Interesting IC literatures that will change your practices

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MAJOR ARTICLE

IDSA Infectious Diseases Society of America

hivma hiv medicine association

OXFORD

Healthcare Workers and Post-Elimination Era Measles: Lessons on Acquisition and Exposure Prevention

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Background. When caring for measles patients, N95 respirator use by healthcare workers (HCWs) with documented immunity is not uniformly required or practiced. In the setting of increasingly common measles outbreaks and provider inexperience with measles, HCWs face increased risk for occupational exposures. Meanwhile, optimal infection prevention responses to healthcare-associated exposures are loosely defined. We describe measles acquisition among HCWs despite prior immunity and lessons from healthcare-associated exposure investigations during a countywide outbreak.

Methods. Primary and secondary cases, associated exposures, and risk factors were identified during a measles outbreak in Orange County, California from, 30 January 2014 to 21 April 2014. We reviewed the effect of different strategies in response to hospital exposures and resultant case capture.

Results. Among 22 confirmed measles cases, 5 secondary cases occurred in HCWs. Of these, 4 had direct contact with measles patients; none wore N95 respirators. Four HCWs had prior evidence of immunity and continued working after developing symptoms, resulting in 1014 exposures, but no transmissions. Overall, 13 of 15 secondary cases had face-to-face contact with measles patients, 8 with prior evidence of immunity.

Conclusions. HCWs with unmasked, direct contact with measles patients are at risk for developing disease despite evidence of prior immunity, resulting in potentially large numbers of exposures and necessitating time-intensive investigations. Vaccination may lower infectivity. Regardless of immunity status, HCWs should wear N-95 respirators (or equivalent) when evaluating suspected measles patients. Those with direct unprotected exposure should be monitored for symptoms and be furloughed at the earliest sign of illness.

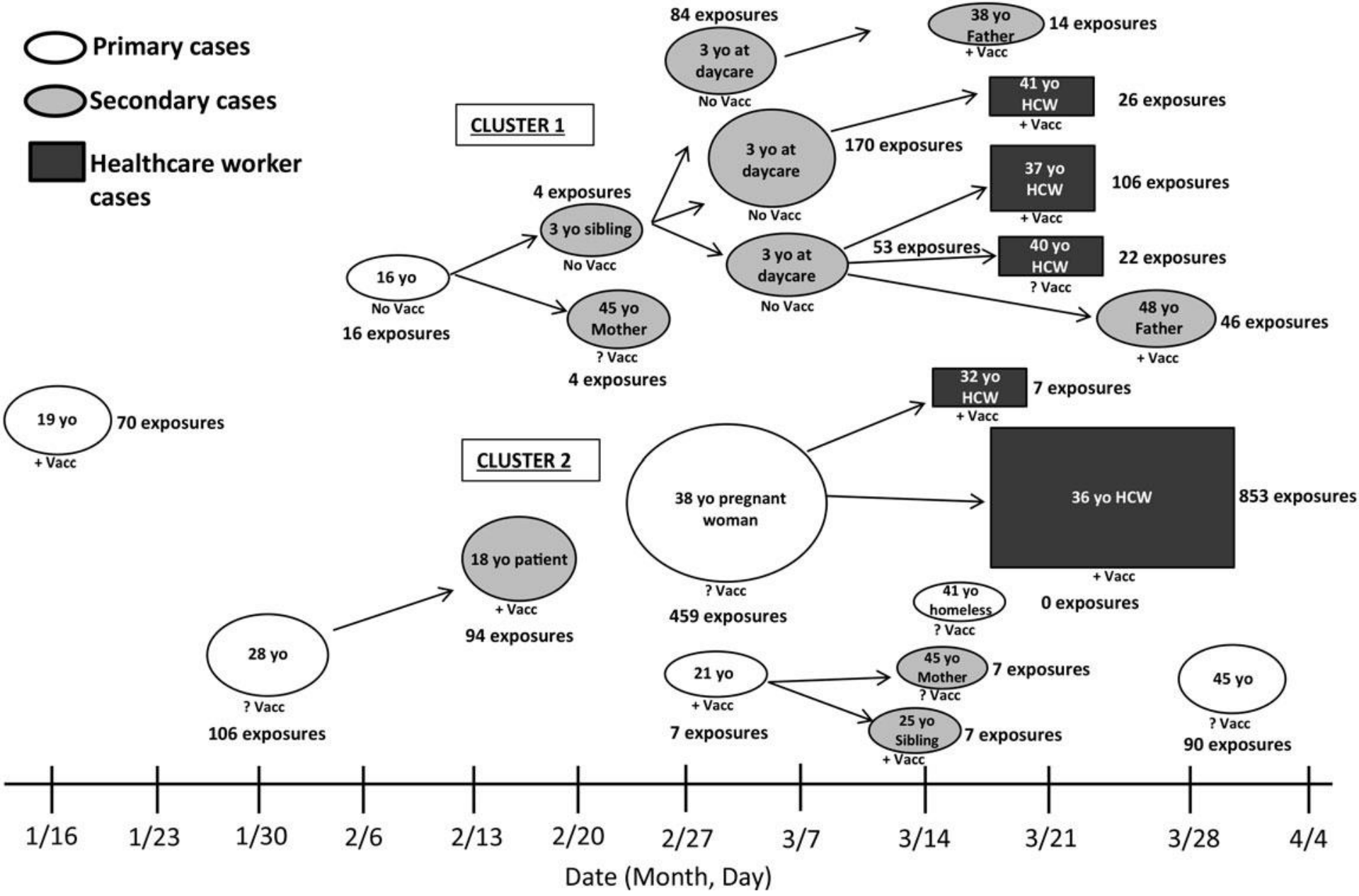
Clin Infect Dis. 2016 Jan 15;62(2):166-72

Measles Outbreak

- More measles cases were reported nationally in 2014 than in any year
  - since elimination was declared in 2000
- Outbreak in Orange County, California
  - from 16 January 2014 - 21 April 2014
  - 22 confirmed cases
    - 7 were primary cases
    - 15 were secondary cases

Outbreak in Orange County, California

- 15 secondary cases
  - 13 (86.6%) had **direct face-to-face** contact with measles patients
    - 8 (61.5%) **had evidence of immunity** against measles
  - 5 were health care worker cases!!
    - 4 had vaccination/immunity


Primary cases
Secondary cases
Healthcare worker cases
CLUSTER 1
84 exposures
3 yo at daycare
No Vacc
38 yo Father
14 exposures
+ Vacc
41 yo HCW
26 exposures
+ Vacc
3 yo at daycare
170 exposures
No Vacc
37 yo HCW
106 exposures
+ Vacc
4 exposures
3 yo sibling
No Vacc
16 yo
No Vacc
16 exposures
3 yo at daycare
53 exposures
No Vacc
40 yo HCW
22 exposures
? Vacc
48 yo Father
46 exposures
+ Vacc
45 yo Mother
? Vacc
4 exposures
19 yo
70 exposures
+ Vacc
CLUSTER 2
32 yo HCW
7 exposures
+ Vacc
38 yo pregnant woman
? Vacc
459 exposures
36 yo HCW
853 exposures
+ Vacc
18 yo patient
+ Vacc
94 exposures
41 yo homeless
? Vacc
0 exposures
28 yo
? Vacc
106 exposures
21 yo
+ Vacc
7 exposures
45 yo Mother
7 exposures
? Vacc
25 yo Sibling
7 exposures
+ Vacc
45 yo
? Vacc
90 exposures
1/16
1/23
1/30
2/6
2/13
2/20
2/27
3/7
3/14
3/21
3/28
4/4
Date (Month, Day)

5 HCWs who acquired measles

- None wore N95 respirators on initial examination of measles patients
- All but 1 had evidence of immunity
  - 1 had uncertain vaccine hx and equivocal IgG titer
- 4 had direct close contact with measles patients

2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings

Jane D. Siegel, MD; Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee

Acknowledgement: The authors and HICPAC gratefully acknowledge Dr. Larry Strausbaugh for his many contributions and valued guidance in the preparation of this guideline.

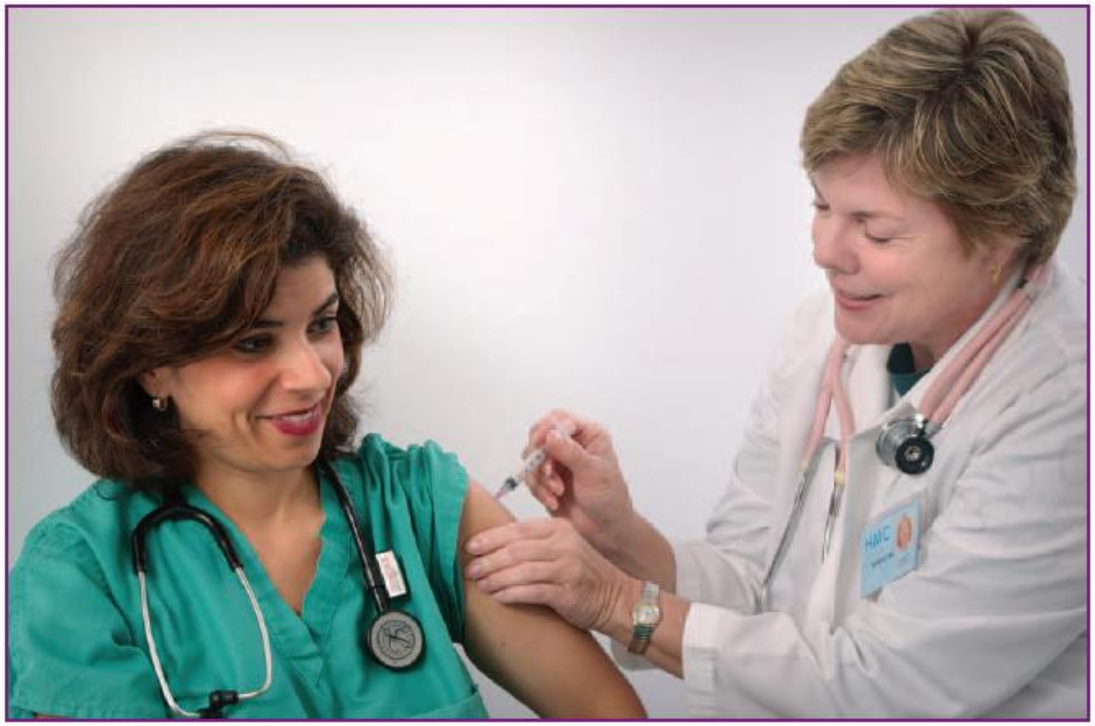
Suggested citation: Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings
http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf

Susceptible HCWs should not enter room if immune care providers are available; no recommendation for face protection for immune HCW; no recommendation for type of face protection for susceptible HCWs, i.e., mask or respirator [1027, 1028]. For exposed susceptibles, post-exposure vaccine within 72 hrs. or immune globulin within 6 days when available [17, 1032, 1034]. Place exposed susceptible patients on Airborne Precautions and exclude susceptible healthcare personnel

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Recommendations and Reports / Vol. 60 / No. 7
November 25, 2011

Immunization of Health-Care Personnel

Recommendations of the Advisory Committee on Immunization Practices (ACIP)



http://www.cdc.gov/mmwr/pdf/rr/rr6007.pdf

in an airborne-infection isolation room (i.e., a negative air-pressure room) as soon as possible. If an airborne-infection isolation room is not available, the patient should be placed in a private room with the door closed and be asked to wear a mask. If possible, only staff with presumptive evidence of immunity should enter the room of a person with suspect or confirmed measles. Regardless of presumptive immunity status, all staff entering the room should use respiratory protection consistent with airborne infection–control precautions (i.e., use of an N95 respirator or a respirator with similar effectiveness in preventing airborne transmission) (*3,150*).

2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings

Notice

The recommendations in this guideline for **Ebola Virus Disease** have been superseded by CDC's **Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Virus Disease in U.S. Hospitals**.

This information is in **Appendix A**. Click here for current information on **how Ebola virus is transmitted**.

The recommendations in this guideline for **Measles** have been superseded by CDC's **Immunization of Healthcare Personnel: Recommendations of the Advisory Committee on Immunization Practices (ACIP)** [PDF - 1,909 KB].

Download the complete PDF version Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007 PDF (3.80 MB / 225 pages)

http://www.cdc.gov/hicpac/2007IP/2007isolationPrecautions.html

The recommendations in this guideline for Ebola Virus Disease have been superseded by CDC's Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected Ebola Virus Disease in U.S. Hospitals.

This information is in Appendix A.

Click here for current information on how Ebola virus is transmitted.

The recommendations in this guideline for Measles have been superseded by CDC's Immunization of Healthcare Personnel: Recommendations of the Advisory Committee on Immunization Practices (ACIP).

Research

Original Investigation

Association of a Bundled Intervention With Surgical Site Infections Among Patients Undergoing Cardiac, Hip, or Knee Surgery

Marin L. Schweizer, PhD; Hsiu-Yin Chiang, MS, PhD; Edward Septimus, MD; Julia Moody, MS; Barbara Braun, PhD; Joanne Hafner, RN, MS; Melissa A. Ward, MS; Jason Hickok, MBA, RN; Eli N. Perencevich, MD, MS; Daniel J. Diekema, MD; Cheryl L. Richards, MJ, LPN, LMT; Joseph E. Cavanaugh, PhD; Jonathan B. Perlin, MD, PhD; Loreen A. Herwaldt, MD

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JAMA. 2015 Jun 2;313(21):2162-71

Objective

- To evaluate whether the implementation of an **evidence-based bundle** is associated with a lower risk of *Staphylococcus aureus* surgical site infections (SSIs) in patients undergoing cardiac operations or hip or knee arthroplasties.

Setting

- 20 hospitals in 9 US states
- March 1, 2009 – March 31, 2014
- Study to Optimally Prevent SSIs in Select Cardiac and Orthopedic Procedures **(STOP SSI)**

To lower rate of *S aureus* SSIs (from Meta-analysis)

- Screening for *S. aureus* nasal carriage
- Decolonizing carriers
  - Intranasal mupirocin
  - Chlorhexidine gluconate (CHG) bathing
- Vancomycin for prophylaxis
  - Among MRSA carriers

Hypothesis

- **"Bundle" implementation** would be associated with a lower incidence of **complex (ie, deep incisional or organ space)** ***S. aureus*** SSIs among patients undergoing cardiac operations or hip or knee arthroplasties

Intervention – elective surgery

- Nasal swab ~ 10 – 14 days before the operations
  - Determine MRSA and MSSA carrier status
    - PCR?, standard culture?, chromogenic agar?
- Positive for MRSA or MSSA
  - Intranasal mupirocin BID for 5 days

    and
  - CHG daily bathing for 5 days

    (Immediately before the operation)

Intervention – elective surgery

- Negative for MRSA and MSSA (noncarriers)
  - CHG bathing the night before and the morning of the operations
- Perioperative ATB prophylaxis
  - Cefazolin or cefuroxime
    - for noncarriers and MSSA carriers
  - Vancomycin PLUS cefazolin/cefuroxime
    - For MRSA carriers

Intervention – elective surgery

- Patients with negative screening tests but with documented histories of MRSA carriage or infection were treated as carriers

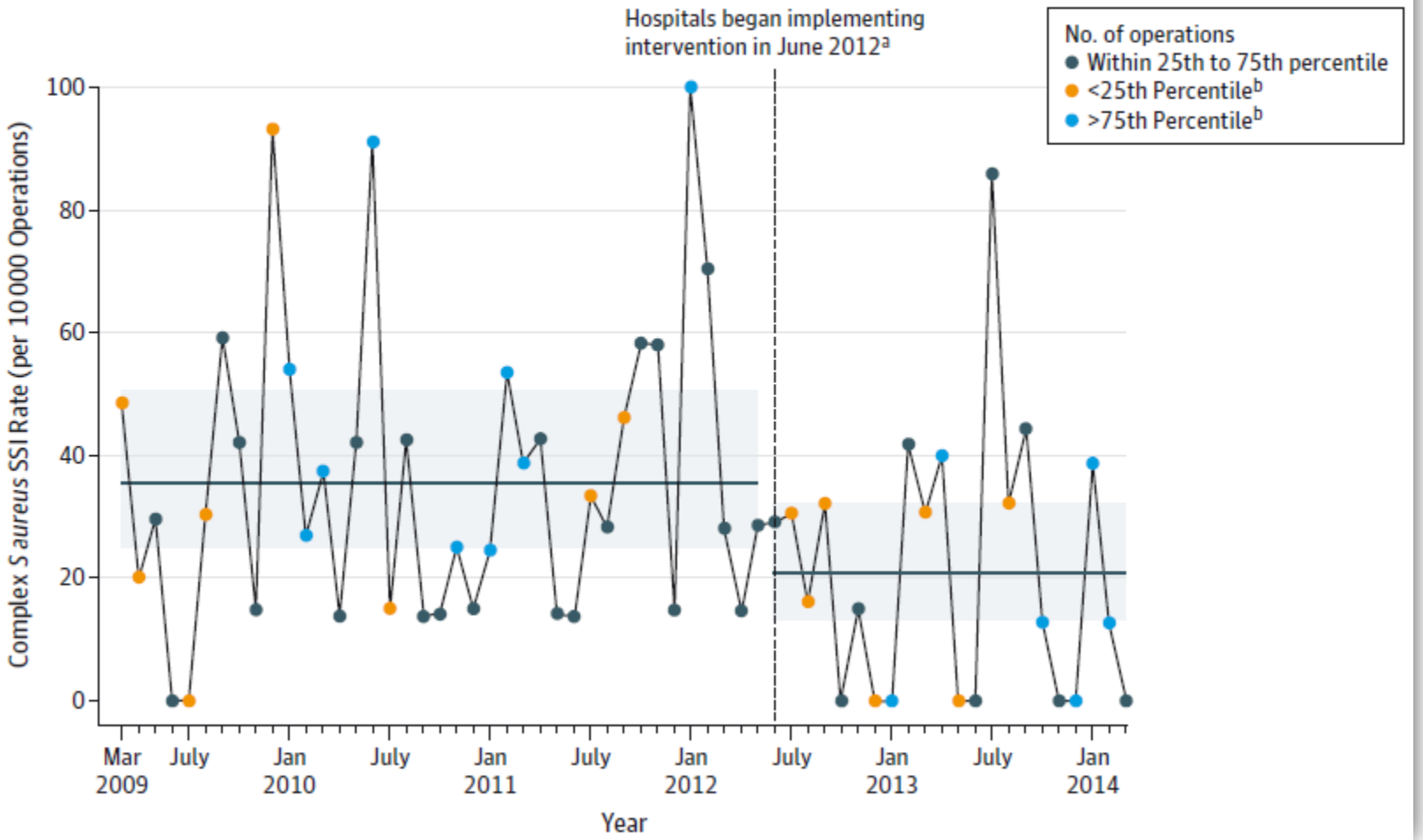
Intervention – emergency

- Vancomycin PLUS cefazolin/cefuroxime
- Obtain nasal swab tests for MSSA/MRSA
- Start intranasal mupirocin
  - discontinued if test results were negative
- No recommendation for CHG

Results

- 42,534 operations among 38,049 patients
  - preintervention period (39 months)
    - 28,218 operations
  - intervention period (22 months)
    - 14,316 operations

Figure 1. Pooled Rate of Complex *Staphylococcus aureus* Surgical Site Infections (SSIs) by Admission Month



36 / 10,000 operations -> 21 / 10,000 operations

(difference, −15 [95%CI, −35 to −2])

Rate ratio [RR], 0.58 [95%CI, 0.37 to 0.92]

Table 2. Poisson Regression Analysis of Monthly Rates of Complex *Staphylococcus aureus* Surgical Site Infections per 10 000 Operations

	Preintervention Period		Intervention Period		Rate Ratio for Bundled Intervention (95% CI)	*P* Value
	No. of Operations	Mean Rate (95% CI)	No. of Operations	Mean Rate (95% CI)		
All operations	28 218	36 (25-51)	14 316	21 (13-32)	0.58 (0.37-0.92)[a]	.02
Urgent/emergent			1189	37 (15-88)	1.03 (0.41-2.57)[a]	.95
Scheduled			13 127	20 (13-30)	0.55 (0.35-0.86)[a]	.009
Cardiac operations	7576	46 (26-82)	3257	40 (23-70)	0.86 (0.47-1.57)[b]	.63
Urgent/emergent			571	67 (32-137)	1.44 (0.53-3.91)[b]	.48
Scheduled			2686	33 (18-62)	0.72 (0.45-1.15)[b]	.17
Hip or knee arthroplasties	20 642	32 (21-48)	11 059	15 (10-24)	0.48 (0.29-0.80)[c]	.005
Urgent/emergent			618	14 (3-75)	0.44 (0.07-2.72)[c]	.38
Scheduled			10 441	16 (10-26)	0.51 (0.30-0.85)[c]	.009

Abbreviations: SSI, surgical site infection.

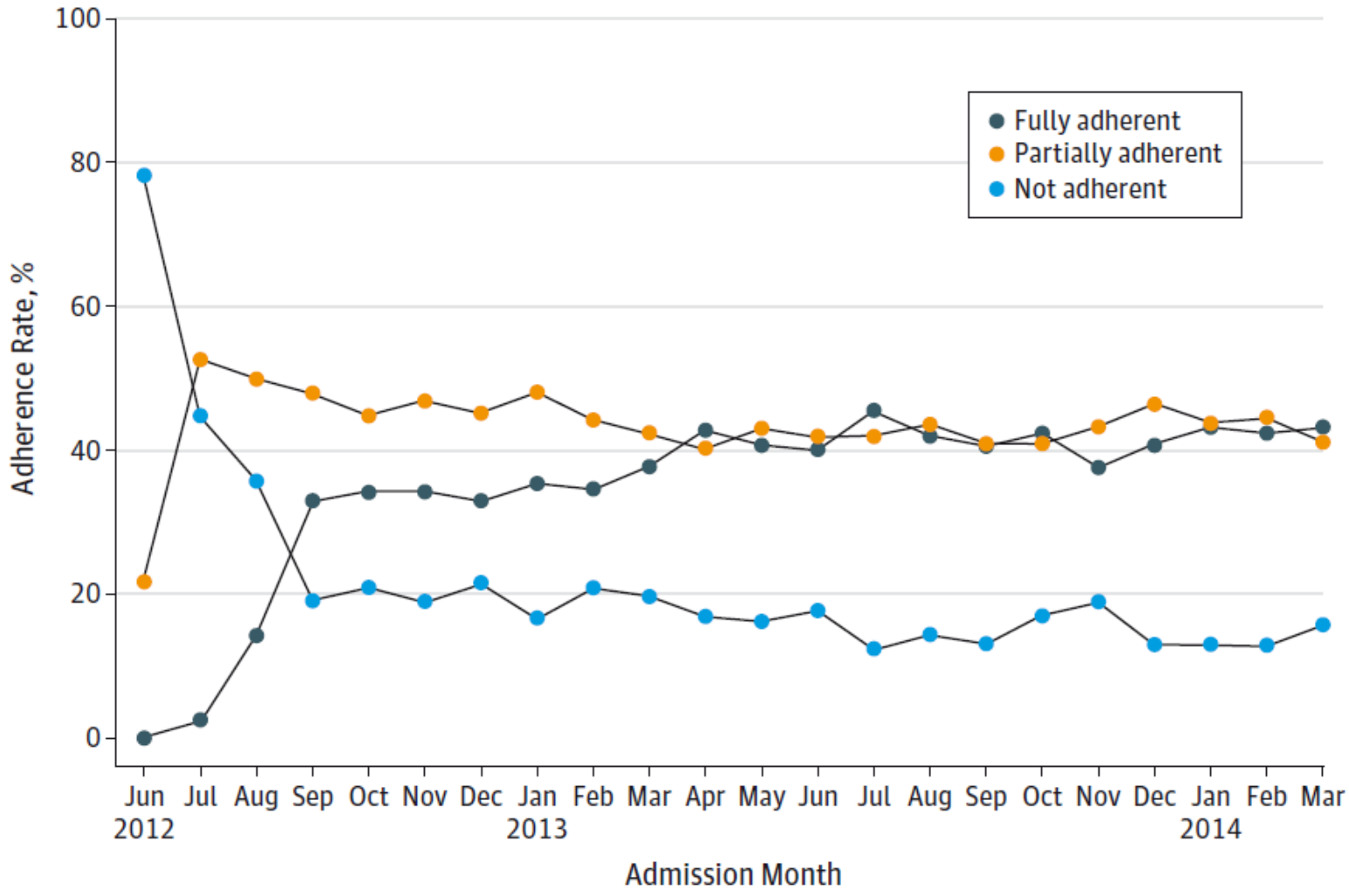
[a] Compared with the monthly rates of complex *S aureus* SSIs after all operations performed during the preintervention period.

[b] Compared with the monthly rates of complex *S aureus* SSIs after all cardiac operations performed during the preintervention period.

[c] Compared with the monthly rates of complex *S aureus* SSIs after all hip or knee arthroplasties performed during preintervention period.

SSIs	Pre (/10,000 ops)	Post (/10,000 ops)	RR	95%CI
Complex *S aureus* SSIs	36	21	0.58	0.37 – 0.92
All *S aureus* SSIs	47	30	0.64	0.38 – 1.09
All Gram neg SSIs	28	23	0.86	0.42 – 1.75
Complex SSIs (all pathogen)	68	45	0.67	0.44 – 1.00

Figure 2. Bundled Intervention Adherence by Month During the Intervention Period (N = 14 316 Operations)



Prevention of Colonization and Infection by *Klebsiella pneumoniae* Carbapenemase–Producing Enterobacteriaceae in Long-term Acute-Care Hospitals

Mary K. Hayden,[1,2] Michael Y. Lin,[1] Karen Lolans,[2] Shayna Weiner,[1] Donald Blom,[1] Nicholas M. Moore,[3] Louis Fogg,[4] David Henry,[5] Rosie Lyles,[6] Caroline Thurlow,[1] Monica Sikka,[1] David Hines,[7] and Robert A. Weinstein[1,6]; for the Centers for Disease Control and Prevention Epicenters Program

Departments of [1]Medicine, Division of Infectious Diseases, [2]Pathology, [3]Medical Laboratory Science, and [4]Nursing, Rush University Medical Center, [5]Department of Biostatistics, University of Illinois School of Public Health, [6]Department of Medicine, Division of Infectious Diseases, Cook County Health and Hospital System, and [7]Metro Infectious Disease Consultants LLC, Chicago, Illinois

Clin Infect Dis. 2015 Apr 15;60(8):1153-61

Background

- Long-term acute-care hospitals (LTACHs) have especially high prevalence of KPC
- Patients in LTACHs
  - Prolonged hospital stay
  - Catheters/lines/tubes/ventilators etc

Methods

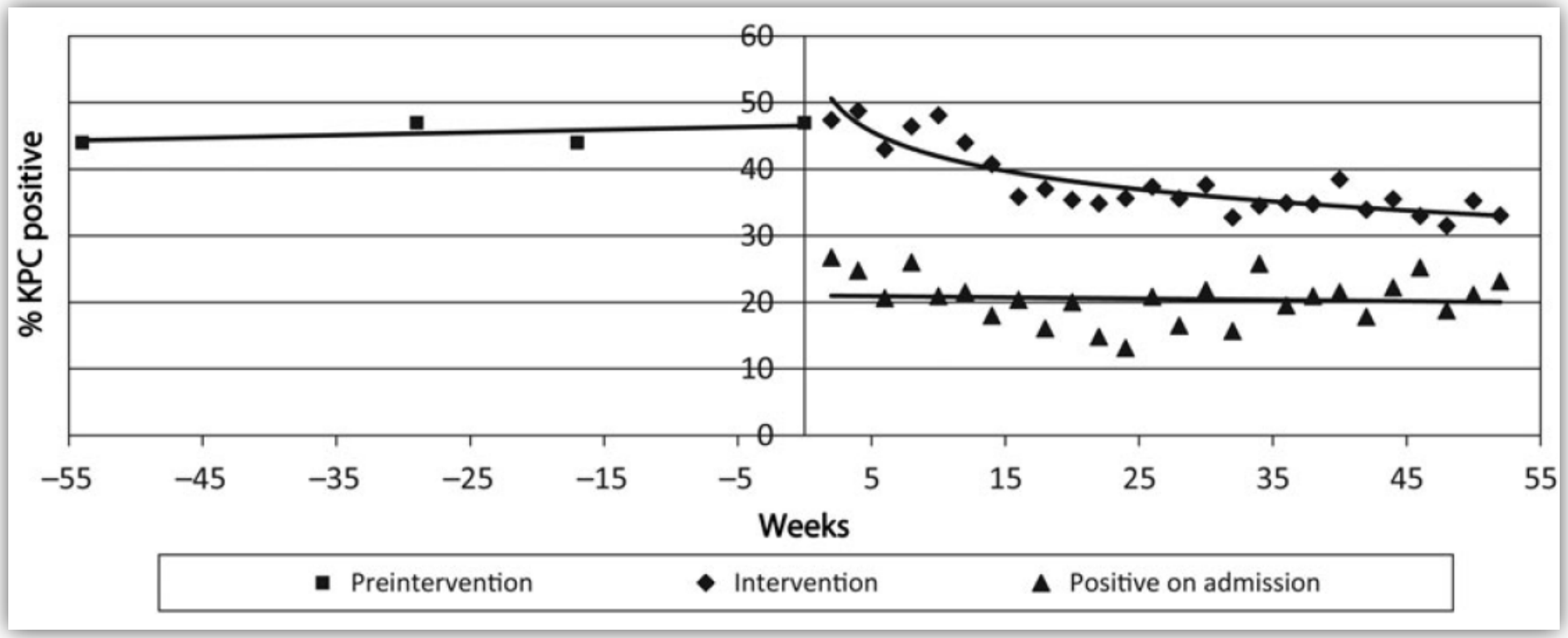
- 4 LTACHs in Chicago, Illinois
  - with high endemic KPC prevalence
- 1 February 2010 to 30 June 2013
- 3894 patients were enrolled during the preintervention period
  - lasting from 16 to 29 months
- 2951 patients were enrolled during the intervention period
  - lasting from 12 to 19 months

Bundled intervention

- Screening patients for KPC rectal colonization
  - Upon admission and **every other week**
- Preemptive contact isolation
  - newly admitted Pts pending culture result
- Contact isolation of KPC-positive patient
- Bathing all patients daily with CHG
  - 2% CHG impregnated cloths
- Health care worker education
- Adherence monitoring
  - Hand hygiene / gown / glove

    (not include ATB stewardship!!!)

Prevalence rate of KPC producing *Enterobacteriaceae*



Preintervention period ~ 45.8% (95%CI, 42.1% - 49.5%)

Intervention period ~ 34.3% (95%CI, 32.4% - 36.2%)

Admission prevalence ~ 20.6% (95%CI, 19.1% - 22.3%)

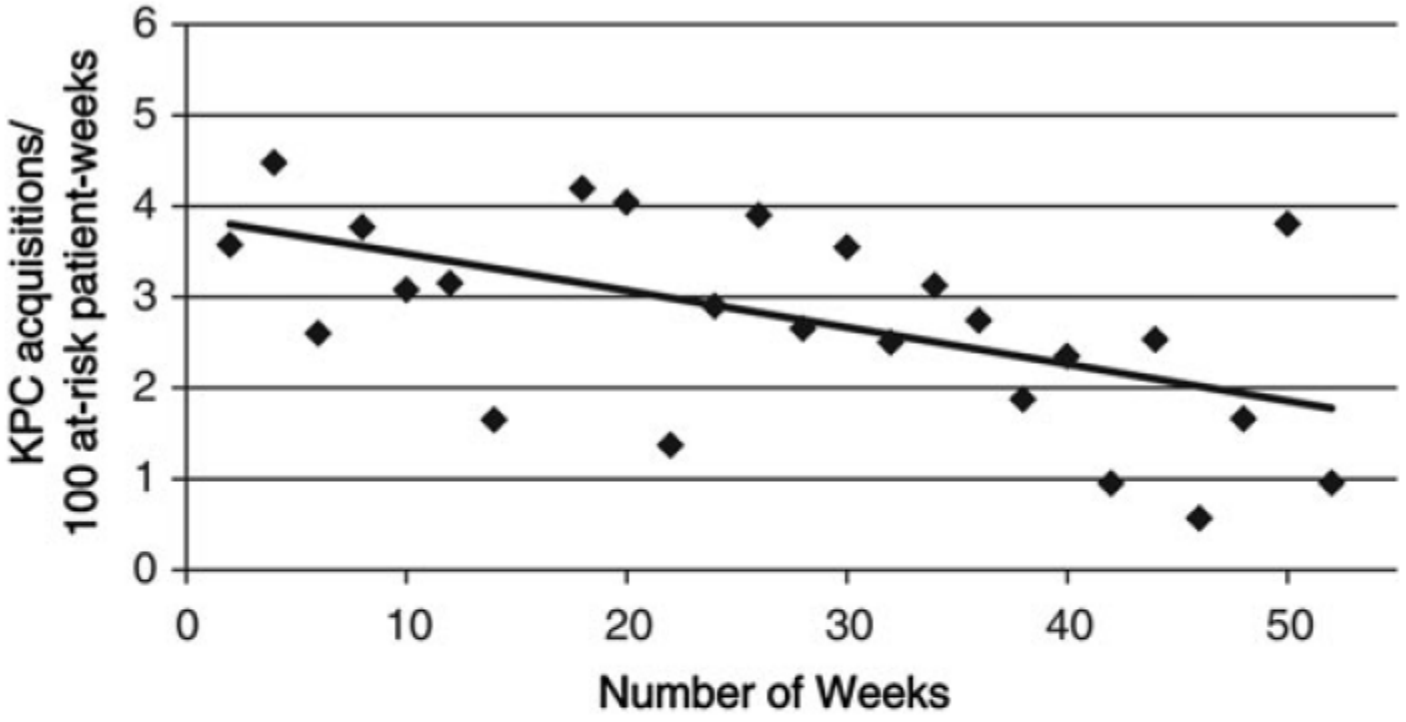


Figure 3. Incidence rate of *Klebsiella pneumoniae* carbapenemase–producing Enterobacteriaceae (KPC) rectal colonization during the intervention period. Each data point represents the number of patients who acquired KPC per 100 patient-weeks, averaged over the preceding 2 weeks. Definite incident cases and data for the first 52 weeks during which each of the 4 long-term acute-care hospitals participating in the study are shown. $P = .004$ for linear decline.

Incidence was reduced by 50%

Table 3. Effect of Intervention Bundle on Clinical Cultures and Blood Culture Contamination

Outcome	Preintervention[a]			Intervention[a]			Change in Event Rate	*P* Value
	No. of Events	Events/1000 Patient-days	95% CI	No. of Events	Events/1000 Patient-days	95% CI		
KPC in any clinical culture	656	3.7	3.4–4.0	285	2.5	2.2–2.8	−1.2	.001
KPC bloodstream infection	165	0.9	.8–1.1	48	0.4	.3–.5	−0.5	.008
Bloodstream infection due to any pathogen	2004	11.2	10.7–11.7	870	7.6	7.1–8.1	−3.6	.006
Contaminated blood culture	865	4.9	4.5–5.2	261	2.3	2.0–2.6	−2.6	.03

Abbreviations: CI, confidence interval; KPC, *Klebsiella pneumoniae* carbapenemase–producing Enterobacteriaceae.

[a] There were 178 516 patient-days in the preintervention period and 114 070 patient-days in the intervention period.

Collateral benefits

KPC in any clinical culture reduced by 32%

KPC bacteremia reduced by 56%

Bloodstream infection due to **any pathogen** reduced by 32%

Contaminated blood culture reduced by 53%

Effect of daily chlorhexidine bathing on acquisition of carbapenem-resistant *Acinetobacter baumannii* (CRAB) in the medical intensive care unit with CRAB endemicity

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Am J Infect Control. 2015 Nov 1;43(11):1171-7

Setting

- Medical ICU, single center
  - University affiliated, tertiary-care hospital
- *Acinetobacter baumannii* endemicity
  - Carbapenem resistance
  - Unable to control with the bundle comprised of
    - Active surveillance culture
      - Nasal and rectal swabs at admission and once per week
    - Preemptive contact precautions
      - Pending culture result
    - Enhanced environmental cleaning
      - Twice daily cleaning/disinfection of high-touch areas

Intervention

- Daily bathing with no-rinse 2% chlorhexidine-impregnated washcloths

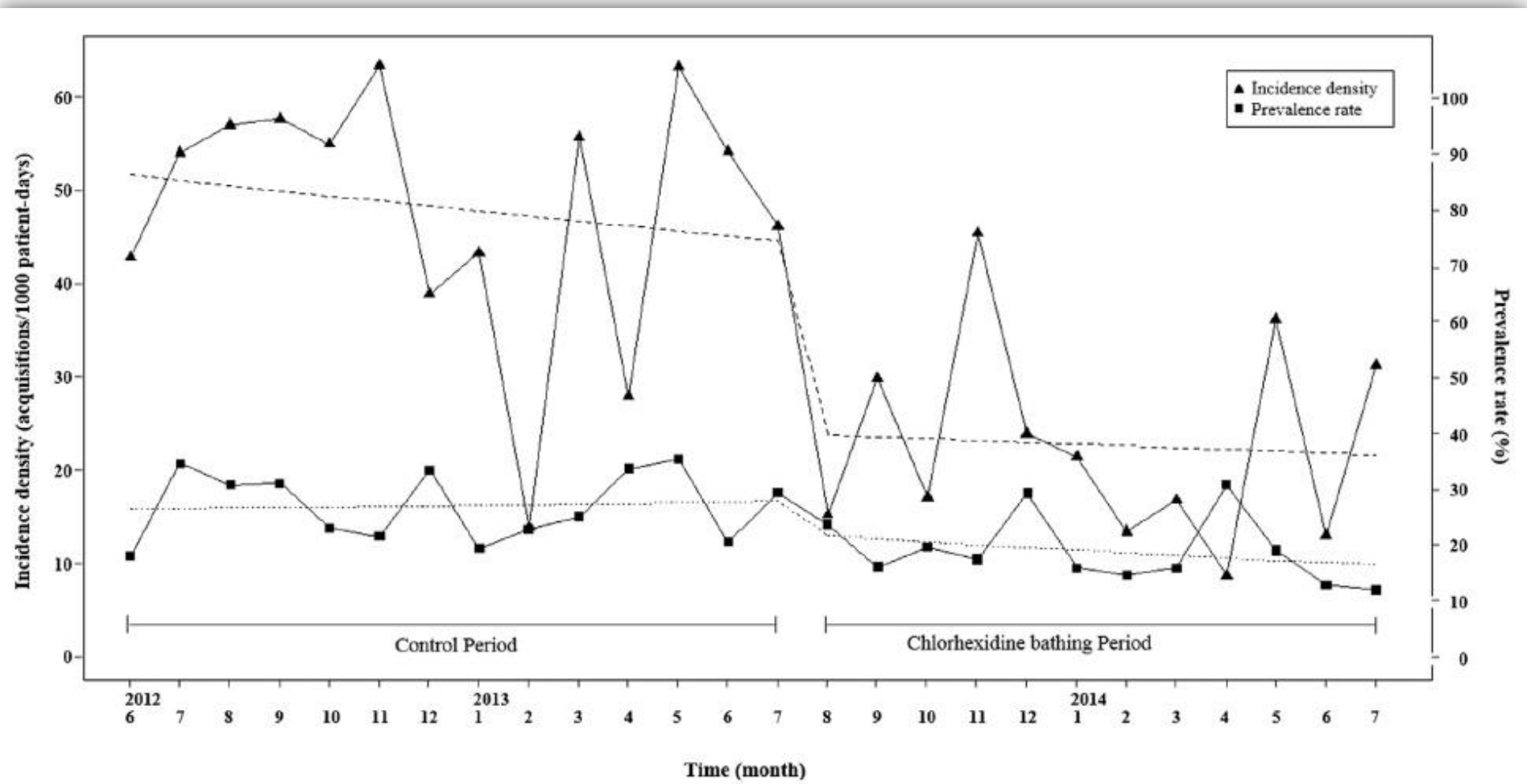

Fig 1. Reduction in the rates of carbapenem-resistant *Acinetobacter baumannii* acquisition associated with daily chlorhexidine bathing.

Acquisition of carbapenem-resistant *Acinetobacter baumannii* before and after daily chlorhexidine bathing

Variable	Control period	Chlorhexidine bathing period
No. of admissions to the medical ICU	1,514.0	1,540.0
No. of patients <18 y of age	17.0	9.0
No. of patients admitted <48 h	904.0	977.0
No. of admissions of eligible patients*	593.0	554.0
No. of prevalent cases	153.0	101.0
Prevalence rates (%)	25.8	18.2
At risk patient days	2,844.0	2,685.0
No. of incident cases	125.0	57.0
Incident density	44.0	21.2

ICU, intensive care unit.

*Eligible patients were defined as nonpregnant adults admitted to the medical ICU for >48 hours, to whom surveillance culture for carbapenem-resistant *A baumannii* was requested.

Table 2
Environmental

Sites of sampling	Control period			
	June 2013		July 2014	
	No. of samples	No. positive for CRAB	No. of samples	No. positive for CRAB
Staff gown	9	4 (44.4)	10	2 (20.0)
Patient gown	12	8 (66.7)	15	6 (40.0)
Curtain	16	3 (18.8)	14	5 (35.7)
Nursing cart	4	0 (0.0)	4	0 (0.0)
Telephone	6	1 (12.5)	6	0 (0.0)
Keyboard	18	7 (38.9)	15	2 (13.3)
Mouse	18	2 (11.1)	15	1 (6.7)
Basin	8	2 (25.0)	8	0 (0.0)
Infusion pump	7	0 (0.0)	13	1 (7.7)
Ventilator	6	2 (33.3)	10	2 (20.0)
Monitor	11	4 (36.4)	16	0 (0.0)
Bed rail	12	6 (50.0)	15	1 (6.7)
Total	127	39 (30.2)	141	20 (14.2)

Sites of samp
Staff gown
Patient gown
Curtain
Nursing cart
Telephone
Keyboard
Mouse
Basin
Infusion pum
Ventilator
Monitor
Bed rail
Total

uly 2014
No. positive for CRAB
2 (20.0)
6 (40.0)
5 (35.7)
0 (0.0)
0 (0.0)
2 (13.3)
1 (6.7)
0 (0.0)
1 (7.7)
2 (20.0)
0 (0.0)
1 (6.7)
20 (14.2)

NOTE. Values a
CRAB, carbapen

Environmental contamination

Chlorhexidine Only Works If Applied Correctly: Use of a Simple Colorimetric Assay to Provide Monitoring and Feedback on Effectiveness of Chlorhexidine Application

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Infect Control Hosp Epidemiol. 2015 Sep;36(9):1095-7

Methods

- Patients undergoing major surgery at the Cleveland VA Medical Center are prescribed **chlorhexidine** bathing to be performed the **evening before surgery**
- CHG either 4% solution or 2% cloths
- Colorimetric assay to determine the presence of chlorhexidine on skin
  - Morning of the surgery

Methods

- Cotton-tipped swabs moistened with water were used to sample 5 × 5 cm^2 areas of the neck, chest, abdomen, arm, and leg
- To measure CHG conc; applied 120 µL of freshly prepared solution to the swab tip
  - Solution containing 5 parts cetyltrimethylammonium bromide and 1 part sodium hypobromite
- The color change was assessed within 30 seconds by comparison to a standard curve

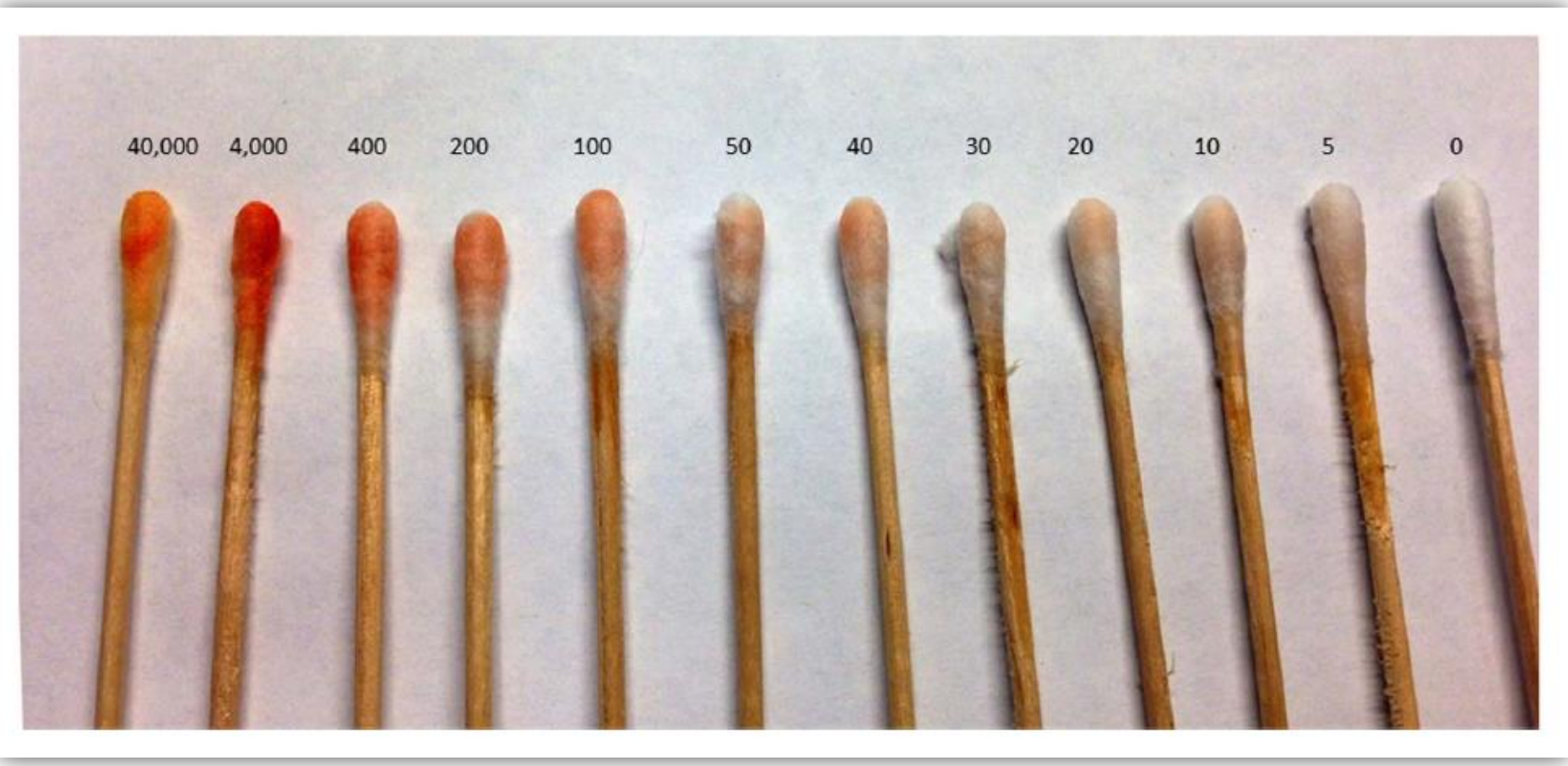
40,000
4,000
400
200
100
50
40
30
20
10
5
0

TABLE 1. Percentages of Skin Sites with Detectable Chlorhexidine During the Pre- and Post-intervention Periods in Patients Prescribed Preoperative Chlorhexidine Bathing[a]

Skin site	Pre-intervention 4% Solution (N = 45 patients/ 250 sites), No. (%)[b]	Pre-intervention 2% No-Rinse Cloth (N = 33 patients/165 sites), No. (%)	*P* Value[c]	Post-intervention 2% No-Rinse Cloth (N = 25 patients/ 125 sites), No. (%)	*P* Value[d]
All sites	114/250 (46)	115/165 (70)	<.001	110/125 (88)	<.001
Neck	26/45 (58)	20/33 (61)	…	21/25 (84)	.080
Chest	27/45 (60)	29/33 (88)	…	23/25 (92)	.690
Abdomen	12/45 (27)	23/33 (70)	…	23/25 (92)	.052
Arm	25/45 (56)	23/33 (70)	…	22/25 (88)	.122
Leg	22/45 (49)	20/33 (61)	…	21/25 (84)	.081

[a]Limit of detection, 5 parts per million.
[b]42 patients applied the 4% solution by showering and rinsing and 3 participants applied it via bed bath.
[c]Comparison of 4% solution vs 2% no-rinse cloths during the pre-intervention period.
[d]Comparison of pre- and post-intervention values for 2% no-rinse cloths.

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CASE REPORT

Fecal Microbiota Transplantation and Successful Resolution of Multidrug-Resistant-Organism Colonization

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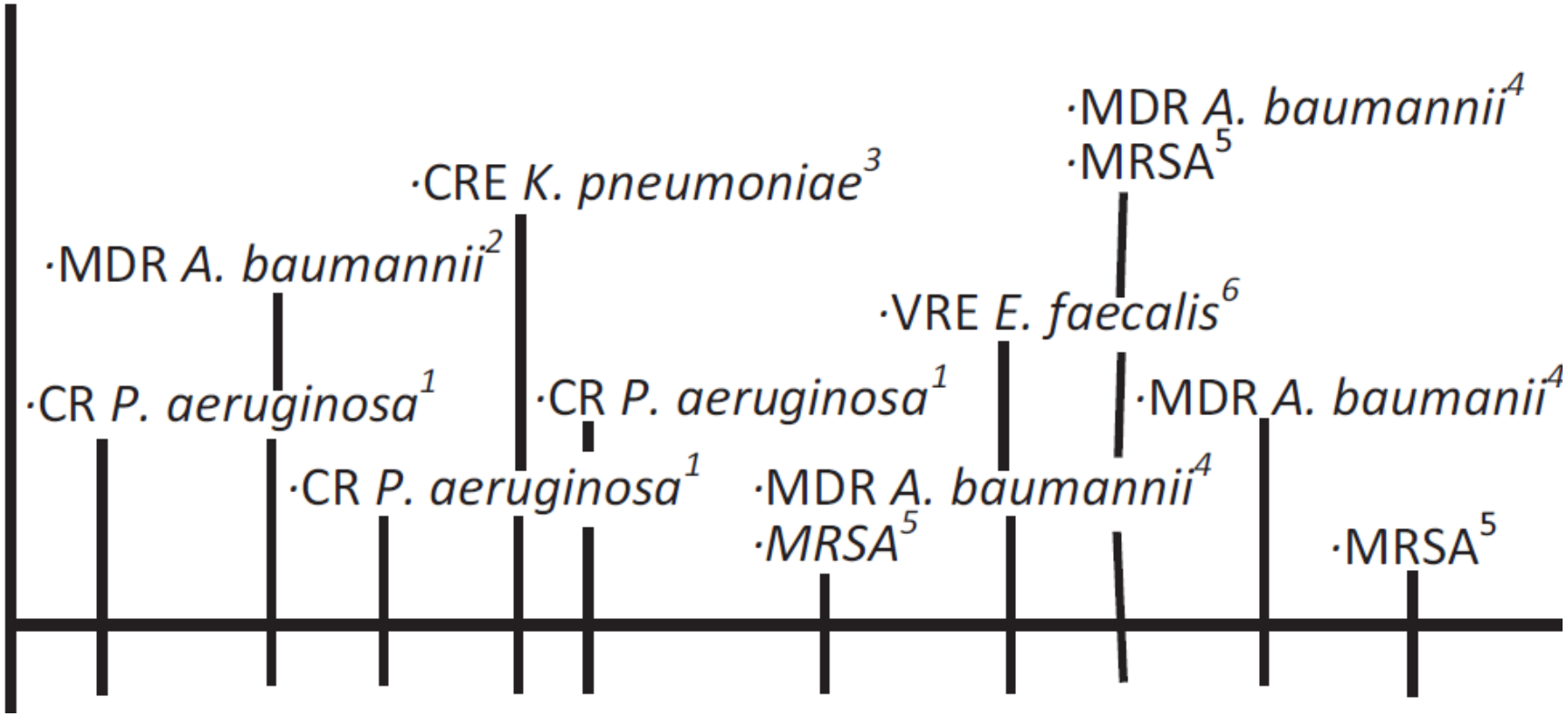
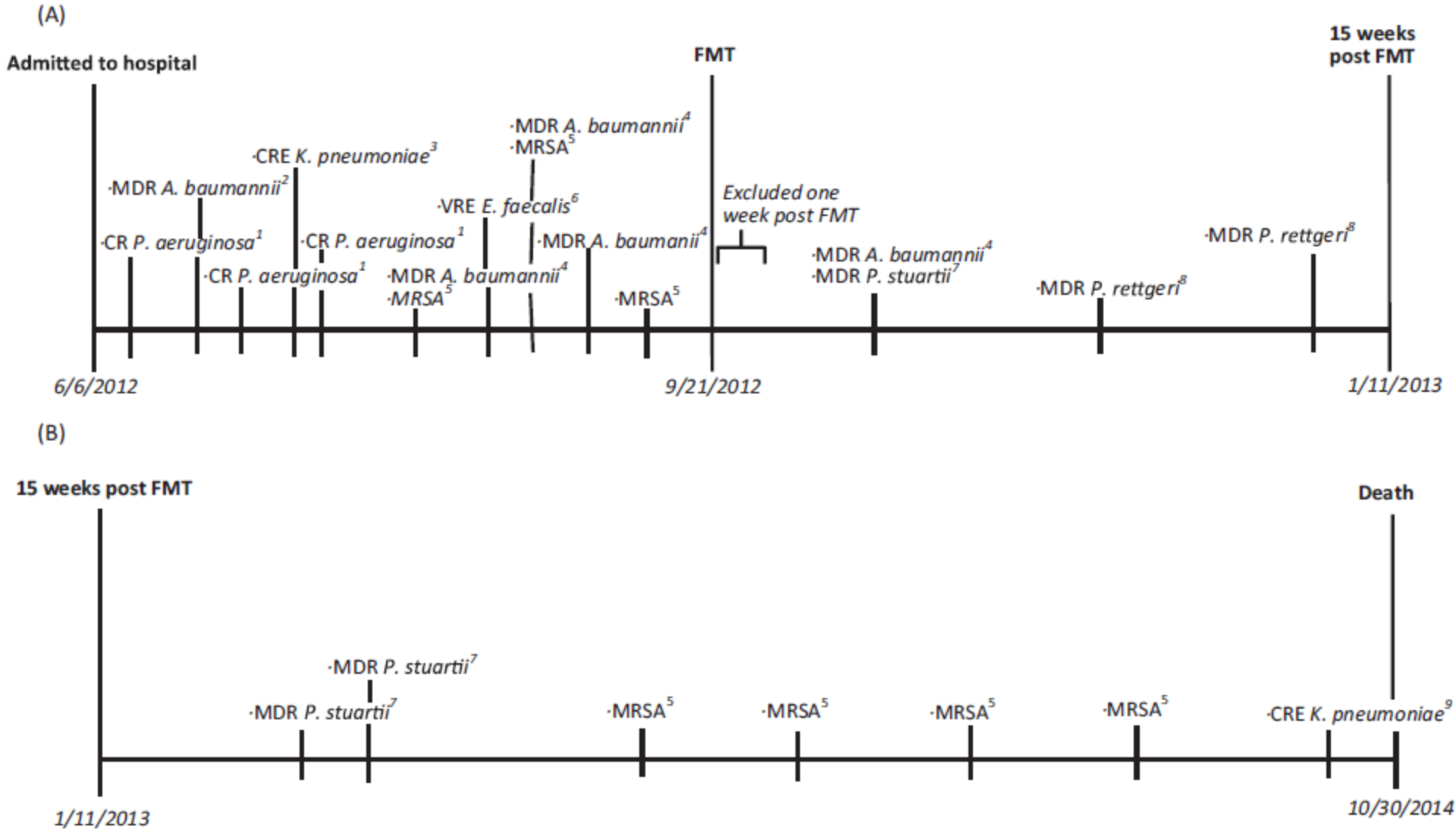
We report a case in which fecal microbiota transplantation (FMT) utilized for relapsing *Clostridium difficile* colitis successfully eradicated colonization with several multidrug-resistant organisms (MDROs). FMT may have an additive benefit of reducing MDRO carriage and should be further investigated as a potential measure to eradicate additional potentially virulent organisms beyond *C. difficile*.

J Clin Microbiol. 2015 Jun;53(6):1986-9

Case report

- 66-year-old male
- March 2011 - Spinal epidural abscess
  - C4 level spinal cord injury
    - Quadriplegia
- Feeding tube, tracheostomy, Foley cath
- Bedsore
- Sepsis monthly


·MDR A. baumannii[4]
·MRSA[5]
·CRE K. pneumoniae[3]
·MDR A. baumannii[2]
·VRE E. faecalis[6]
·CR P. aeruginosa[1]
·CR P. aeruginosa[1]
·MDR A. baumanii[4]
·CR P. aeruginosa[1]
·MDR A. baumannii[4]
·MRSA[5]
·MRSA[5]


(A)
Admitted to hospital
FMT
15 weeks post FMT
·MDR A. baumannii[4]
·MRSA[5]
·CRE K. pneumoniae[3]
·MDR A. baumannii[2]
·VRE E. faecalis[6]
Excluded one week post FMT
·CR P. aeruginosa[1]
·CR P. aeruginosa[1]
·MDR A. baumanii[4]
·MDR A. baumannii[4]
·MDR P. rettgeri[8]
·CR P. aeruginosa[1]
·MDR A. baumannii[4]
·MRSA[5]
·MDR P. stuartii[7]
·MRSA[5]
·MDR P. rettgeri[8]
6/6/2012
9/21/2012
1/11/2013
(B)
15 weeks post FMT
Death
·MDR P. stuartii[7]
·MDR P. stuartii[7]
·MRSA[5]
·MRSA[5]
·MRSA[5]
·MRSA[5]
·CRE K. pneumoniae[9]
1/11/2013
10/30/2014

Shortening Isolation of Patients With Suspected Tuberculosis by Using Polymerase Chain Reaction Analysis: A Nationwide Cross-sectional Study

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Clin Infect Dis. 2015 Nov 1;61(9):1365-73

2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings

Jane D. Siegel, MD; Emily Rhinehart, RN MPH CIC; Marguerite Jackson, PhD; Linda Chiarello, RN MS; the Healthcare Infection Control Practices Advisory Committee

Acknowledgement: The authors and HICPAC gratefully acknowledge Dr. Larry Strausbaugh for his many contributions and valued guidance in the preparation of this guideline.

Suggested citation: Siegel JD, Rhinehart E, Jackson M, Chiarello L, and the Healthcare Infection Control Practices Advisory Committee, 2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings
http://www.cdc.gov/ncidod/dhqp/pdf/isolation2007.pdf

Pulmonary or laryngeal disease, confirmed

Discontinue precautions only when patient on effective therapy is improving clinically and has three consecutive sputum smears negative for acid-fast bacilli collected on separate days(MMWR 2005; 54: RR-17

Pulmonary or laryngeal disease, suspected

Discontinue precautions only when the likelihood of infectious TB disease is deemed negligible, and either 1) there is another diagnosis that explains the clinical syndrome or 2) the results of three sputum smears for AFB are negative. Each of the three sputum specimens should be collected 8-24 hours apart, and at least one should be an early morning specimen

Discontinuation of Isolation

Danish recommendation

- 3 consecutive negative sputum smears

  or

- 2 weeks of effective anti TB treatment

European guideline

- Promote use of 2 samples

Discontinuation of Isolation

- Single sputum sample PCR?
  - Higher sensitivity than AFB smear
  - Shortening isolation

Method

- International Reference Laboratory of Mycobacteriology at Statens Serum Institut (SSI), Copenhagen, Denmark
- Sputums from 1 Jan 2002 to 31 Dec 2011
  - **Cultured confirmed TB**
  - Identifying patients with ≥3 samples
    - within **14 days** before and after **the first culture-positive** sample and with ≥1 PCR result
    - the first 3 samples, prioritizing the first culture-positive sample and the first PCR result
      - Any subsequent PCR results were excluded

Method

- PCR for MTBC
  - BDProbeTec ET Direct Detection (Becton Dickinson)
  - GenoType MTBDRplus (Hain Lifescience)

- The primary outcome was
  - **Patients who had (first) PCR-negative, (any) smear-positive**

Background. Isolation of patients suspected for pulmonary tuberculosis is guided by serial sputum smears. This can result in isolation for days for patients with noncontagious tuberculosis. To determine whether a single sample negative for *Mycobacterium tuberculosis* complex at polymerase chain reaction (PCR) can guide isolation.

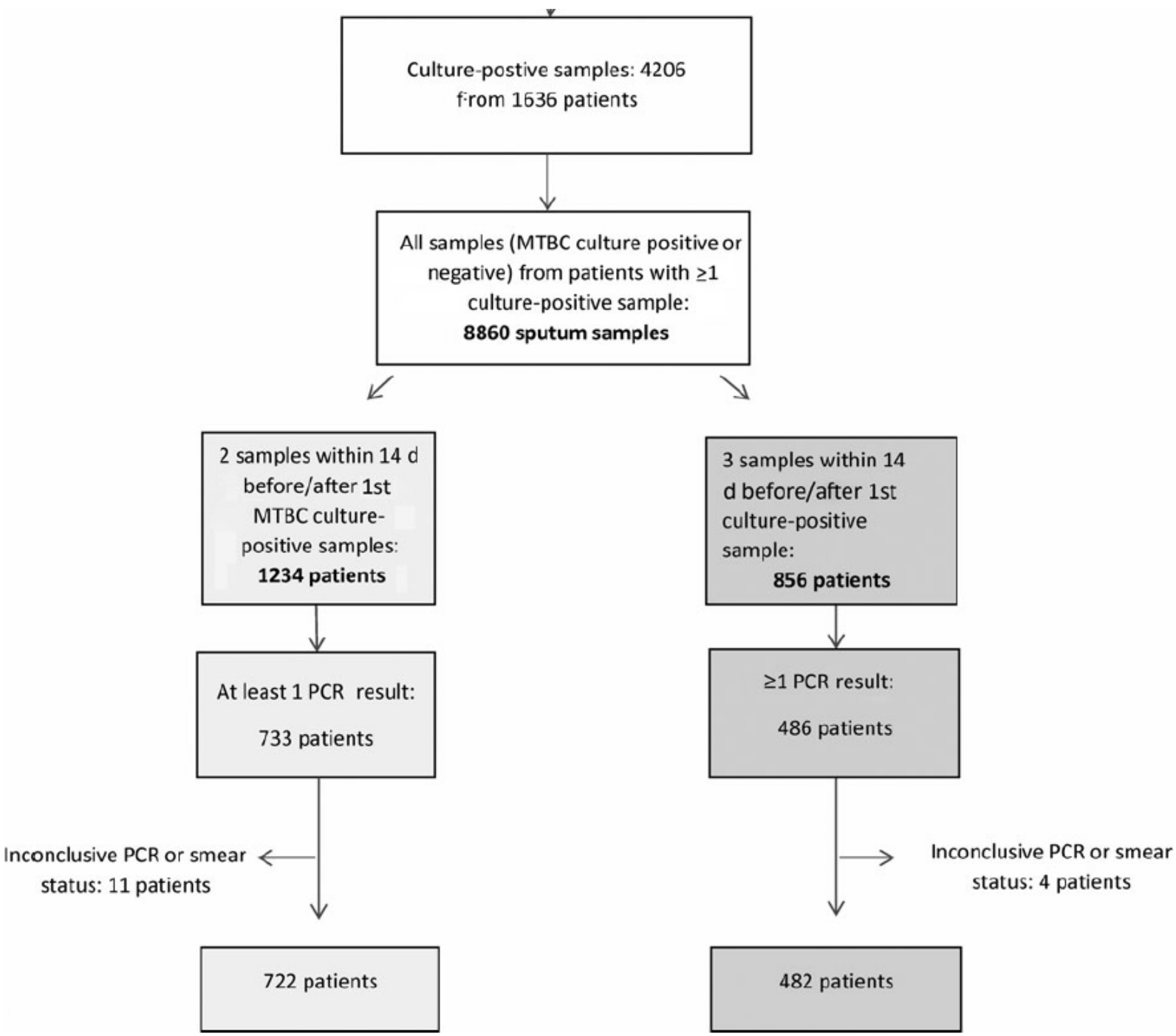
Methods. We retrospectively evaluated sputum samples analyzed for *M. tuberculosis* complex at the International Reference Laboratory of Mycobacteriology, Copenhagen, Denmark in 2002–2011. We selected culture-confirmed tuberculosis cases with ≥3 samples within 14 days before or after the initial culture-positive sample. We repeated the process for those with ≥2 samples within 28 days. The primary outcome was PCR-negative, smear-positive patients.

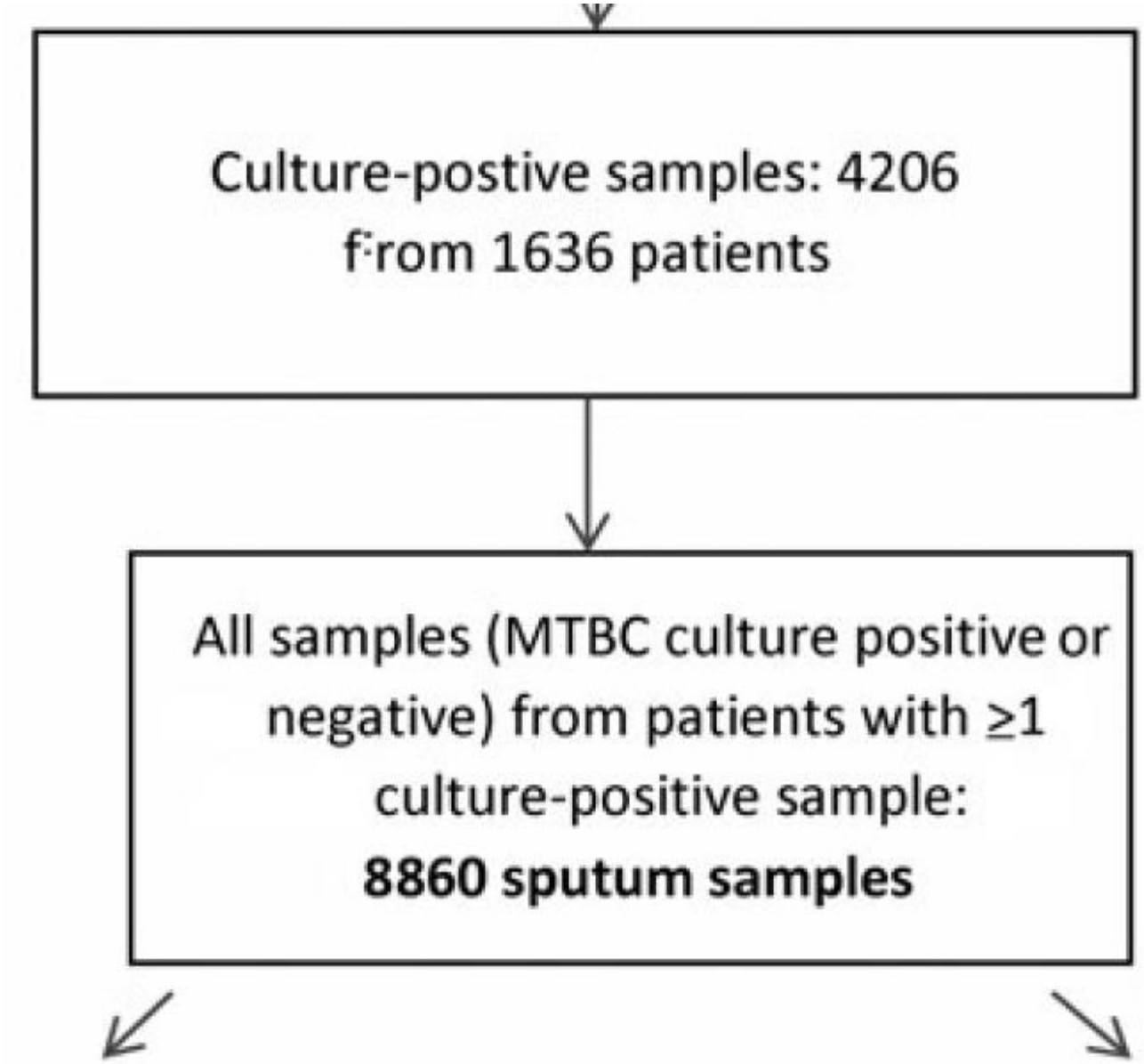
Results. We included 53 533 sputum samples from 20 928 individuals; 1636 had culture-confirmed tuberculosis. Of these, 856 had ≥3 sputum samples analyzed within the 28 days, and 482 had ≥1 PCR result. Nine patients (2.5% of smear-positive patients) were smear positive/PCR negative; 8 of the 9 had a smear-positive result in only 1 of 3 samples, and 5 had a low smear grade. Of 722 patients with 2 samples, 7 (1.3% of smear-positive patients) were smear positive/PCR negative. Overall, none were smear positive for the sample that produced the negative PCR result.

Conclusions. Primary PCR identified >97% of serial smear-positive cases. The majority of the missed cases had low-grade smears. Nevertheless, the occurrence of smear-positive/PCR-negative cases underlines the importance of increasing the quantity and quality of samples. Moreover, it is important that samples analyzed with PCR are cultured, owing to higher-sensitivity drug susceptibility testing, differential diagnosis, and surveillance.

Result

- 20,928 patients
- Culture confirmed TB = **1,636**
  - Smear-positive = 1,158 patient
    - 8,860 sputum samples
- **Culture confirmed TB who had PCR tested**
  - All = **937**
    - smear-positive = **683**
  - First PCR – positive = **777**
    - smear-positive = **671**


Culture-postive samples: 4206 from 1636 patients
All samples (MTBC culture positive or negative) from patients with ≥1 culture-positive sample: 8860 sputum samples
2 samples within 14 d before/after 1st MTBC culture-positive samples: 1234 patients
3 samples within 14 d before/after 1st culture-positive sample: 856 patients
At least 1 PCR result: 733 patients
≥1 PCR result: 486 patients
Inconclusive PCR or smear status: 11 patients
Inconclusive PCR or smear status: 4 patients
722 patients
482 patients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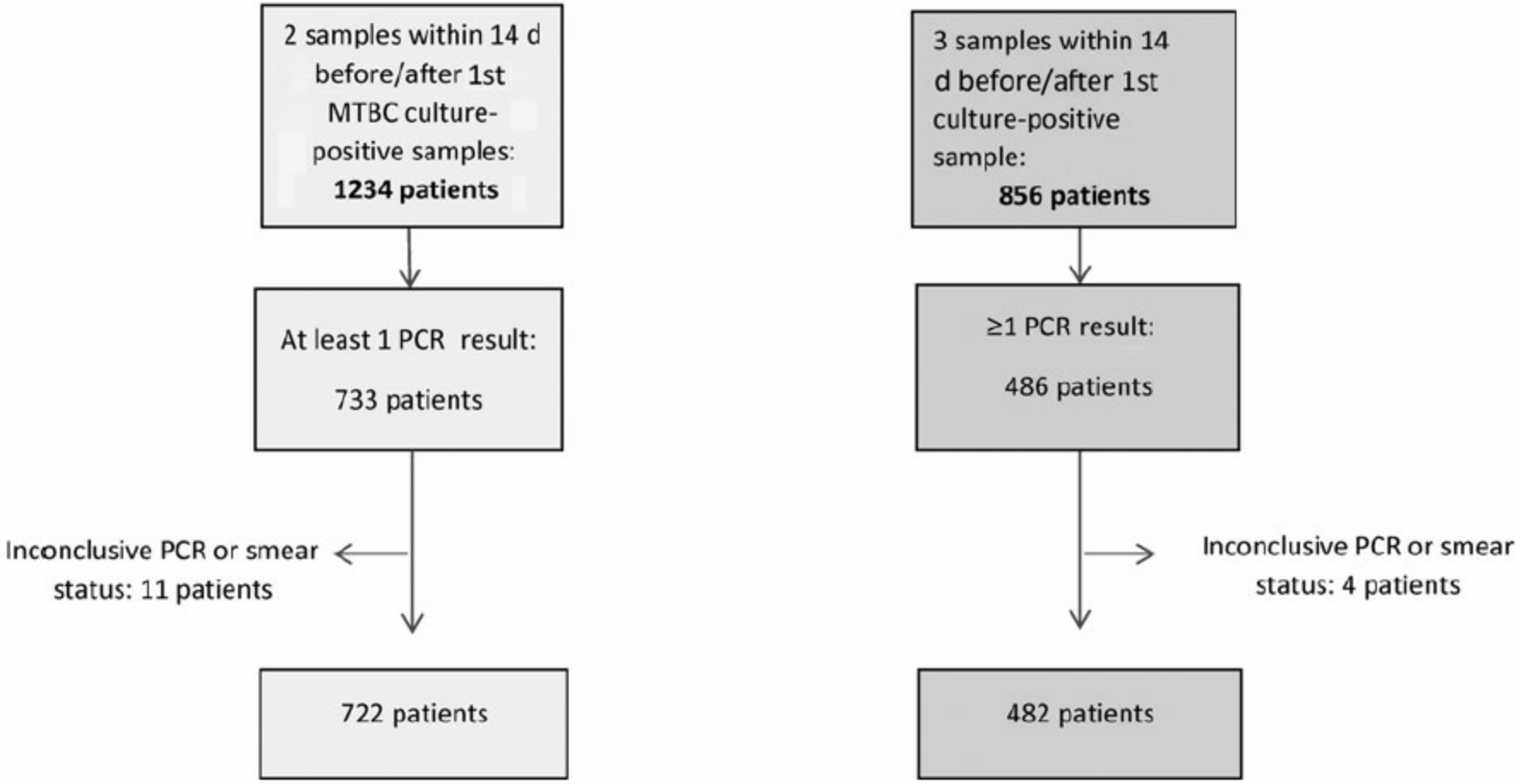
2 samples within 14 d before/after 1st MTBC culture-positive samples: 1234 patients
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Inconclusive PCR or smear status: 11 patients
722 patients
3 samples within 14 d before/after 1st culture-positive sample: 856 patients
≥1 PCR result: 486 patients
Inconclusive PCR or smear status: 4 patients
482 patients

Table 2. Patients With Culture-Confirmed Tuberculosis and ≥2 and ≥3 Samples Within 14 Days Before or After Initial Culture-Positive Samples[a]

Initial Samples	Negative PCR Results	Positive PCR Results	Total
2 initial samples			
Smear negative	79	46	125
Smear positive	9	348	357
Total	88	394	482
3 initial samples			
Smear negative	108	86	194
Smear positive	7	521	528
Total	115	607	722

None had both PCR-negative and smear-positive results in the same sample

In conclusion, a single primary conventional sputum PCR test identified >97% of serial smear-positive pulmonary tuberculosis cases. Most missed cases had low-grade smears. The occurrence of smear-positive, PCR-negative cases underlines the importance of increasing both the quantity and quality of the samples investigated. Still, it is important to culture samples analyzed with PCR owing to the higher sensitivity of cultures, but it is also important to perform drug susceptibility testing, differential diagnosis, and surveillance. The challenge can be overcome by using the same sample for both PCR and culturing.