% of blood culture samples were incubated within 30 minutes of receipting to the laboratory. Compliance increases to 98% within 1 hour.

•With regard to national standards, Gram-stain result should be informed to clinician within 2 hours of flagging positive. Gram-stain was performed in 46.51% of positive samples less than 2 hours. However, more than 10% of specimens were processed for Gram-stain more than 12 hours.

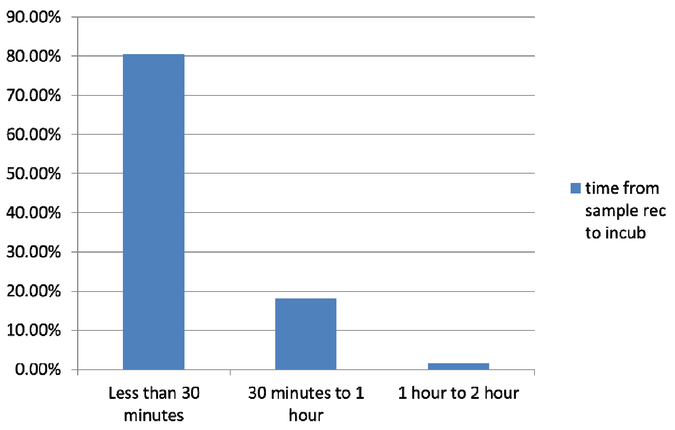
•In RLI Microbiology laboratory, nearly 70% of positive blood sample results were issued within 5 days of reception to the laboratory as final results. According to national standards final results should be issued less than 5 days.

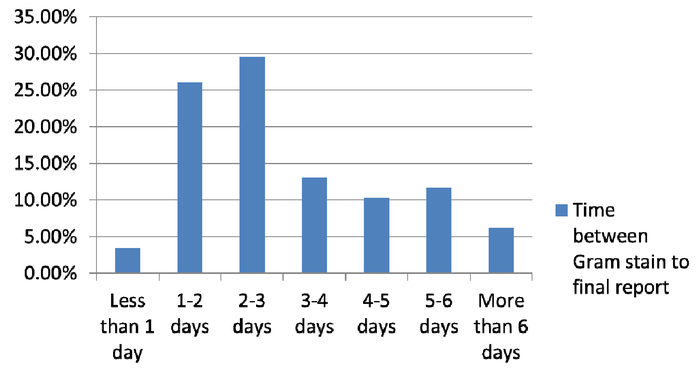
•Average blood culture turnaround time of this audit was less than 5 days because more than 65% of positive samples were processed within 5 days of inoculating blood culture broth.

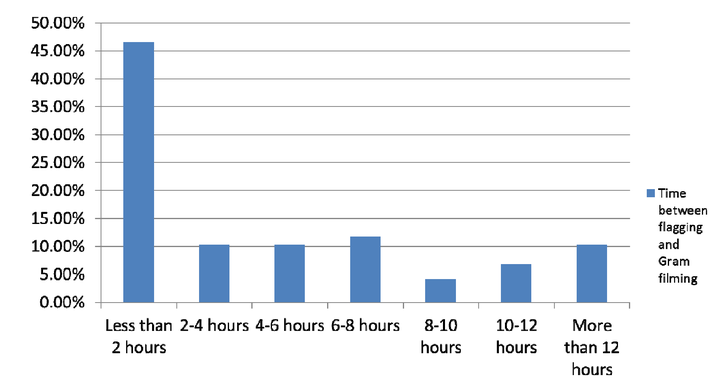
Collection and sample reception date and time are manually recorded, therefore not every sample could be assessed. The compliance with this figures are shown in table 4 and 5. The rest of the data were collected from electronic systems therefore there was no lack of information with regards of starting the incubation, reporting out preliminary and final results.

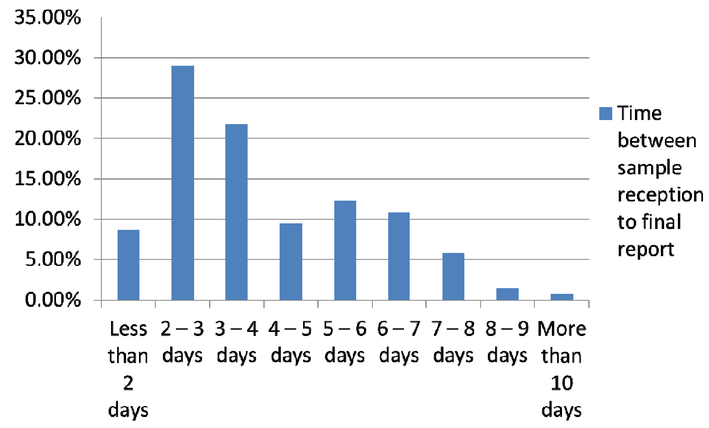
Table 4: Sample collection date and time on request forms	Number of positive BC request form with date and time indicated	Percentage
Date	128/146	87.67%
Time	123/146	84.24%

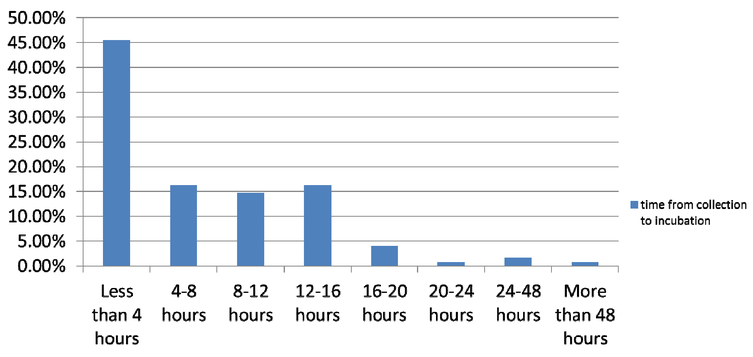
Table 5: Sample reception date and time recorded on request forms	Number of request forms with recorded reception date and time	Percentage
Date	138/146	94.52%
Time	138/146	94.52%

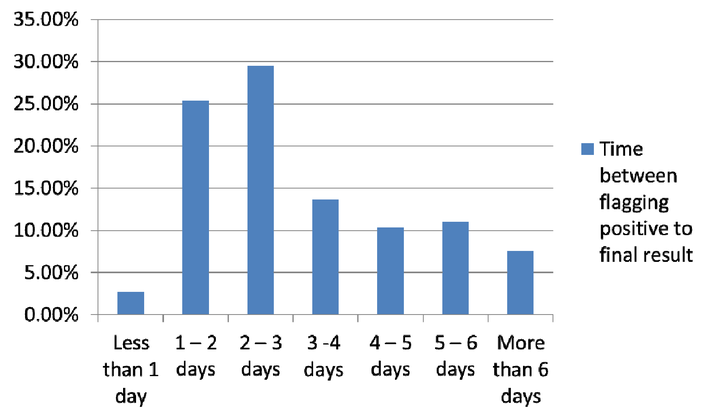


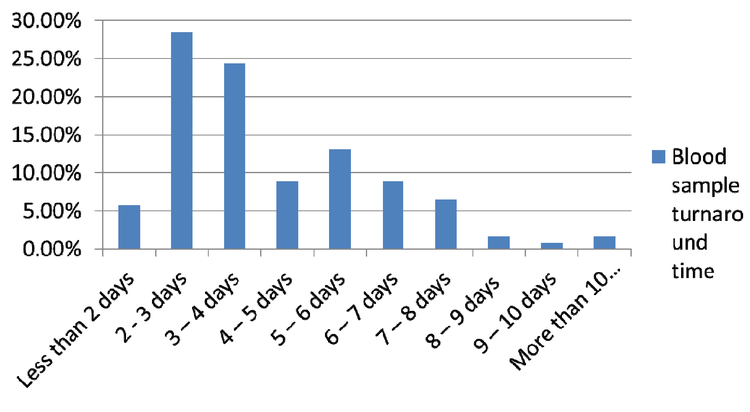












Conclusion

The identified delaying points of blood culture pathway are the time between collection to incubation and providing Gram-staining result from the time BC bottles flagged up positive in the automatic incubator. The identified reason of these delays is the non-availability of 24 hour working shift in the microbiology laboratory. Advanced molecular technology would also shorten the turnaround time of the positive BC results.

Recommendations

Microbiology Laboratory at Royal Lancaster Infirmary (RLI) currently uses traditional microbiology methods for identifications and sensitivity tests combined with VITEK automatic ID and SENS if required. With the current resources the turnaround time of the positive blood culture samples can be still reduced. The laboratory is closed between 8pm and 8am. That also cause delay in processing. If there is an urgent sample process requested at night BMS has to process the positive BCs as well. That shorten the turnaround time of those BCs. Due to the audit findings decision has been made to perform VITEK ID and sensitivity tests on those positive BCs that became positive by early morning and there is sufficient growth on subculture plates by teatime to proceed more investigations on the same day. Re-audit will investigate if these interventions make difference in turnaround time of resulting positive BCs.