Many of your patients hate needles. And if there are problems with the blood culture, repeated collections annoy them even more.

At Navicent Health in Macon, Georgia, the emergency department performs 10,000 blood cultures annually. And their contamination rate exceeded a national best practice benchmark, an institutional benchmark and a liberal emergency department benchmark of, respectively, 1 percent, 3 percent and 5 percent.

Blood cultures are an important and frequently deployed diagnostic tool in providing proper medical treatment and are commonly collected when a patient shows symptoms of septic shock, leukocytosis, fever, chills and suspected endocarditis. They also are frequently collected prior to initiating antimicrobial treatment in elderly patients or those with compromised immune systems.

All those factors combined to lead Navicent Health management to approve a Six Sigma black belt project charter in late 2014 to improve and standardize the processes associated with collecting blood cultures in the emergency department to decrease contamination rates. Figure 1 is a high-level SIPOC (supply, input, process, output, customer) diagram outlining the process.

**Define**

Contaminated blood cultures can cost hospitals a lot – both in terms of quality of patient care and monetary expenses. Previous studies of the cost of contamination have shown charges in the range of $2,000 per contaminant to more than $8,000 in excess charges associated with a single contaminated culture.

Applying the conservative $2,000 as a base multiplier means that achieving the institutional target rate of 3 percent would save Navicent Health more than $800,000 each year. Simply meeting the emergency department threshold of 5 percent would save $325,000 a year.

With the cost opportunity defined, the Six Sigma black belt team identified categories for three measures of impact: contamination defects, turnaround time (TAT) and labeling defects.

For contamination defects, evidence-based research supports the belief that contamination can be reduced by using the most effective antiseptic agents while using personnel who are dedicated to drawing blood cultures.

Turnaround time is defined as time intervals between steps within the process that were defined in the Navicent Health laboratory as follows:

- Order time: The time the physician or designee enters the order into the hospital information system
- Collect time: The time the blood culture specimen is collected from the patient
- Receipt time: The time the specimen is received in the laboratory
- Process time: The time the specimen is processed within the laboratory
- Login time: The time the specimen begins the testing phase within the microbiology lab
- Call time: The time a positive blood culture result is called to the physician or care-giver
- Final (result) time: The time the result is posted and all work is completed

Labeling defects include specimens submitted with an unspecified sample collection site, specimens that lack a time of collection or specimens that don’t have the collector’s identification. All are considered defective and incomplete.

The voice of the customer was determined by soliciting feedback through several focus groups that included patients and front-line staff, along with a survey of staff and physicians. The feedback was then refined and extracted to determine which elements were critical to quality (CTQ).

**FIGURE 1**

The view from above

This high-level SIPOC diagram outlines the blood collection process a Navicent Health lean Six Sigma team tackled for improvement.

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**SIPOC**

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Inputs</th>
<th>Process</th>
<th>Outputs</th>
<th>Customers</th>
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<tbody>
<tr>
<td>Patients</td>
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<td>Patients</td>
</tr>
<tr>
<td>Physicians</td>
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<td>Phlebotomy</td>
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<td>Pharmacy</td>
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<td>Reference tests</td>
<td></td>
<td></td>
<td>Reference tests</td>
<td>Infection control</td>
</tr>
<tr>
<td>Blood labeled and sent to the core laboratory for processing</td>
<td></td>
<td></td>
<td>Blood labeled and sent to the microbiology lab; positive results called to RN / MD</td>
<td>Laboratory</td>
</tr>
<tr>
<td>Final cultures reported with identification; negative cultures held 5 days for rule-out</td>
<td></td>
<td></td>
<td></td>
<td>State epidemiology</td>
</tr>
</tbody>
</table>

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Patient presents in ED; physician orders blood cultures to be drawn if indicated by disposition

ED tech collects cultures; RN or MD collects if port or line draw; Phlebotomy for backup if needed

Blood labeled and sent to the microbiology lab; positive results called to RN / MD

Final cultures reported with identification; negative cultures held 5 days for rule-out