

# Unveiling the Hidden Costs:

## THE CLINICAL AND ECONOMIC IMPACT OF FALSE-POSITIVE BLOOD CULTURES

Tuesday, January 21, 2025



# Guest Speakers



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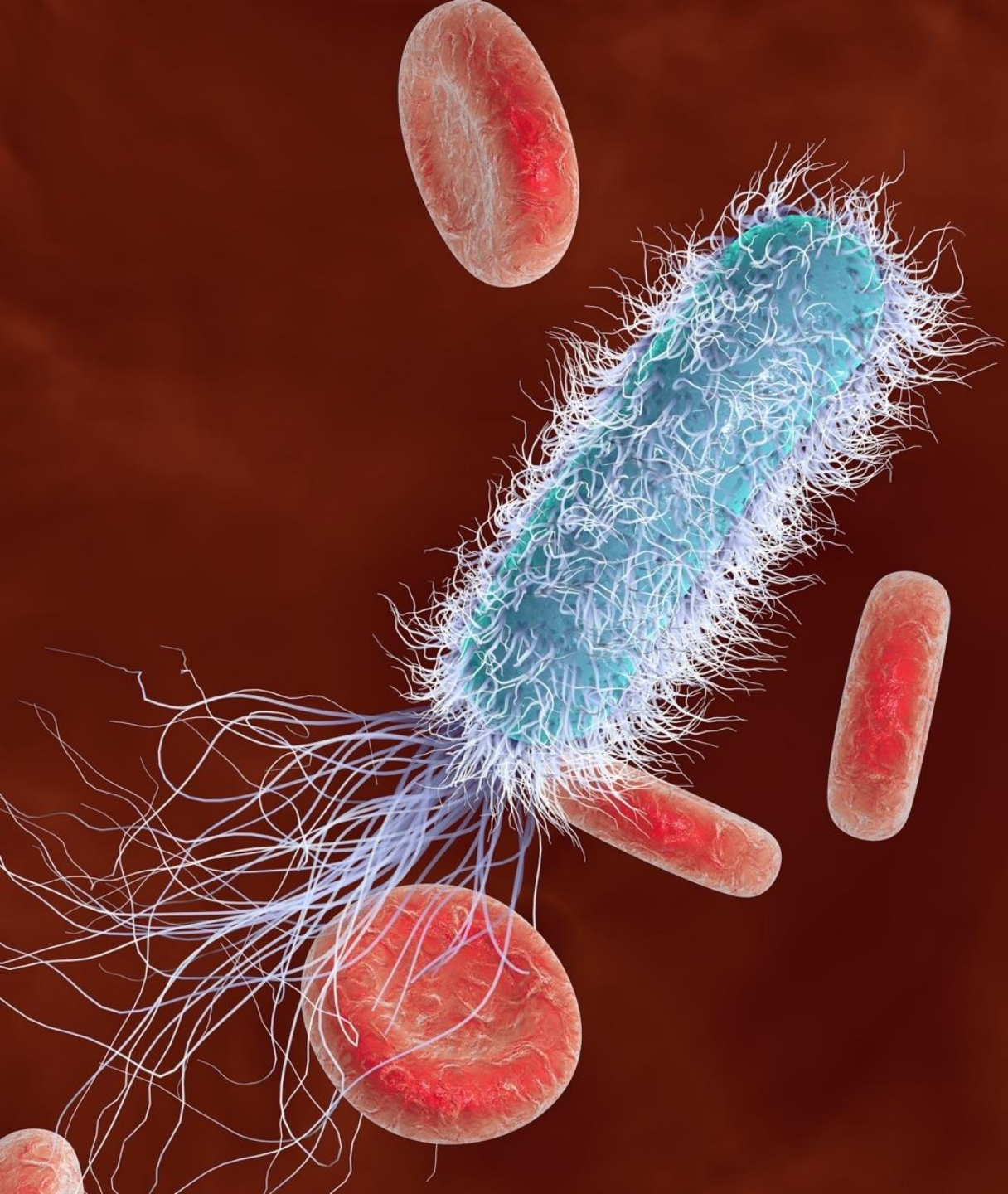
# Learning Objectives

- ▶ Provide a brief overview of the downstream negative impacts of blood culture contaminations
- ▶ Review the pilot outcomes of blood culture contamination reduction with an Initial Specimen Diversion Device<sup>(R)</sup>
- ▶ How the study conducted at a large, multi-hospital health system demonstrated the irrefutable impact, clinically and economically, of patients that received a false positive blood culture result in comparison to patients who received a true negative result



# The Problem & Challenge

Blood Culture Contamination



Sepsis is the **#1** cause  
of **death, readmissions,**  
and **costs** in U.S. hospitals

*... and blood cultures remain the  
gold standard for diagnosing this  
disease*

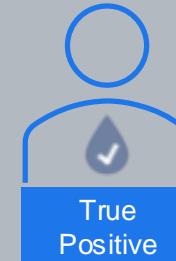
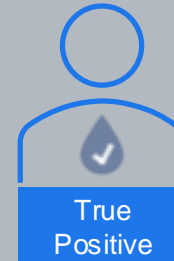
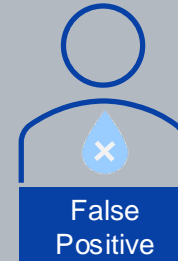
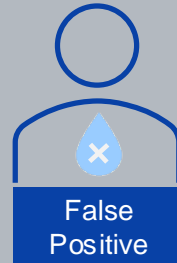
<sup>1</sup>Liu V, Escobar GJ, Greene JD. Hospital deaths in patients with sepsis from 2 independent cohorts. JAMA. 2014;312(1):90-92. doi:10.1001/jama.2014.5804.

<sup>2</sup>Weiss AJ, Jiang HJ. Overview of clinical conditions with frequent and costly hospital readmissions by payer, 2018. HCUP Statistical Brief #278. July 2021. Agency for Healthcare Research and Quality, Rockville, MD.

Of all positive blood cultures



2 out of 5 Patients



On average, **40%** to over **50%** of positive blood culture results  
are **FALSE POSITIVE**





# Hospital Economic Implications of False Positive Blood Cultures



## Publication

Attributable  
Incremental Hospital  
Costs

Extended  
Length of Stay

Infection Control and Hospital Epidemiology  
(2022)<sup>1</sup>

\$2,853\*

1.3

Journal of Hospital Infection (2019)<sup>2</sup>

\$4,817

2.4

Journal of Clinical Microbiology (2019)<sup>3</sup>

\$4,739

2.0

Journal of Hospital Infection (2011)<sup>4</sup>

\$3,405\*

5.4

Journal of Clinical Microbiology (2009)<sup>5</sup>

\$4,142\*

1+

Journal of Hospital Medicine (2006)<sup>6</sup>

\$3,647\*

3.0

The American Journal of Medicine (1999)<sup>7</sup>

\$6,319\*\*

2.0

Clinical Performance Quality Healthcare (1998)<sup>8</sup>

\$3,962\*

8.4

Journal of American Medical Association (1991)<sup>9</sup>

\$3,303\*

4.5

The American Journal of Medicine (1989)<sup>10</sup>

\$4,431\*

4.2

**Average Cost Per False-Positive Event**

**\$4,162**

**3.4 days**

1. Klucher J, Davis K, Lakkad M, Painter JT, Dare RK. Risk factors and clinical outcomes associated with blood culture contamination. Infect Control Hosp Epidemiol. 2022;43(3):291-297. doi:10.1017/ice.2021.111. 2. Geisler BP, Jilg N, Patton RG, Pletzsch JB. Model to evaluate the impact of hospital-based interventions targeting false-positive blood cultures on economic and clinical outcomes. J Hosp Infect. 2019;102(4):438-444. doi:10.1016/j.jhin.2019.03.012. 3. Skoglund E, Dempsey CJ, Chen H, Garey KW. Estimated clinical and economic impact through use of a novel blood collection device to reduce blood culture contamination in the emergency department: a cost-benefit analysis. J Clin Microbiol. 2019;57(1):e01015-18. doi:10.1128/JCM.01015-18. 4. Alahmadi YM, Aldeyab MA, McElroy JC, et al. Clinical and economic impact of contaminated blood cultures within the hospital setting. J Hosp Infect. 2011;77(3):233-6. doi:10.1016/j.jhin.2010.09.033. 5. Gander RM, Byrd L, DeCrescenzo M, Hrary S, Bowen M, Baughman J. Impact of phlebotomy-drawn blood cultures on contamination rates and health care costs in a hospital emergency department. J Clin Microbiol. 2009;47(4):1021-4. doi:10.1128/JCM.02162-08. 6. Zhang O, Albert RK. Analysis of strategies to improve cost effectiveness of blood cultures. J Hosp Med. 2006;1(5):272-6. doi:10.1002/jhm.115. 7. Little JR, Murray PR, Traynor PS, Spitznagel E. A randomized trial of povidone-iodine compared with iodine tincture for venipuncture site disinfection: effects on rates of blood culture contamination. Am J Med. 1999;107(2):119-25. doi:10.1016/S0002-9343(99)00197-7. 8. Surdulescu S, Utamsirgh D, and Shekar S. Phlebotomy teams reduce blood-culture contamination rate and save money. Clin Perform Qual Health Care. 1998;6(2):60-2. 9. Bates DW, Goldman L, Lee TH. Contaminant blood cultures and resource utilization. The true consequences of false-positive results. JAMA. 1991;265(3):365-9. doi:10.1001/jama.1991.03460360365. 10. Dunagan WC, Woodward RS, Medoff G, et al. Antimicrobial misuse in patients with positive blood cultures. Am J Med. 1989;87(3):253-9. doi:10.1016/S0002-9343(89)80146-9. \*Adjusted by a 40% cost-to-charger ratio and then inflation adjusted using CPI Inflation Calculator ([https://www.bls.gov/data/inflation\\_calculator.htm](https://www.bls.gov/data/inflation_calculator.htm)) from June year of publication to June 2019. Did not adjust 2022 study given recency. \*\*Inflation adjusted using CPI Inflation Calculator ([https://www.bls.gov/data/inflation\\_calculator.htm](https://www.bls.gov/data/inflation_calculator.htm)) from June 1999 to June 2019.

# Pilot Study Outcome

## Steripath<sup>®</sup> Initial Specimen Diversion Device<sup>®</sup>



# A 6 Month Pilot Using an Initial Specimen Diversion Device<sup>(R)</sup>

Pilot completed in 3 of the EDs within the health system

## The Health System

- 10+ hospitals
- 2,000 staffed beds across the entire system
- >60,000 blood cultures performed annually

## Baseline Contamination Rate

- Pre-Steripath<sup>(R)</sup> baseline contamination rate above the national average of 3%

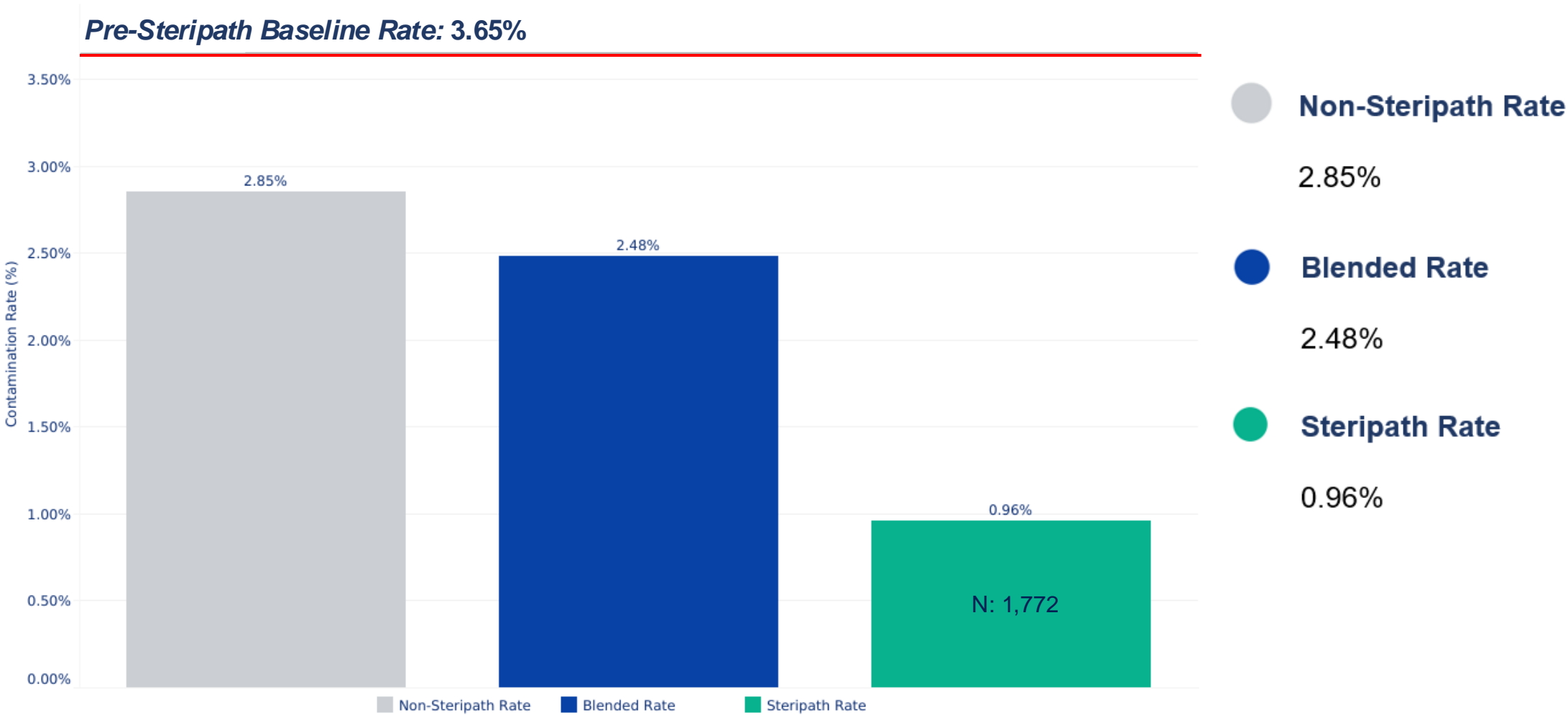
## Pilot Results

- A contamination rate of less than 1%



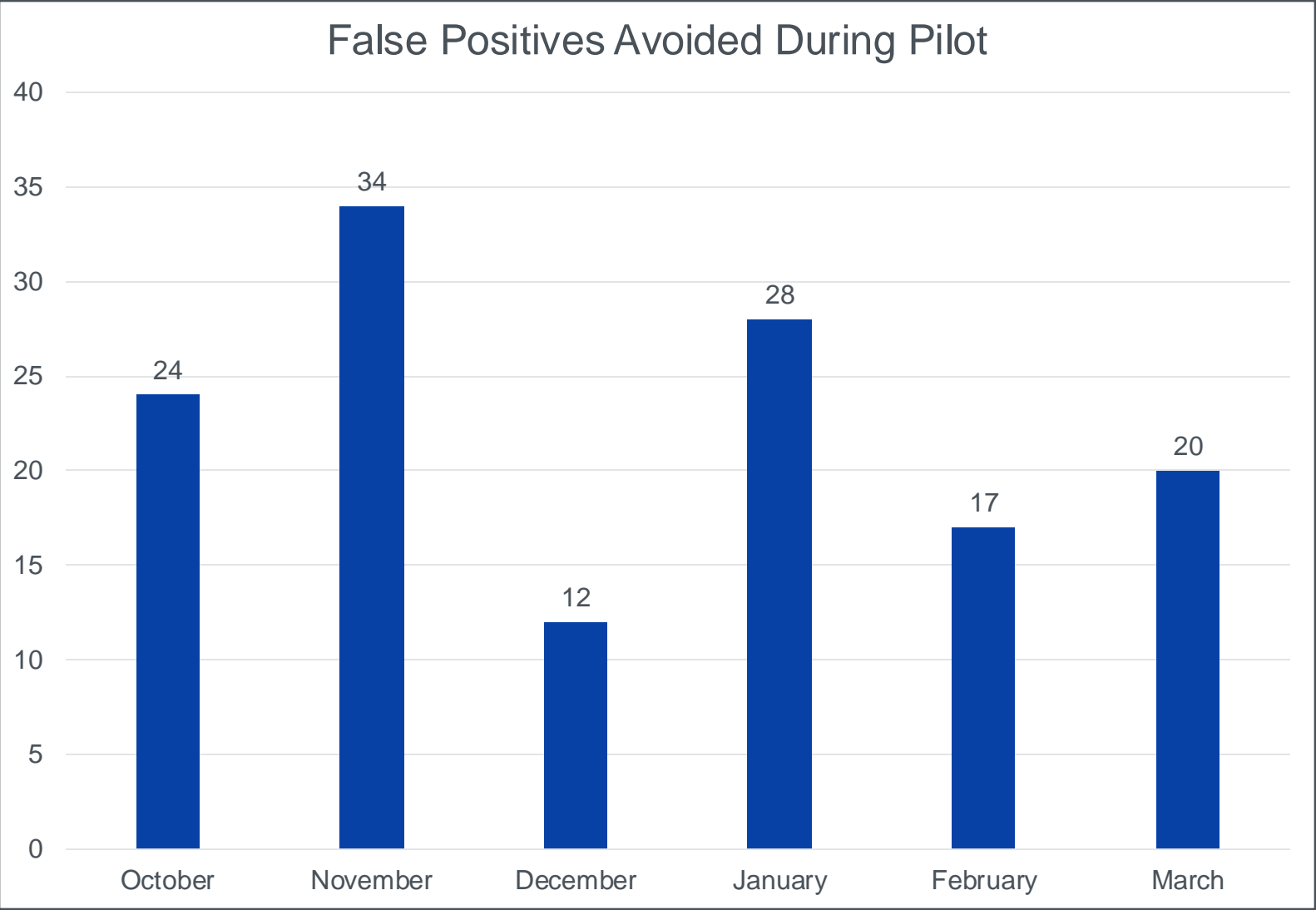
# Blood Culture Contamination Rates

Reduction in Contamination Rates since Implementing Steripath



Non-Steripath Rate: BCC% on draws where Steripath was not used  
Blended Rate: BCC% for both non-Steripath and Steripath draws combined  
Steripath Rate: BCC% for Steripath draws only

# The Patient Impact



**\*Projected # of False Positives**

**Baseline Rate: 3.65%**

**Projected False Positives During Pilot Period: ~331**



**Blended Contamination Rate during Pilot**

**2.48%**



**\*Avoided False Positives during Pilot**

**135 patients**

**59% reduction in false positives from the baseline rate**

*\*Projected # of False Positives calculation: Baseline BCC% \* total blood cultures performed during pilot*  
*\*False Positives Avoided calculation: Projected false positives – (total blood cultures performed during pilot \* pilot blended rate)*

# Pilot Summary

October 1, 2022 – March 31, 2023

- **2.45%** blended rate, **32% reduction** from 3.65% baseline
  - **0.96%** Steripath only rate, **74% reduction**
  - **135** avoided false-positives during pilot period
- **\$561,870** in cost savings based on cost of contamination of \$4,162



*Based on the efficacy proven during the pilot, Steripath would be the catalyst to **< 1.0% BCC** system wide*

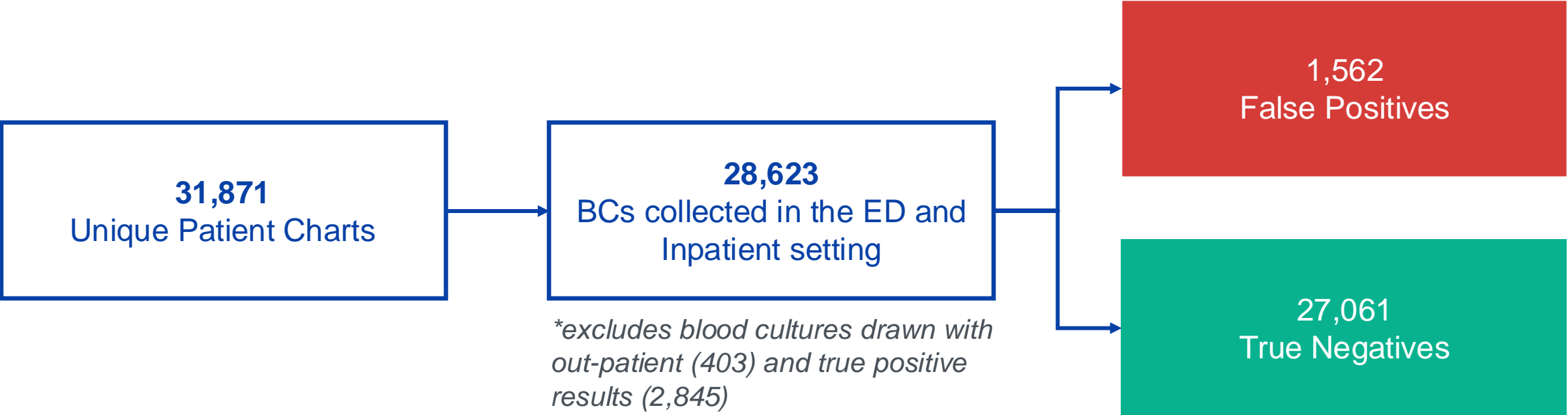


# A Comprehensive Data Analysis of Blood Cultures

12-month study results

January 1, 2023 – December 31, 2023

# Compared False-Positive (*case event*) to True Negative (*control event*)



# Total Profit Loss Per False-Positive



**\$1,617**

Total Profit Loss  
per False Positive

*Each false-positive event incurred an average **total profit loss of \$1,617** to the health system - factoring in both care delivery costs and received reimbursements.*





# Despite higher reimbursement for False Positives, increased cost of care leads to loss of \$940 per patient

<u>Avg Per Event</u>	False-Positive	True Negative	Difference (FP - TN)
Event Count	1,562	27,061	N/A
Avg Total Charges <sup>1</sup>	\$85,774	\$55,979	\$29,795
Avg Total Costs <sup>2</sup>	\$22,267	\$14,478	\$7,789
Avg Total Expected Payment <sup>3</sup>	\$22,048	\$16,007	\$6,041
Avg Total Payment <sup>4</sup>	\$21,327	\$15,155	\$6,172
Margin (Payment - Costs) <sup>5</sup>	<b>-\$940</b>	<b>\$677</b>	<b>-\$1,617</b>

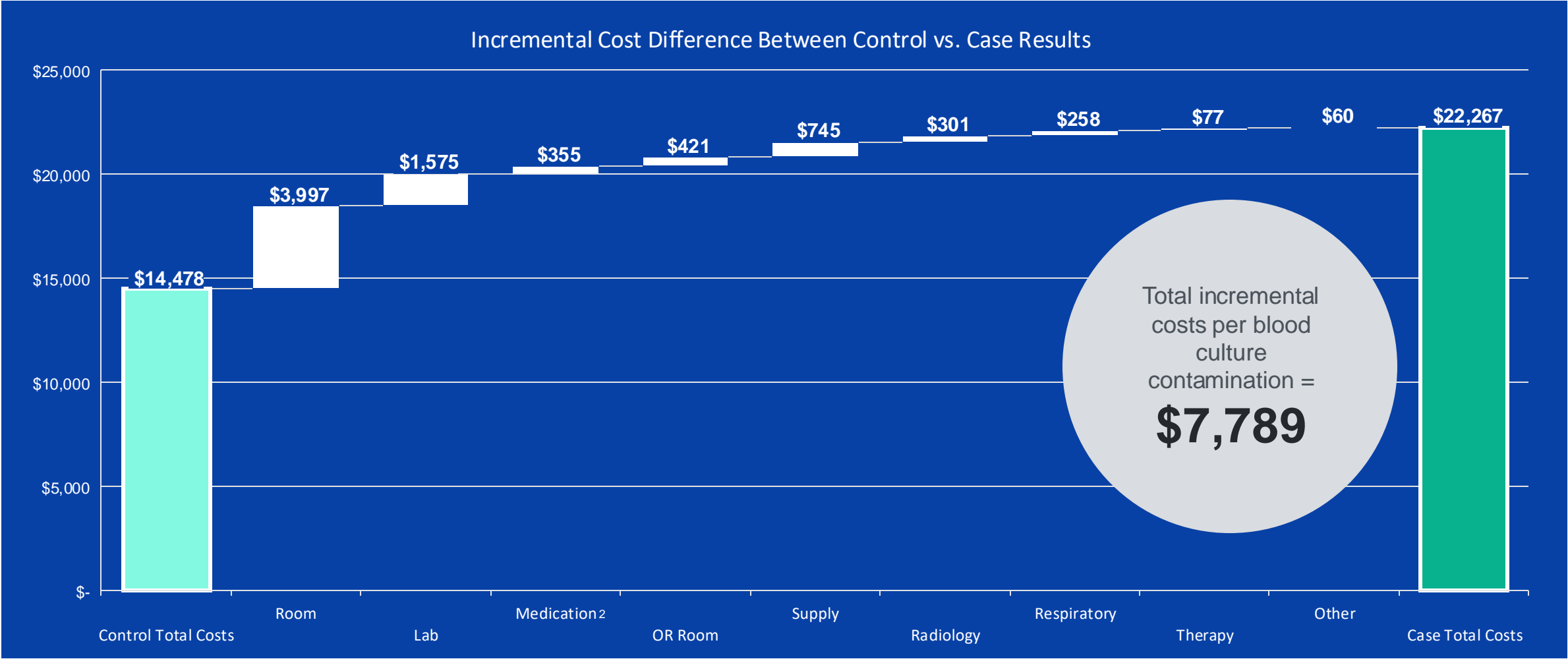
Total lost profit per  
blood culture  
contamination event  
=  
**\$1,617**

<sup>1</sup>Total charges posted to the Hospital Account for the patient encounter during which the blood culture was taken.  
<sup>2</sup>Total costs calculated using a CCR of 0.277, except for medications, whose cost data is stored within Epic.  
<sup>3</sup>Total expected payment based on the expected reimbursement calculated by the contract logic stored within Epic.  
<sup>4</sup>Total payments posted to the Hospital Account (from insurance or self-pay) for the patient encounter during which the blood culture was taken.  
<sup>5</sup>Margin, also referred to as profit, represents the difference between revenue (payments) and costs.



# Blood Culture Contamination False Positive vs. True Negative Result

Costs calculated using the total charges for the account and multiplying by an estimated Cost-to-Charge Ratio of .2771



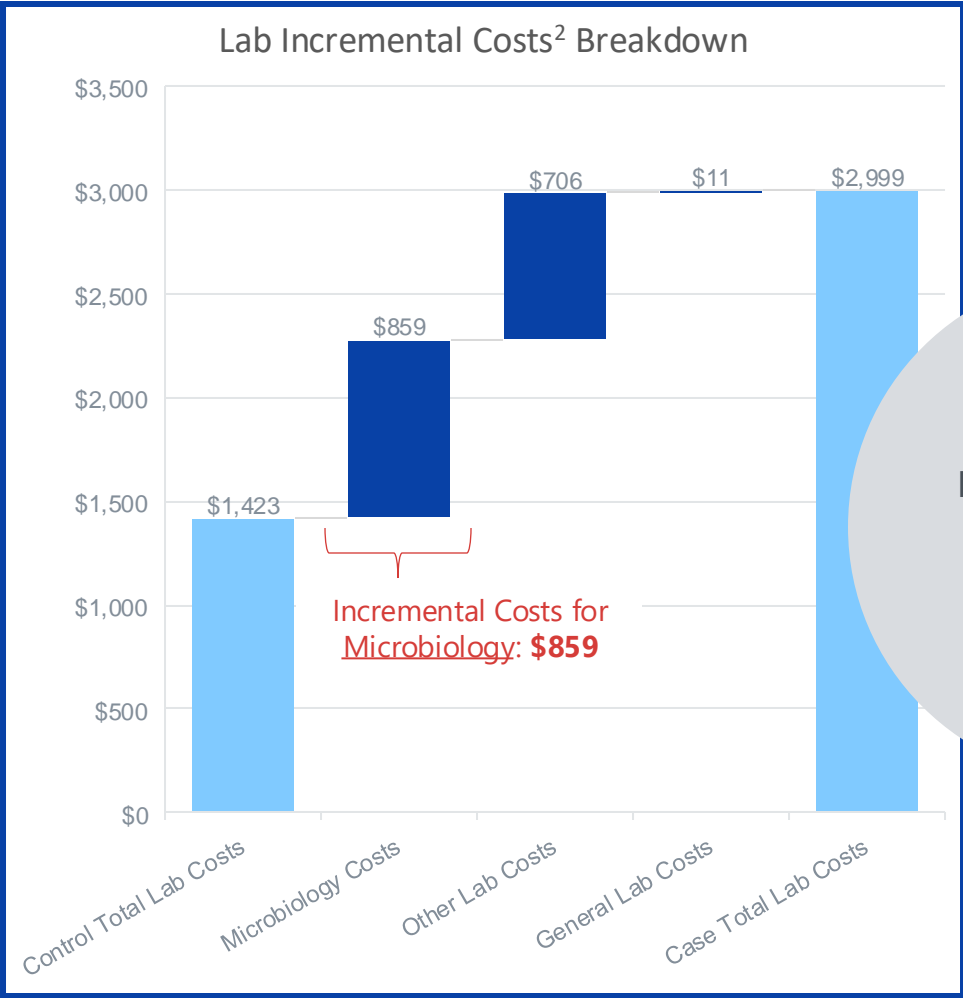
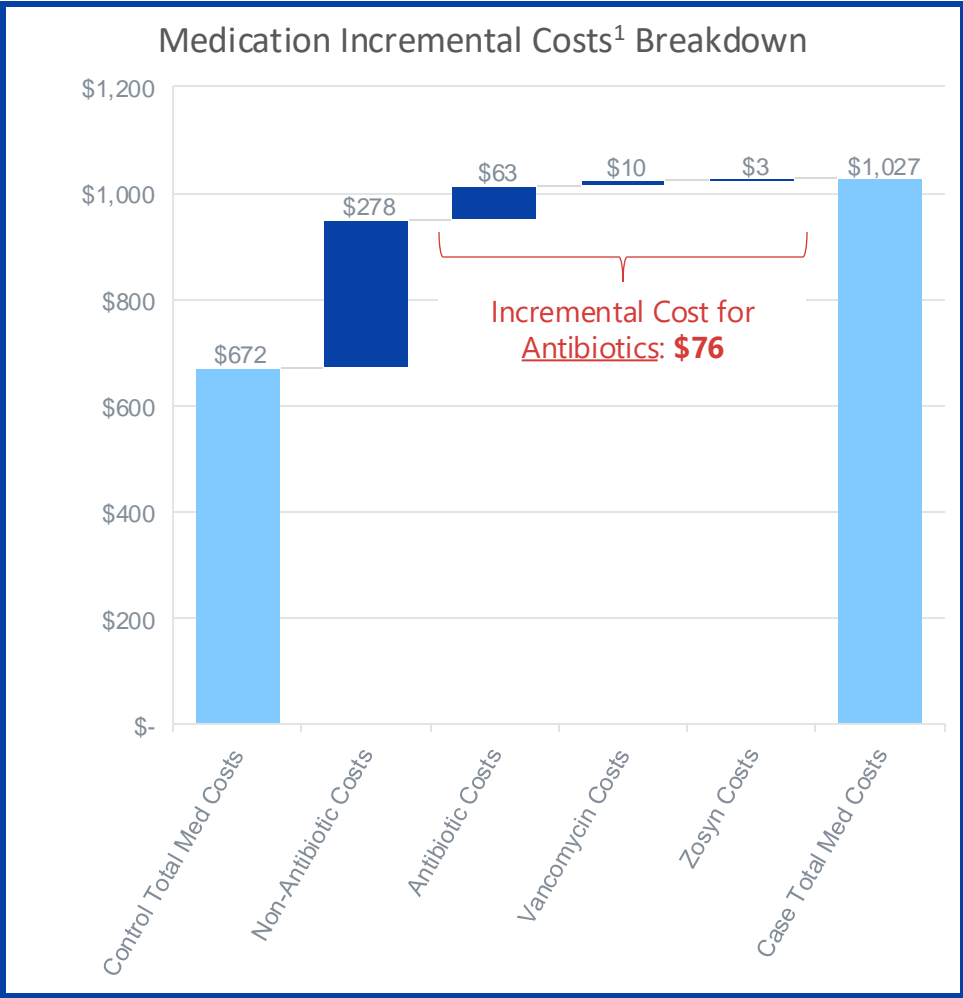
<sup>1</sup>Cost-to-Charge Ratio was estimated based on the FY21 Medicare Cost Report.

<sup>2</sup>Epic stores cost data for medications (whereas other cost data is typically in disparate systems). To achieve maximum precision, medication costs were directly queried the healthcare system's database, which aggregates data from Epic, rather than using the CCR for calculations.



# Hospital Health Blood Culture Contamination Case vs. Control Results

Detailed Breakdown of Lab and Medication Costs Attributable to Blood Culture Contamination



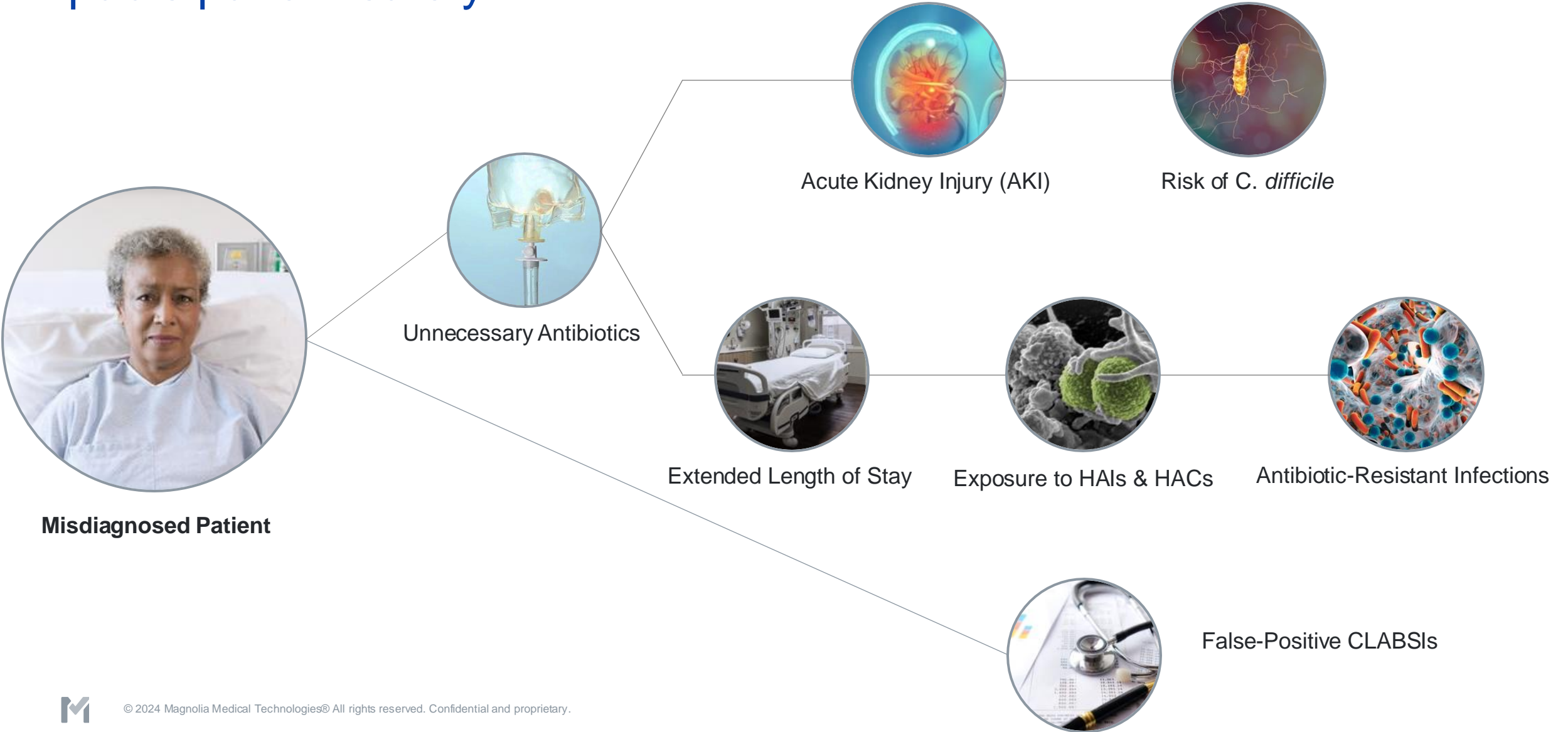
Total incremental  
Antibiotics and  
Microbiology costs  
per blood culture  
contamination =  
**\$935**

<sup>1</sup>Medication costs were directly queried from the Hospital Qlikview database, which aggregates data from Epic, rather than using the CCR for calculations.

<sup>2</sup>Lab costs were determined using a CCR of .277



# Blood culture contamination not only impacts the bottom line but also impacts patient safety



# Questions?



## Contact Cardamom



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## Contact Magnolia Medical Technologies



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