

## Hand Hygiene

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Automated Surveillance for Catheter-Associated Bloodstream Infections Outside of the Intensive Care Unit

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### Background

Manual surveillance for catheter-associated bloodstream infections (CABSI) by an infection control specialist is time consuming and often limited to Intensive Care Units (ICUs). Automated electronic surveillance by integration of existing microbiology and pharmacy databases with data regarding central-venous catheter (CVC) usage offers a more efficient and timely method of surveillance.

### Objective

To compare electronic CABSI surveillance to manual chart review surveillance outside of the ICU.

### Methods

Patients with a positive blood culture in four non-ICU wards at Barnes-Jewish Hospital between July 1, 2005 and June 30, 2006 were evaluated. Patient demographics, microbiology, pharmacy, and CVC usage data were collected manually by chart review. Electronic CABSI surveillance data was obtained through the medical informatics database. Investigators used Centers for Diseases Control and Prevention National Nosocomial Infection Surveillance System definitions to determine "true" CABSI for chart review data. For each positive blood culture, simple rules were applied to the electronic data to predict presence or absence of a CABSI. The rules were: (1) culture positive > 48 hours after admission; (2) organism was not a common skin contaminant OR was either confirmed by a duplicate culture within 5 days or was treated with vancomycin; (3) organism was not a coagulase-negative staphylococcus (CNS); (4) patient had a CVC; (5) organism was grown from a wound, urine, respiratory, sterile, or non-sterile site after positive blood culture. Sensitivity, specificity, predictive values, and Pearson's correlation were calculated for various rule sets, using manual chart review as the reference standard.

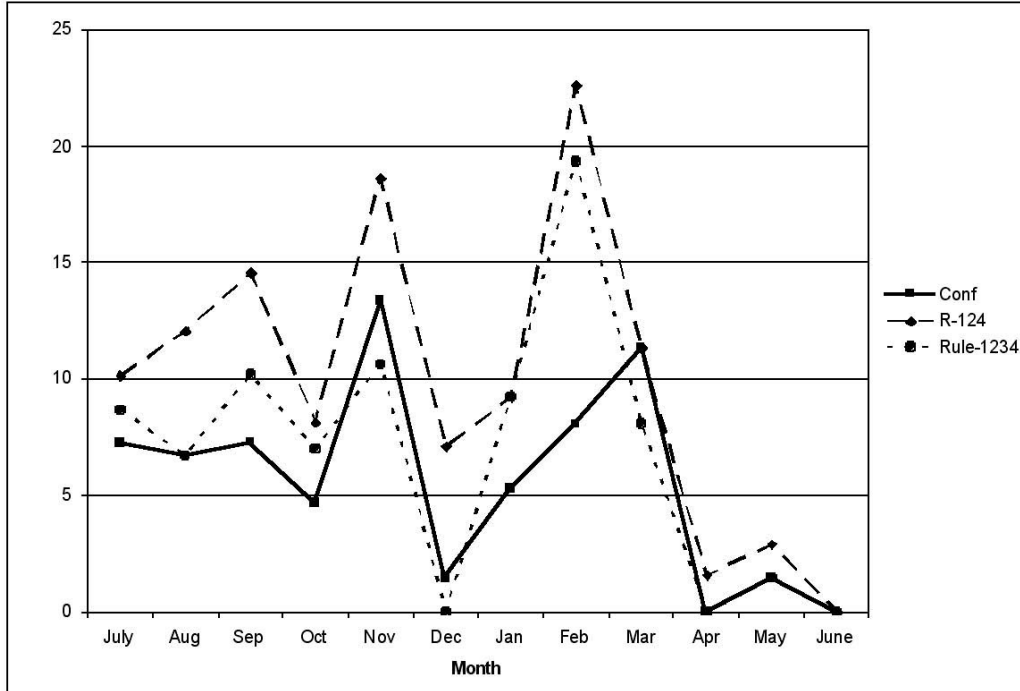
### Results

During the study period, 324 positive blood cultures from 217 patients were evaluated. Forty-seven (15%) CABSI were confirmed by manual chart review (5.7 CABSI per 1,000 central line-days). Together, rules 1, 2, and 4 had the highest sensitivity (85.1%) (Table 1), though CABSI were overpredicted compared to manual chart review (Figure 1).

**Table 1. Performance of Alternative Methods for CABSI Prediction**

Rules	Predicted BSIs N (%)	Sensitivity %	Specificity %	PVP %	PVN %	Pearson's Correlation
124	83 (25.6)	85.1	84.5	48.2	97.1	.561
1234	57 (17.6)	70.2	91.3	57.9	94.8	.569
1245	6 (1.9)	4.3	98.6	33.3	85.8	.073
12345	6 (1.9)	4.3	98.6	33.3	85.8	.073

**Figure 1. Monthly CABSI Rates Determined by Manual Chart Review and Prediction Rules**



Addition of rule 5 to the prediction rules drastically increased specificity and decreased sensitivity (Table 1).

#### Conclusions

Although these prediction rules need refinement, electronic surveillance rates accurately reported CABS I trends. Automated CABS I rate estimation has the ability to provide cost- and time-efficient surveillance outside of the ICU, where surveillance is currently non-existent.