

Novel Blood Culture Collection Device Reduces False-Positive Blood Cultures, Saves Costs, and Increases Accuracy of Bloodstream Infection Diagnosis

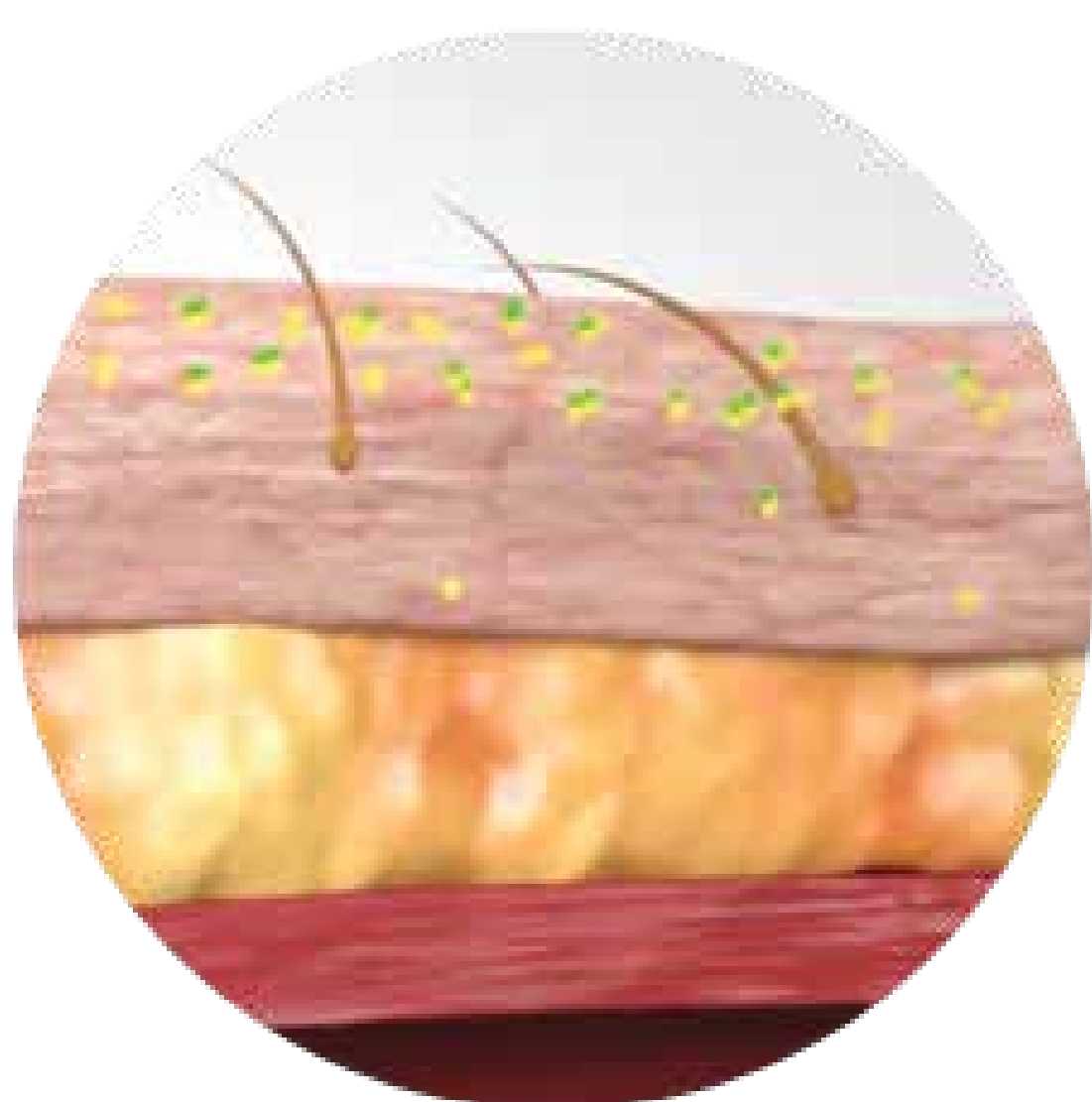


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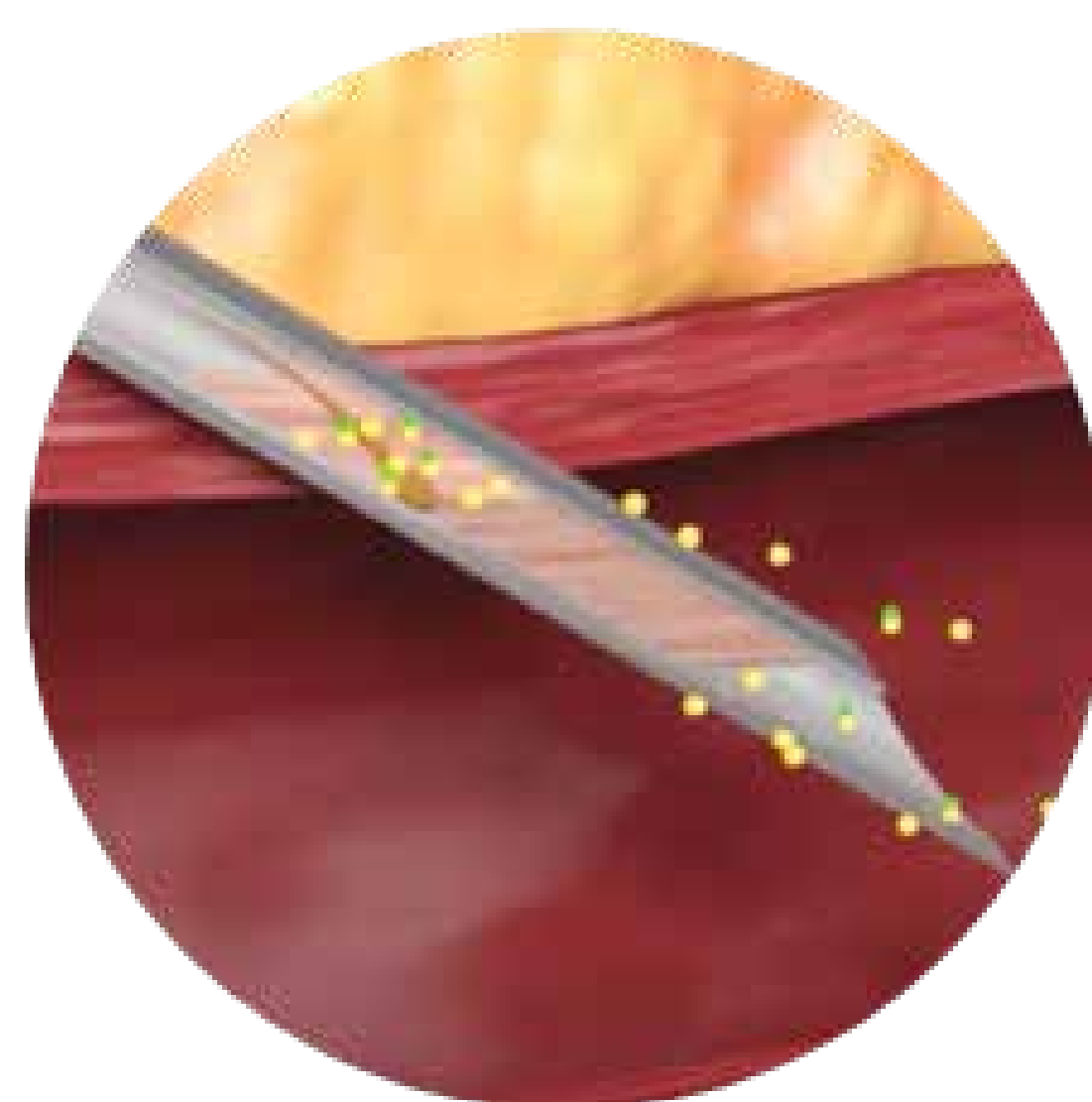
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Background

Blood cultures (BC) are obtained to diagnose the etiology of bacteremia/fungemia and severe sepsis to optimize timely, appropriate antibiotic therapy and antimicrobial stewardship. BCs are often contaminated during collection. False positive BCs (FPBCs) can lead to inappropriate antibiotic use and associated side-effects; excess healthcare costs/labor inefficiency; and increased antibiotic resistance. FPBC rates can be especially high in emergency departments (EDs).



Up to 20% of skin flora remains viable in the keratin layer of the skin even after skin prep.



Skin plugs, when present, will always enter the culture specimen bottle and commonly will contain microorganisms.

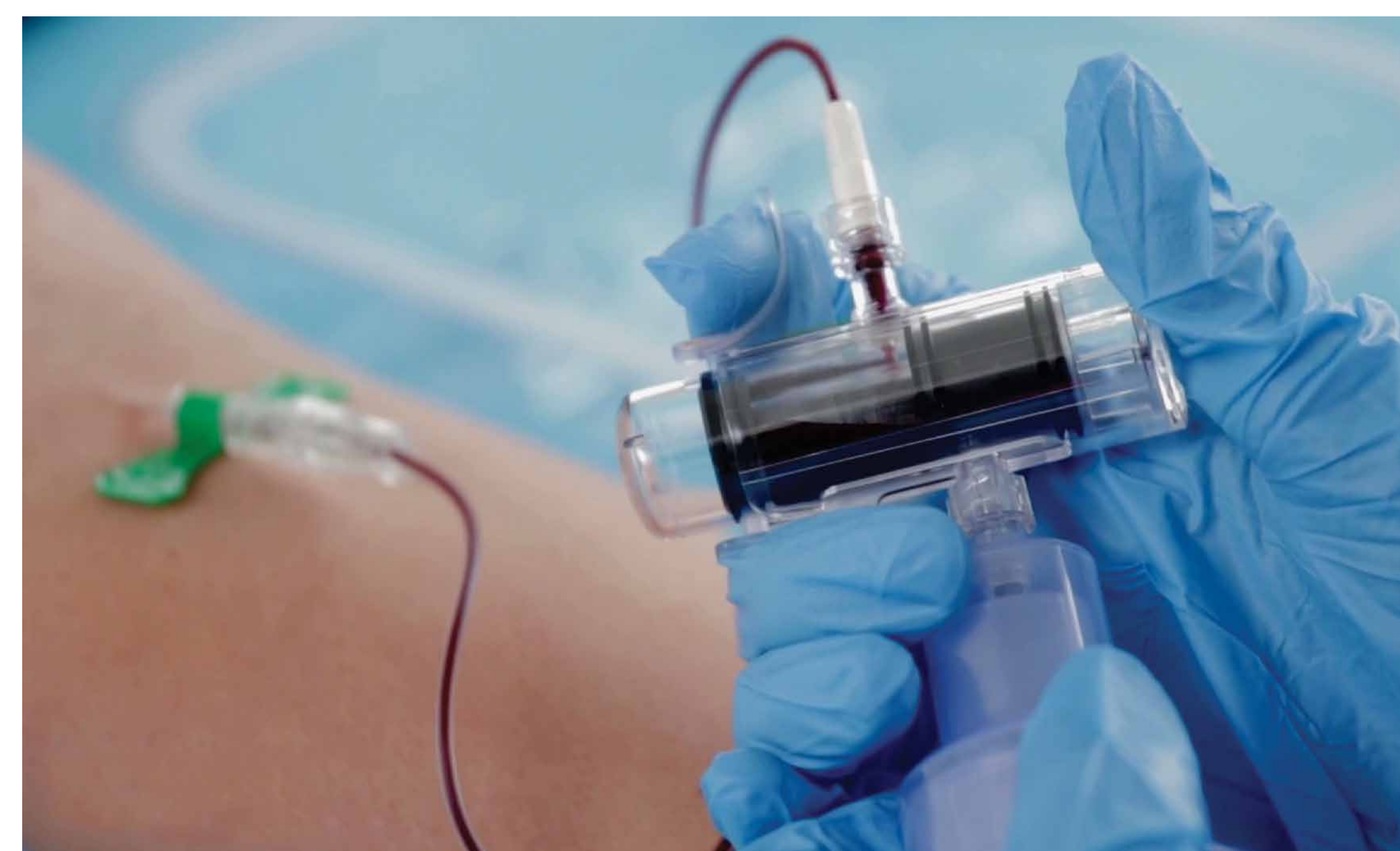
A novel mechanical initial specimen diversion device (ISDD) can minimize FPBCs by diverting, sequestering and isolating the initial 2.0 mL of blood, which can contain contaminating flora from skin fragments created by the venipuncture. The ISDD (Steripath, Magnolia Medical Technologies, Seattle, WA) then collects the culture specimen through an independent second sterile pathway that is hypothetically contamination-free.

Rupp et al. showed that use of this ISDD in their adult ED resulted in a significant decrease in their already low FPBC rates without affecting the detection of true bacteremia and would have resulted in cost avoidance of \$1.8 million if used hospital-wide.¹

Objectives

The primary Adult ED in our 713-bed academic medical center draws an average of 4,000 BC per year (range 3,125–4,673 for years 2015–2017). Starting in 2009, we instituted

multidisciplinary education and semi-real-time feedback that reduced FPBC from 7.1% in 2009 to 4.0% in 2012. FPBC rates climbed slowly to 4.6% by 2015. In 2015, we sought further reductions by trialing the ISDD. Following initial reduction with the ISDD, we assessed if the decreased rate could be sustained.



The mechanical ISDD closed-system can minimize FPBCs by diverting, sequestering and isolating the initial 2.0 mL of blood.

Methods

Nurses dedicated to the Adult ED were trained by ISDD company trainers for one month on how to use the device. This was accompanied by renewed training on the institutional blood culture collection policy. Some Adult ED nurses were also trained to be trainers for new ED staff. Nurses temporarily assigned to the Adult ED and other non-RN personnel assigned to the ED were not trained to use the ISDD, providing an ongoing internal control.

Once trained, ED nurses performed BC collections, using their best judgment as to whether to use the ISDD with given patients; compliance was tracked. FPBC rates for ISDD-obtained BCs were compared to rates for non-ISDD-obtained BCs. Device usage cost-effectiveness was calculated using \$4,850 as additional cost per FPBC per hospitalized patient.¹

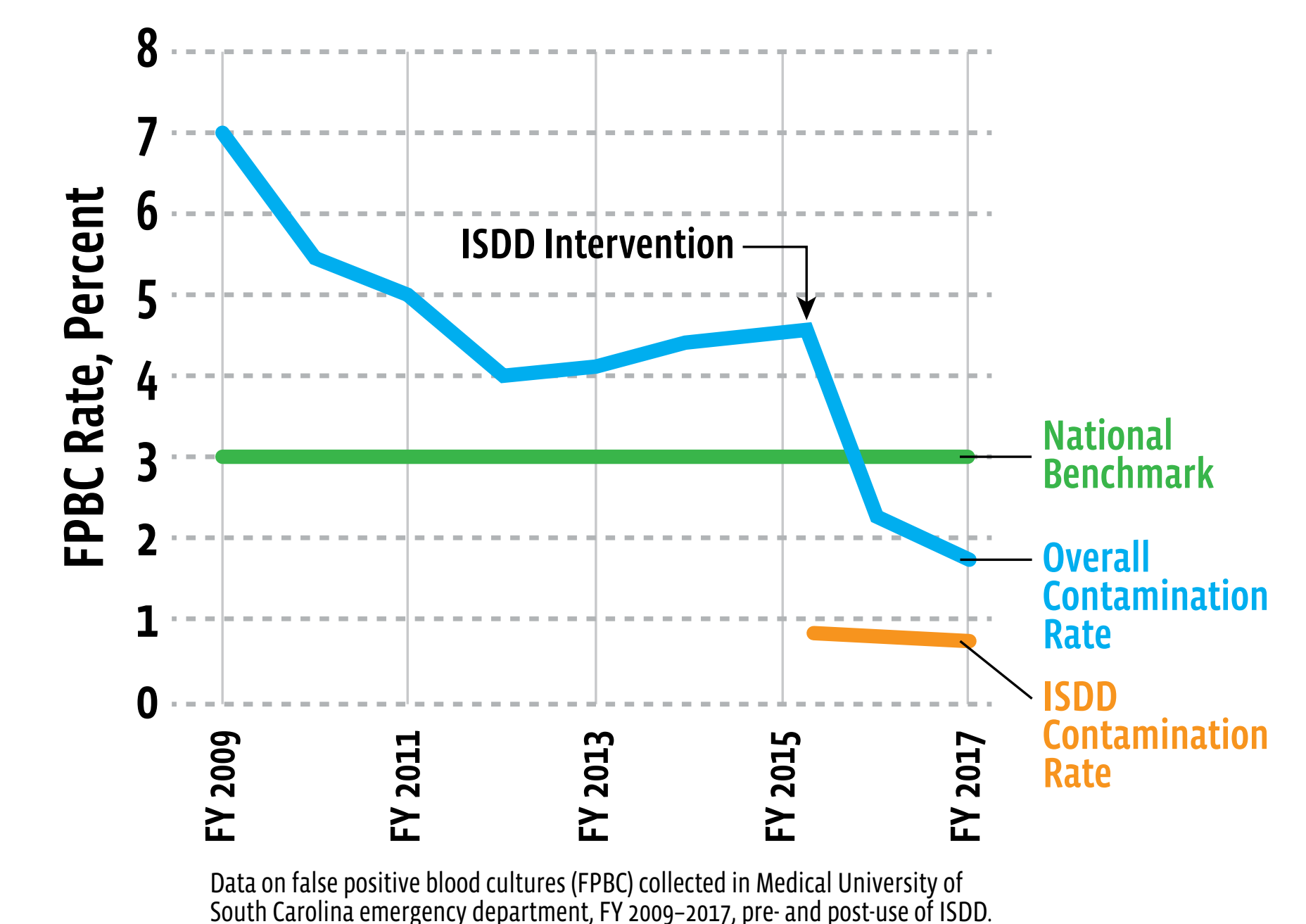
Results

ISDD implementation began in November 2015, and the FPBC rate dropped precipitously and stayed below 1% for the first 8 months (June 2016). For the following 12 months (through June 2017), the average FPBC rate with the ISDD was 0.91%, a nearly four-fold reduction from the non-ISDD rate (3.45%) during the same time period. Using Rupp's conservative estimate for

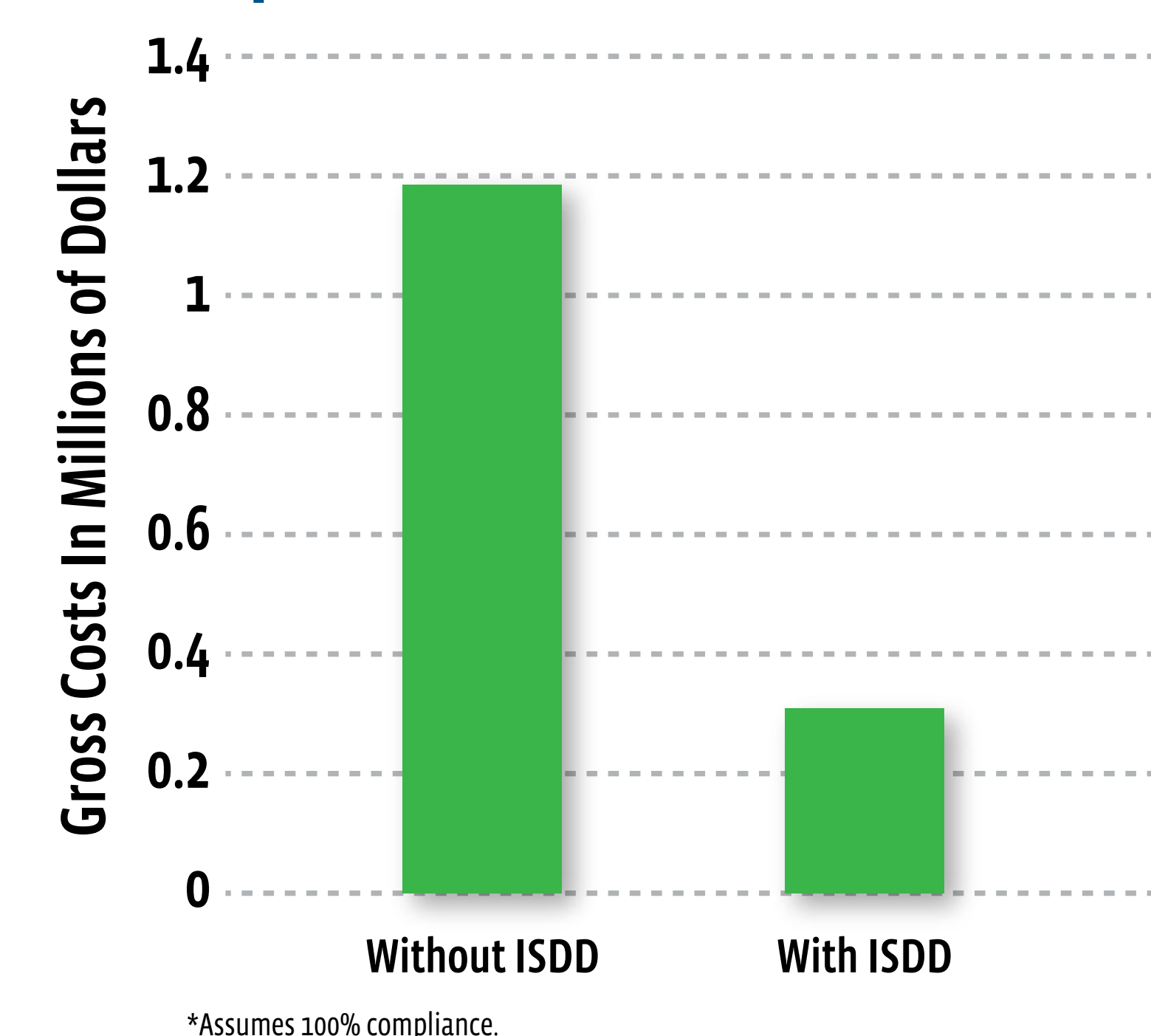
avoided FPBCs, ISDD use would predict cost savings of \$744,955 for the study period if there were 100% compliance.

Because some patients were uncooperative or “difficult to stick,” the average compliance rate for ISDD use in our ED was 66% over the 20-month time period. Nurses reported the ISDD was easy to use once “hand memory” developed.

Impact of Measures to Reduce Incidence of FPBC in Adult ED



Impact of ISDD on Reducing Hospital Costs* for FPBCs



Conclusions and Implications

ISDD use decreased FPBCs below 1% in a busy adult ED, well below the national benchmark of 3%, and the reduction in FPBC has been sustained for 20 months. Reducing FPBCs has led to reduced related costs and more efficient use of staff time, while helping to comply with national/international efforts to improve antibiotic stewardship and patient safety.

References

1. Rupp ME, et al. Clin Infect Dis. 2017;65:201-05.