A Cultured Discussion: A Review of Blood Culture Utilization

Name: Ayal Levi, MD. Travis Rinderle, DO.

Introduction:

Blood cultures are a staple of medical practice; viewed as relatively non-invasive, cheap, and reliable. They remain a common diagnostic tool in the emergency department, internal medicine floor, and intensive care unit. The clinical refrain of “culture if spikes” echoes during sign-out. Nevertheless, its true utility and complications remain unclear. In this abstract we present a review and analysis of blood culture data from a community hospital.

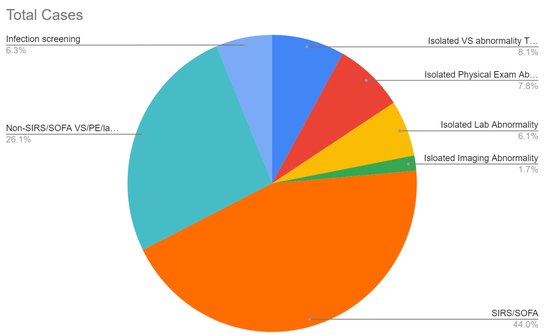
Methods:

Retrospective review of 608 patient charts from 2019 at Saint Joseph Hospital. Evaluated initial indication for blood cultures per physician note, physical, vitals, and lab values. Blood culture results were grouped according to: vital sign, lab value, physical exam finding, a combination of the aforementioned, or SIRS/qSOFA.

Results:

13% of the blood cultures were positive. The most common principle diagnosis was sepsis due to E. coli, MSSA, MRSA, and unspecified organism. 44% of the blood cultures were for SIRS/qSOFA criteria, with 20% being positive. 26.1% were for two or more of the following; a vital sign, physical exam, lab, or imaging finding, with 10.1% being positive. 26% consisted of isolated findings within those same categories with 10.3% positive. 6.3% of findings were documented as infection screening with 2.3% turning positive.

	Isolated VS abnormality TOTAL	Isolated Physical Exam Abnormality or AMS	Isolated Lab Abnormality	Isolated Imaging Abnormality	SIRS/SOFA	Non-SIRS/SOFA VS/PE/lab/imaging combinations	Infection screening	OVERALL
Total Cases	49	47	37	10	266	158	38	608
BCX POS	1	4	4	2	51	16	1	79
BCX NEG	48	43	33	8	214	140	36	525
Percent Positive	2.04%	8.51%	10.81%	20.00%	19.17%	10.13%	2.63%	12.99%



Discussion:

In our review, we found that sepsis physiology was the greatest predictor of positive blood cultures. Isolated abnormalities were shown to be poor predictors. Our study resulted in higher positive blood culture results than the national average, suggesting an elevated false positive rate.

Physicians will continue to rely on blood cultures to guide the intensity and duration of treatment, which will have large impacts on hospital resource utilization. Based off of our data, blood cultures, despite their inherent “low-cost,” should not be considered standard part of every work-up. Instead, blood cultures are most likely to be positive when a patient displays sepsis physiology or has multiple laboratory/clinic indicators, i.e. “sick at the bedside.” Physicians should consider potential false-positives and subsequent impact on patient care.

The cost of a single blood culture at our institution totals $56. With a 25% reduction in blood cultures there would be a reduction in cost totaling approximately $80,000 annually. Given that false positive cultures increase hospital length of stay, a 25% reduction would lead to annual savings of approximately $1 million dollars. More importantly, it would save patients unnecessary medical treatment.

With our review, we identified several conditions that are likely to result in a positive test. This data, despite its limitations, would be useful in guiding clinical practice. Sepsis physiology or evident clinical illness should prompt blood culture collection. There are patient and cost savings associated with a reduction in blood culture utilization for other scenarios. Further research is needed to identify clinical guidelines for proper utilization.

References:

1. Bates DW, Cook EF, Goldman L, et al. Predicting bacteremia in hospitalized patients: a prospectively validated model. Ann Intern Med. 1990;113:495-500.
2. Alahmadi YM, Aldeyab MA, McElnay JC, et al. Clinical and economic impact of contaminated blood cultures within the hospital setting. J Hosp Infect. 2011;77:233-6.
3. Bates DW, Goldman L, Lee TH. Contaminant blood cultures and resource utilization: the true consequences of false-positive results. JAMA. 1991;265:365-369.
4. Perl B, Gottehrer NP, Raveh D, Schlesinger Y, Rudensky B, Yinnon AM. Cost-effectiveness of blood cultures for adult patients with cellulitis. Clin Infect Dis. 1999 Dec;29(6):1483-8. doi: 10.1086/313525. PMID: 10585800.
5. B.P. Geisler a,b, N. Jilg c,d, R.G. Patton e, J.B. Pletzsch. Model to evaluate the impact of hospital-based interventions targeting false-positive blood cultures on economic and clinical outcomes. Journal of Hospital Infection. 2019;102:438-444. https://doi.org/10.1016/j.jhin.2019.03.012
6. Linsenmeyer K, Gupta K, Strymish JM, Dhanani M, Brecher SM, Breu AC. Culture if spikes? Indications and yield of blood cultures in hospitalized medical patients. J Hosp Med. 2016;11(5):336-340. doi:10.1002/jhm.2541