



# Impact of On-Demand Molecular Testing on Effective Infection Prevention Programs

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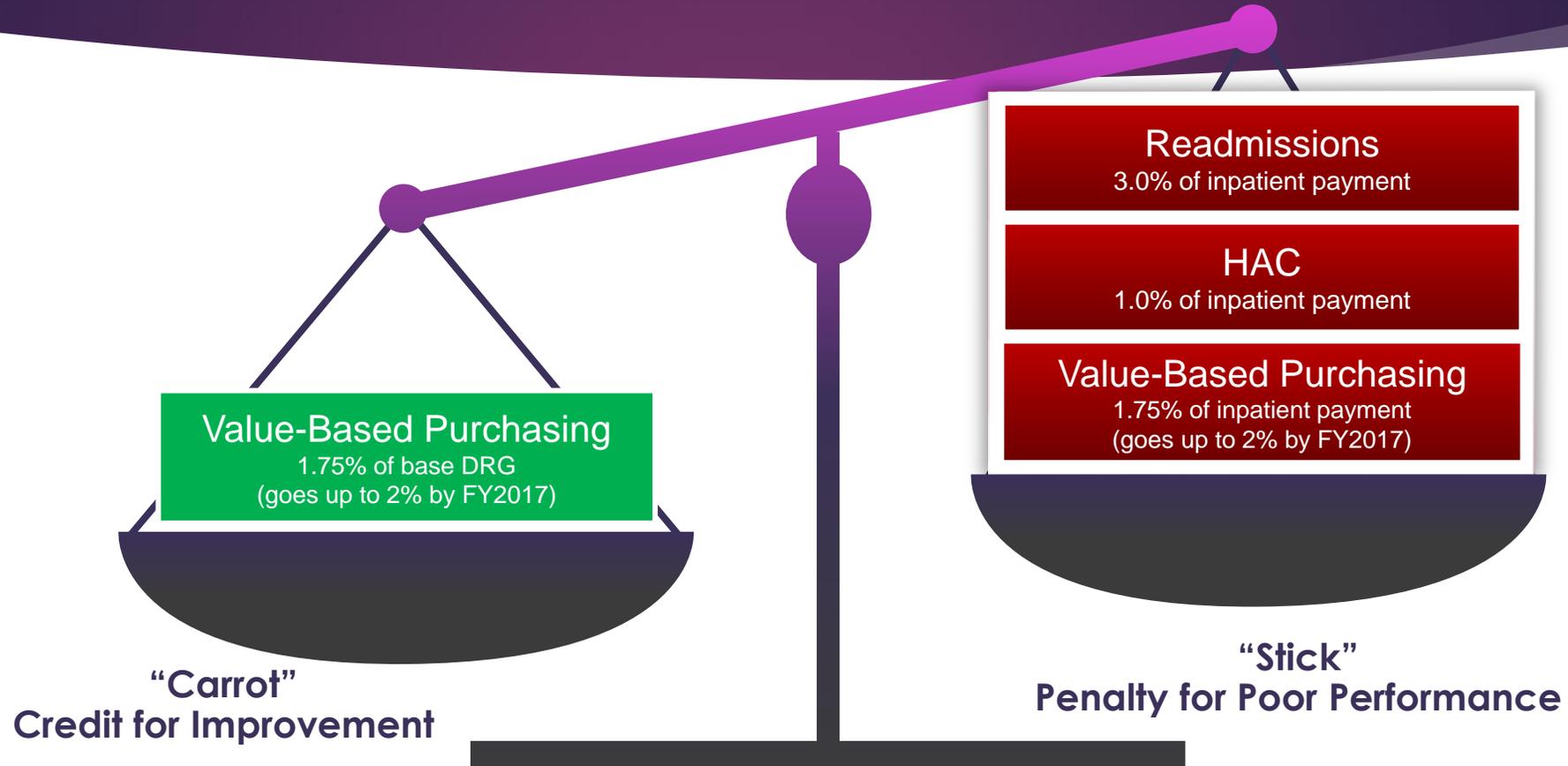
# Institutional Concern About HAIs?



## For Hospital and Health Systems, HAIs Represent Substantial Risk

- ▶ Millions of dollars of revenue potentially at risk
- ▶ Harm to the institution's reputation (publicly reported rates)
- ▶ Exposure to malpractice liability
- ▶ Additional work/tracking for resource-limited infection prevention functions

# CMS Quality Incentive Programs: A Carrot and a Stick



# HACs Are Deadly, Costly, and Generally Not Reimbursed by CMS

Medicare generally refuses to pay the added cost of healthcare acquired conditions (HACs)<sup>1</sup> including:

- ▶ Catheter-associated urinary tract infections (CAUTI)
- ▶ Surgical site infections
  - Coronary artery bypass grafts
  - Bariatric surgery
  - Certain orthopedic procedures

HAI Type <sup>2</sup>	Cost	LOS
Surgical site infections	\$21,000	11
MRSA	\$42,000	23
CLABI	\$46,000	10
MRSA	\$59,000	16
CAUTI	\$900	NR
Ventilator-associated pneumonia	\$40,000	13
<i>Clostridium difficile</i> infections	\$11,000	3

LOS = length of stay; CLABSI = central line-associated bloodstream infections; CAUTI = catheter-associated urinary tract infections; NR = not reported.

1. Boris A. A revenue leak soon turns into flood: how payment penalties for high infection rates could drain hospital finances.

<http://www.beckershospitalreview.com/finance/a-revenue-leak-soon-turns-to-flood-how-payment-penalties-for-high-infection-rates-could-drain-hospital-finances.html>. Accessed November 5, 2015.

2. Zimlichman E, et al. *JAMA Intern Med.* 2013;(173):2039-46.

# Case #1: Presurgical Screening

Patient has elective total knee replacement surgery

Culture-based pre-surgical screening performed 7 days prior to surgery; patient was colonized with *Staphylococcus aureus* (MSSA), but not MRSA

CHG bath ordered for 5 days prior to surgery and nasal mupirocin twice a day

Patient is admitted to the hospital 3 weeks later with a surgical site infection (MRSA)

# What Went Wrong? Low culture sensitivity missed MRSA – no vancomycin ordered

MRSA	Sensitivity <sup>1</sup>	Specificity <sup>1</sup>
Culture with selective media (24-hour test)	62%	99.5%
Culture with selective media (48-hour test)	78%	98%
Same-day PCR	98%	98%

## MSSA<sup>2</sup>

- Bathe with CHG for 5 days prior to surgery
- Administer intranasal mupirocin decolonization treatment
- Administer antibiotic prophylaxis (cefazolin)

## MRSA<sup>2</sup>

- Bathe with CHG for 5 days prior to surgery
- Administer intranasal mupirocin decolonization treatment
- Administer antibiotic prophylaxis (cefazolin + vancomycin)

1. Olchanski N, et al. Infect Control Hosp Epidemiol. 2011;(32):250-7.

2. Optimizing Pre-Operative Antibiotic Prophylaxis for Cardiac and Orthopedic Procedures Study Protocol (STOP SSIs Project.)

# What's the Impact?

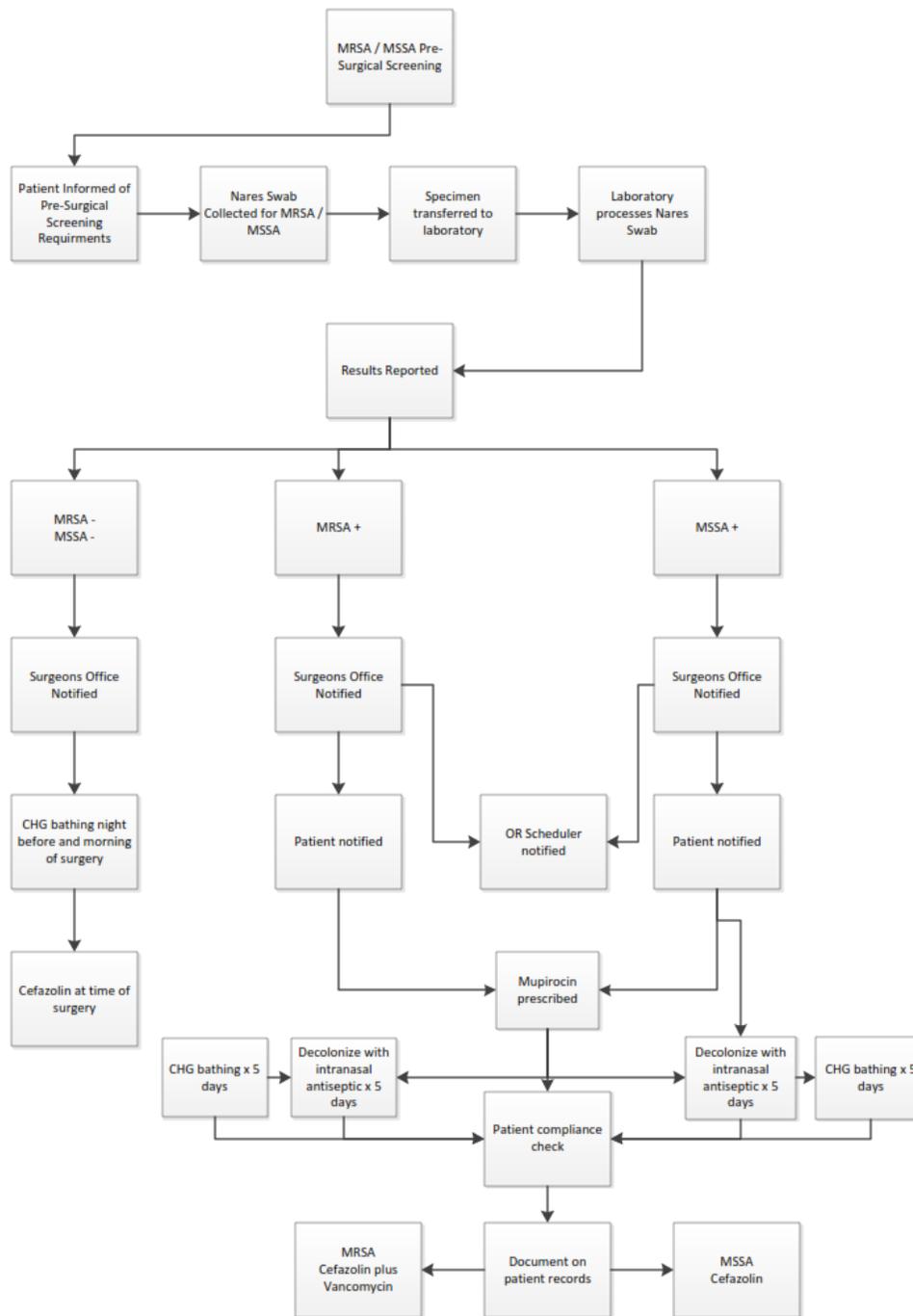
- ▶ As a result of this post-surgical complication, the site may be subject to associated reimbursement penalties:
  - Surgical site infection 
  - Readmission after total knee replacement 
- ▶ The average cost of a MRSA surgical site infection is \$42,300 and the average length of stay is 23 days
- ▶ CMS does not reimburse hospitals for additional costs associated with a surgical site infection following certain orthopedic procedures

 One Infection Avoided Can Pay for Over 1200 PCR Tests!

# Preventing Surgical Site Infections

- ▶ *Staphylococcal aureus* represents 30% of surgical site infections<sup>1</sup>
- ▶ Perioperative screening to identify colonization + active decolonization prior can help reduce rates
- ▶ On-demand PCR testing has high sensitivity and specificity to ensure the correct organism is identified so appropriate treatment/measures can be administered
- ▶ Effective decolonization
  - Nasal decolonization
  - CHG body washes

1. Sievert DM, et al. Antimicrobial resistant pathogens associated with healthcare associated infections. Summary of data reported to the Centers for Disease Control and Prevention 2009-2010. *Infection Control and Hospital Epidemiology*. 2013;34(1):1-14.



## Case #2: *C. difficile*

Patient presented to the ED with chest pain and was diagnosed with acute myocardial infarction

Underwent coronary artery bypass surgery and given perioperative antibacterial prophylaxis

After surgery spent 2 days in the surgical ICU and 5 days in a general ward

Patient discharged

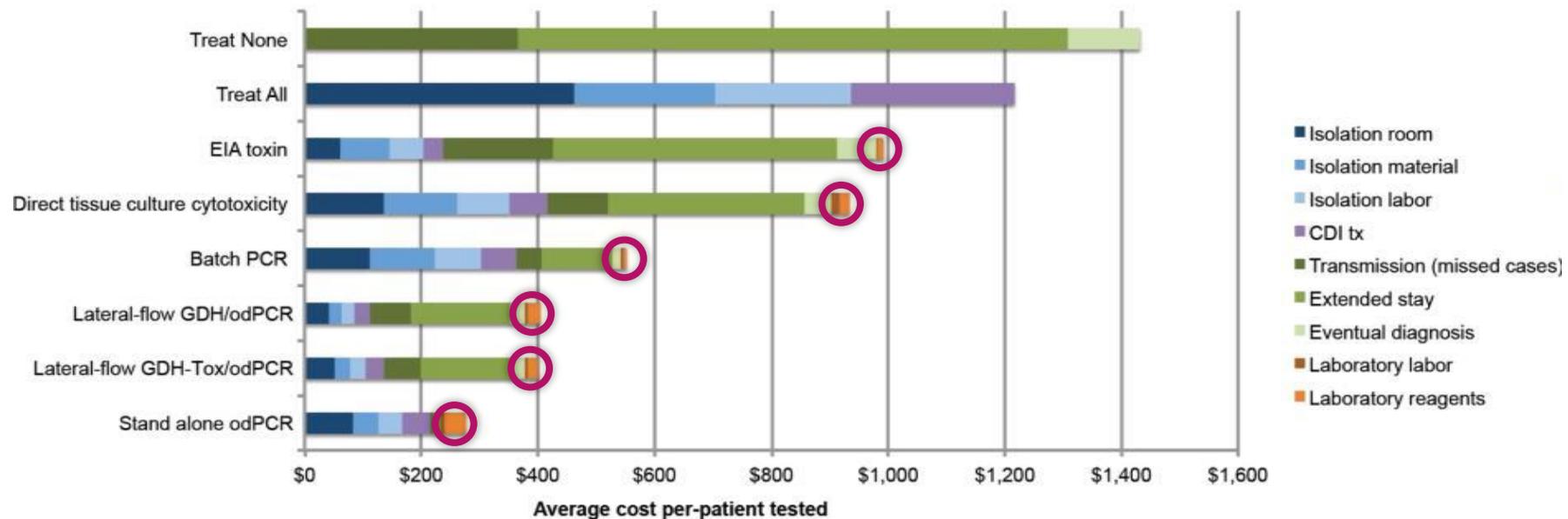
After 3 days the patient developed diarrhea and was readmitted a week later requiring treatment for *C. difficile*

# What Went Wrong?

- ▶ The patient was transferred into a double room on Friday
- ▶ By Friday afternoon, the patient's roommate developed clinically significant diarrhea; a sample was collected
- ▶ The hospital was tested with EIA and ran PCR to confirm negatives; samples were batched and ran on Mon/Wed/Fri
- ▶ The sample was tested on Monday; positive for *C. difficile*
- ▶ The patient was transferred out of the colonized room so that the roommate could be placed on Special Contact Precautions
- ▶ The patient was exposed to environmental spores, contaminated hands, and equipment leading to CDI



# What Went Wrong? – Delayed diagnosis due to EIA and not PCR



➔ Testing-Related Expenses Represent a Minority of the Overall Cost

# Case #2: *C. difficile*

Value-Based Purchasing  
1.75% of Base DRG

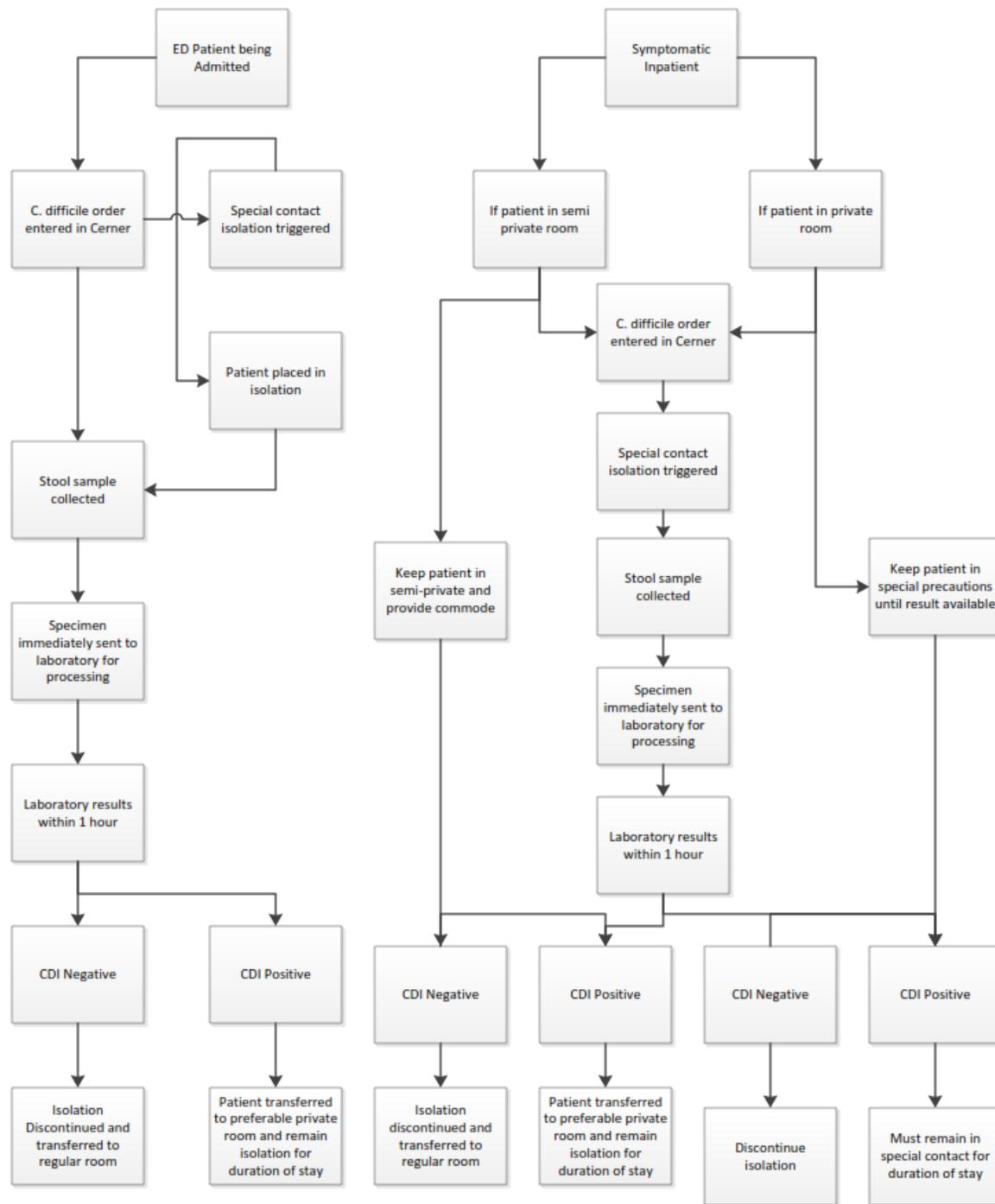
- CLABSI
- CAUTI
- SSI [colon/hysterectomy] (2016)
- MRSA bacteremia (2017)
- *C. difficile* (2017) 

All-Cause Readmissions  
3.00% of Base DRG

- Acute myocardial infarction 
- Heart failure
- Pneumonia
- COPD
- Elective total hip/knee orthopedic surgery

Healthcare-Acquired  
Conditions Reduction  
1.00% of Base DRG

- CLABSI
- CAUTI
- SSI [orthopedic, bariatric, CABG] (2016)
- MRSA bacteremia (2017)
- *C. difficile* (2017) 



# Case #3 – Suspect Tuberculosis

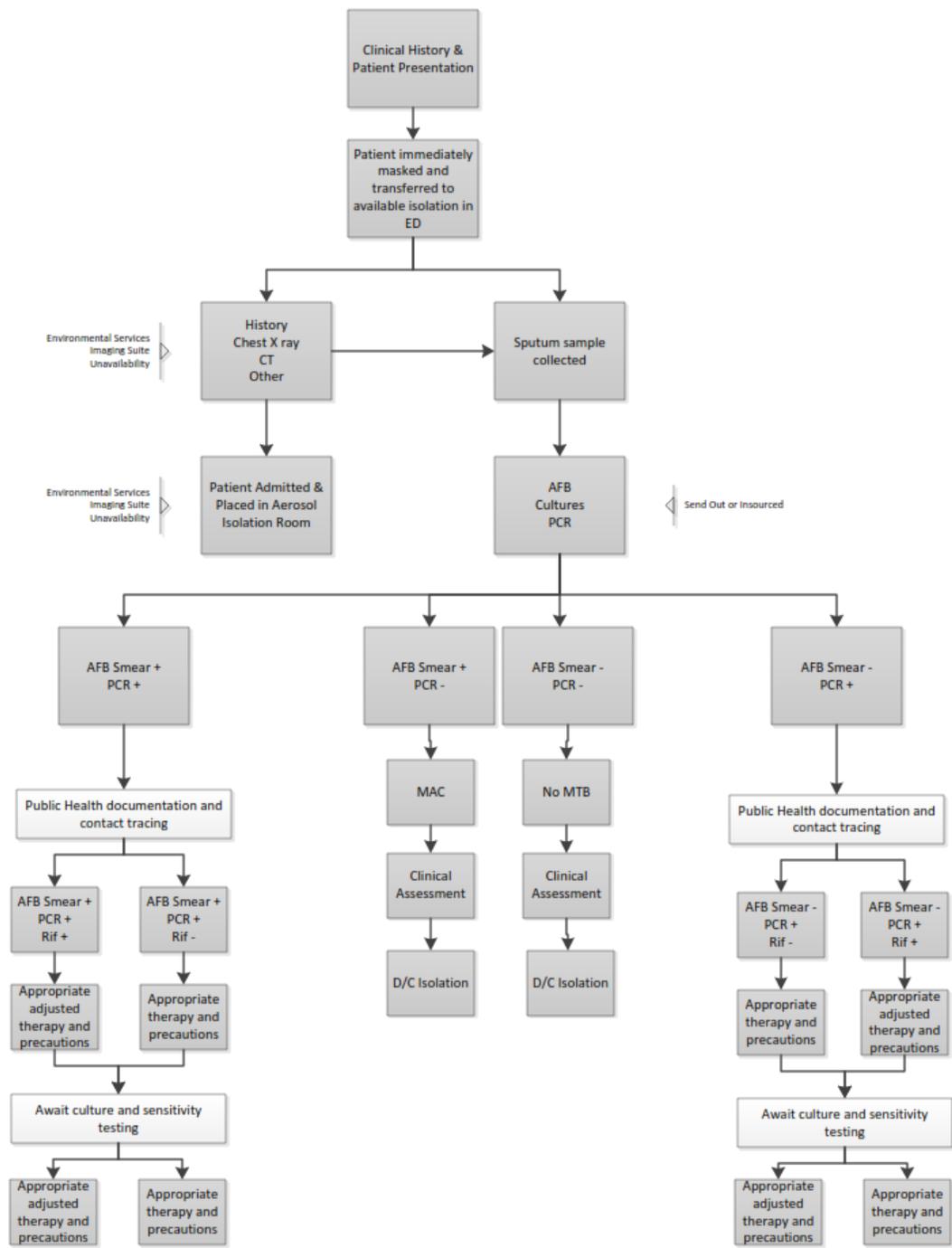
- ▶ 75-year-old male with a history of asthma was admitted to ED
- ▶ Patient was not initially on any type of respiratory precautions due to lack of evidence to suspect infectious respiratory condition
- ▶ Transferred to the ICU due to worsening condition on the same day after spending 8 hours in the ED waiting for an ICU bed
- ▶ The following day an emergency bronchoscopy was performed and specimen resulted positive for AFB smear; specimen sent for TB testing
- ▶ Patient placed on airborne precautions
- ▶ List of ED patients and staff – and ICU patients and staff potentially exposed to TB – were obtained. Department of Public Health notified of potential TB case
- ▶ Anti-TB meds initiated; PPD skin testing started for all exposed patients and staff

# Result of TB Test – Revealed *M. avium*

- ▶ Airborne precautions discontinued
- ▶ Anti-TB drugs discontinued
- ▶ DPH and Infection Prevention stopped contacting staff and patients for TB skin testing
- ▶ Staff relieved they were not exposed to TB

# MTB – On-demand PCR Testing

- ▶ Rapid diagnosis of mycobacterium tuberculosis within 2 hours
- ▶ If negative – airborne isolation and treatment may be stopped
- ▶ Contact lists, TB skin testing, notification of DPH can be stopped



# Conclusion

- ▶ On-demand rapid diagnostics enhance the efficiency and effectiveness of infection prevention programs
- ▶ Rapid diagnosis:
  - ▶ Reduces isolation days
  - ▶ Reduces unnecessary antimicrobial therapy thereby improving the antimicrobial stewardship program
  - ▶ Reduces laboratory processing time with cultures
  - ▶ Results in cost avoidance and cost reduction
  - ▶ Identifies colonized and infected patients faster for immediate control measures to prevent spread
  - ▶ Identifies patients with *Clostridium difficile* on admission compared with batching delays that can result in a HO-CDI Lab ID test in NHSN
  - ▶ Quickly distinguishes types of Mycobacterium and identifies true MTB in 2 hours