Time from Specimen Collection to Culture and Susceptibility Report Completion for *Staphylococcus aureus*: An Opportunity for Healthcare Quality Improvement

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ABSTRACT

Background: A central component of antimicrobial stewardship is the timely reporting of culture and antibiotic susceptibility results so that clinicians can select appropriate treatments. Non-culture based molecular determinants of antibiotic resistance genes are now commercially available and could be used to aid in this process, with the potential to improve clinical outcomes.

Methods: *Staphylococcus aureus* culture and susceptibility results (methicillin susceptible [MSSA] and resistant [MRSA]), were evaluated in five acute care facilities of the Veterans Affairs New England Healthcare System. Using specimens collected from January 2003 through December 2010, we calculated the time between the collection date and the bacterial report completion date. Time trends were analyzed with Spearman correlation and culture site differences with Wilcoxon rank-sum tests.

Results: Time to culture report completion from collection (Table 1) differed significantly between MSSA and MRSA ($p<0.0001$). Results availability was shortest for urine specimens, which varied significantly from all other culture sites ($p<0.0001$). Non-significant decreases in reporting time were observed over the study period.

Conclusions: The median time to bacterial report completion from collection ranged from 3 to 5 days. Alternative diagnostic modalities are needed to reduce the length of empiric therapy which in turn promotes the switch to organism-targeted therapy. Rapid molecular diagnostic testing in the microbiology laboratory could substantially improve timelines and subsequently facilitate de-escalation of antimicrobial therapy, enhance antimicrobial stewardship, and decrease length of stay.

BACKGROUND

- Antimicrobial stewardship improves clinical outcomes[1-2]
  - Optimize antimicrobial therapy
  - The sooner the culture result is reported, the sooner empiric therapy can be discontinued and organism-targeted therapy can be initiated
- Non-culture based molecular determinants of antibiotic resistance genes are now commercially available[1-3]
  - Improve turnaround time, time to appropriate therapy
  - Shorten length of stay, length of therapy, reduced costs and antimicrobial pressure
- We sought to describe typical result reporting times for *S. aureus* from various clinical culture sites over the past 8 years

METHODS

- Five acute care facilities of the Veterans Affairs New England Healthcare System (CT, MA, ME, RI, VT)
- MSSA and MRSA clinical specimens collected from January 2003 through December 2010
- Time to culture and susceptibility report completion = bacterial report completion date – collection date
- Included feasible lengths for time to culture and susceptibility report completion: censored at 10 days, excluded 811 specimens (4%)
- Time trends analyzed with Spearman correlation and generalized linear mixed models
- Culture site differences analyzed with Wilcoxon rank-sum tests

RESULTS

Table 1. Time to culture and susceptibility report completion, by culture site

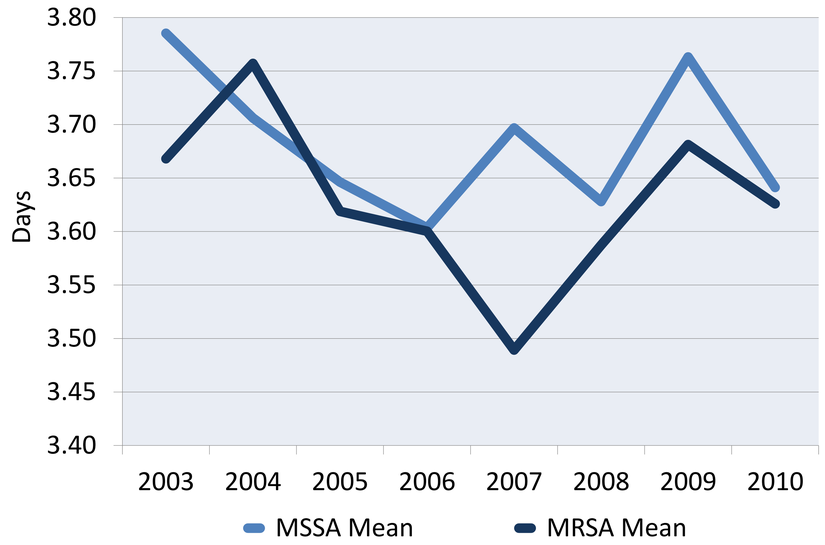
S. aureus, Culture Site	N (%)	Median Days (IQR)	Mean Days (SD)
MSSA	8,152	3 (2-4)	3.7 (1.7)
Blood	651 (8.0%)	4 (3-6)	4.2 (1.7)
Bone	177 (2.2%)	5 (3-7)	4.8 (2.4)
Lung	1,274 (15.6%)	3 (3-4)	3.5 (1.4)
Skin & soft tissue	4,489 (55.1%)	3 (2-4)	3.7 (1.8)
Urine	1,111 (13.6%)	3 (2-4)	3.3 (1.5)
Other / unknown	450 (5.5%)	3 (2-4)	3.7 (1.8)
MRSA	10,724	3 (3-4)	3.6 (1.7)
Blood	903 (8.4%)	4 (3-6)	4.5 (1.9)
Bone	209 (1.9%)	4 (3-6)	4.7 (2.2)
Lung	3,294 (30.7%)	3 (2-4)	3.4 (1.5)
Skin & soft tissue	4,062 (37.9%)	3 (3-4)	3.8 (1.8)
Urine	1,829 (17.1%)	3 (2-4)	3.2 (1.4)
Other / unknown	427 (4.0%)	3 (3-5)	3.9 (1.8)

Abbreviations: IQR, interquartile range; SD, standard deviation.

- Due to the large sample size, small differences in time to culture report completion from collection were found to be significant
  - MSSA versus MRSA, between culture sites
- Small, non-significant decreases in reporting time were observed over the study period
  - MRSA: modeled decrease of 0.9% per year, $p=0.09$
- Variations were observed by facility, with lower culture volume facilities having shorter report completion times

RESULTS

Figure 1. Time to culture and susceptibility report completion, by year



CONCLUSIONS

- Median time to bacterial report completion from collection ranged from 3 to 5 days
- Promote switch to organism-targeted therapy from empiric therapy, decreasing length of empiric therapy
  - Need alternative diagnostic modalities
- Rapid molecular diagnostic testing in the microbiology laboratory could substantially improve timelines
  - Facilitates de-escalation of antimicrobial therapy
  - Enhances antimicrobial stewardship
  - Decreases length of stay

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