Published in final edited form as:

Am J Infect Control. 2012 October ; 40(8): 696–700. doi:10.1016/j.ajic.2012.03.014.

Wide variation in adoption of screening and infection control interventions for multidrug-resistant organisms: A national study

Monika Pogorzelska, PhD, MPH^{a,*}, Patricia W. Stone, PhD, RN, FAAN^a, and Elaine L. Larson, RN, PhD, FAAN, CIC^b

^a Columbia University School of Nursing, New York, NY

^b Columbia University School of Nursing, Mailman School of Public Health, New York, NY

Abstract

Background—We performed a survey of National Healthcare Safety Network hospitals in 2008 to describe adoption of screening and infection control policies aimed at multidrug-resistant organisms (MDRO) in intensive care units (ICUs) and identify predictors of their presence, monitoring, and implementation.

Methods—Four hundred forty-one infection control directors were surveyed using a modified Dillman technique. To explore differences in screening and infection control policies by setting characteristics, bivariate and multivariable logistic regression models were constructed.

Results—In total, 250 hospitals participated (57% response rate). Study ICUs (n = 413) routinely screened for methicillin-resistant *Staphylococcus aureus* (59%); vancomycin-resistant *Enterococcus* (22%); multidrug-resistant, gram-negative rods (12%); and *Clostridium difficile* (11%). Directors reported ICU policies to screen all admissions for any MDRO (40%), screen periodically (27%), utilize presumptive isolation/contact precautions pending a screen (31%), and cohort colonized patients (42%). Several independent predictors of the presence and implementation of different interventions including mandatory reporting and teaching status were identified.

Conclusion—This study found wide variation in adoption of MDRO screening and infection control interventions, which may reflect differences in published recommendations or their interpretation. Further research is needed to provide additional insight on effective strategies and how best to promote compliance.

Keywords

Infection prevention and control programs; Methicillin-resistant *Staphylococcus aureus*; Vancomycin-resistant *Enterococcus*; *Clostridium difficile*

Health care-associated infections (HAI) are one of the leading causes of death and a major source of morbidity in acute care hospitals.¹ Part of this morbidity and mortality is due to increased antibiotic resistance in HAI, which renders standard treatment ineffective. It has

been estimated that more than 70% of bacteria that cause HAI are resistant to at least 1 antibiotic commonly used in treatment.² Methicillin-resistant *Staphylococcus aureus* (MRSA); vancomycin-resistant *Enterococcus* (VRE); and multidrug-resistant (MDR), gram-negative rods (GNR) are several multidrug-resistant organisms (MDRO) that have presented serious challenges.^{3,4} Additionally, although infections caused by *Clostridium difficile* are not considered to be MDRO, they result in significant patient burden and are associated with the frequent use of antibiotics.⁵ Furthermore, there is increased focus on mandated public reporting of *C difficile* and MDRO rates.⁶

Because of the substantial burden caused by MDRO and *C difficile*, identification and prevention of these infections remains a major component of infection control programs. Interventions often recommended to control MDRO and *C difficile* include active surveillance, isolation/contact precautions, and cohorting of colonized/infected patients. However, the evidence base on the relationship between MDRO infection prevention and control programs and MDRO rates is weak, although studies point to the effectiveness of implementing multiple interventions in reducing MDRO rates.⁷ Importantly, there is wide variation in recommendations set forth by different organizations. For example, Centers for Disease Control and Prevention (CDC) guidelines recommend use of barrier precautions for confirmed cases but do not recommend routine surveillance cultures in low MDRO prevalence settings.⁸ Conversely, the Society for Healthcare Epidemiologists of America recommends surveillance cultures for all high-risk admissions and use of preemptive barrier precautions for patients with pending cultures.⁹ Several European countries employ more stringent approaches that include screening and isolation of patients considered high risk for MRSA carriage.¹⁰

Although several studies have been conducted on the use of different infection control practices,¹¹⁻¹⁷ adoption of specific MDRO and *C difficile* screening and infection control policies in US hospitals is not well described. Additionally, research on setting characteristics that influence implementation of these interventions in intensive care units (ICUs) is lacking. Therefore, the aims of this large, cross-sectional study of National Healthcare Safety Network (NHSN) hospitals were to (1) describe adoption of MDRO and *C difficile* screening and infection control interventions, as well as their implementation in ICUs; and (2) investigate whether the presence, monitoring, and/or implementation of screening and infection control interventions aimed at MDRO in ICUs varies with setting characteristics (ie, hospital, infection control department, and ICU characteristics).

METHODS

As part of a larger study, "Prevention of Nosocomial Infections and Cost Effectiveness Analysis," R01NR010107, select NHSN hospitals were surveyed in 2008. A total of 441 hospitals were eligible to participate in this study, and the eligibility criteria included conducting NHSN HAI surveillance in 2007 and a minimum of 500 device-days. The eligibility criteria reflected the aims of the larger study, which were to investigate the effectiveness of infection control bundles in reducing device-associated HAI rates. A modified Dillman technique was used, and participant recruitment and study methodology are described in detail elsewhere.¹⁸ The online survey was designed to be answered by the infection control department director. Respondents provided data on each medical, medical/surgical, and surgical ICU at their hospitals. Test-retest reliability of the survey was assessed ($\kappa = 0.88$), and the survey was pilot tested by 3 infection preventionists (IPs) and 2 doctoral students. Study procedures were reviewed and approved by the Columbia University Medical Center Institutional Review Board.

The conceptual framework guiding our work was based on the quality of care definition developed by Donabedian who defined quality of care as being composed of the structures, processes, and outcomes of care¹⁹ (Fig 1). Specifically, we investigated the relationship between structures of care (ie, hospital and infection control characteristics) and processes of care (ie, adoption, monitoring, and implementation of infection control policies aimed at MDRO).

Independent variables

Hospital characteristics examined included geographic region (Northeast, South, Midwest, West) and state mandatory reporting of HAI (yes/no). Teaching status and bed size were not collected as part of the original survey but subsequently obtained from public data sources and telephone calls to hospitals that completed the survey. Hospital teaching status was defined as the hospital being affiliated with a medical school, and bed size was defined as the number of licensed in-patient beds. Infection control department characteristics included the following: presence of hospital epidemiologist (full-time defined as 40 hours per week devoted to infection control, part-time defined as less than 40 hours and any [either part- or full-time]), proportion of IPs certified in infection control, number of IP full-time equivalents (FTE) per 100 beds, number of infection control staffing hours per week, number of IP staff, and use of electronic surveillance systems for tracking of HAI (yes/no).

Dependent variables

To assess screening practices for specific organisms, respondents were asked whether each ICU routinely screened for MRSA, VRE, *C difficile*, and MDR GNR. Data were collected on 5 screening and infection control policies (aim 2): (1) screening ALL ICU admissions for *any* MDRO, (2) screening for *any* MDRO periodically after admission, (3) presumptive isolation/contact precautions pending a screen, (4) contact precautions for culture-positive patients, and (5) cohorting of colonized patients. For each of these 5 policies, we asked the following: Was a written policy in place? If yes, was it monitored? If monitored, what proportion of time was the policy correctly implemented? Answer choices included the following: all the time (95%-100%), usually (75%-94%), sometimes (25%-74%), rarely/never (less than 25%), and don't know. Fifteen outcomes were examined: presence, monitoring, and correct implementation of each of the 5 policies. Correct implementation was defined dichotomously as 75% versus <75% of the time based on distributions of responses.

Data analysis

Data were analyzed using Stata 11.1 (Stata Corporation, College Station, TX). Descriptive statistics were examined. We computed frequencies and percentages to determine adoption of different interventions (aim 1). To examine whether presence, monitoring, and implementation of interventions for *any* MDRO varied with setting characteristics (aim 2), we constructed bivariate logistic regression models. The independent variables were the hospital, infection control department, and ICU characteristics outlined previously. Because of an exploratory nature of this study, we used an empirical approach to include variables in the multivariable model because not a lot is known about predictors of adoption and implementation of these policies. Those variables with a *P* value of .1 were entered into multivariable logistic regression models to estimate the independent effect of each predictor on the presence, monitoring, and implementation of interventions aimed at any MDRO. Additionally, potential confounding variables were added one by one into the model, and, if the coefficient of a covariate changed by 10% or more, the variable was considered a confounder and entered into the final model. Because data were collected on more than 1 ICU, we calculated robust variance estimators for all analyses to adjust for clustering at the

hospital level.²⁰ Correlations among variables were examined to assess collinearity. A *P* value of <.05 was considered statistically significant.

RESULTS

Of 441 eligible hospitals, 250 provided data on 413 ICUs (57% response rate). Table 1 provides demographic data of study hospitals. The majority of respondents (*n* = 142, 57%) provided data on only 1 ICU, with an additional 74 (30%) providing data on 2 ICUs. Almost half the hospitals were located in the Northeast (44%), and the majority was located in states with mandatory reporting of HAI (76%). Two-fifths reported presence of a part-time hospital epidemiologist (42%), whereas a full-time epidemiologist was present in only 6% of the hospitals. Of the independent variables, only total hours of infection control staffing and number of infection control staff were highly correlated (*r* = 0.90).

Aim 1: Describe adoption of MDRO and *C. difficile* screening and infection control interventions

Study ICUs routinely screened for MRSA (59%), VRE (22%), MDR GNRs (12%), and *C. difficile* (11%). A written policy to screen all admissions for *any* MDRO was reported for 40% of ICUs, and 27% had a policy for periodic screening following admission (Table 2). Of those ICUs that reported the presence of these 2 policies, the majority monitored implementation (80% and 79%, respectively), and correct implementation 75% of the time was reported for 96% and 91% of the ICUs, respectively. Approximately one-third reported a policy requiring isolation/contact precautions for patients with pending screens; 98% and 42% reported a policy for contact precautions for culture-positive patients and cohorting of colonized patients, respectively.

Aim 2: Examine whether presence, monitoring, and/or implementation of screening and infection control interventions aimed at any MDRO vary with setting characteristics

In bivariate analysis, state mandatory reporting (odds ratio [OR], 2.52; 95% confidence interval [CI]: 1.36-4.66; *P* = .03), teaching status (OR, 1.80; 95% CI: 1.01-3.21; *P* = .048), hospital bed size of 201 to 500 beds (OR, 2.73; 95% CI: 1.28-5.79; *P* = .009), and location in the West (OR, 0.31; 95% CI: 0.12-0.80; *P* = .015) were associated with a policy to screen all admissions for any MDRO. In the multivariable model, mandatory reporting, teaching status, and location in the West remained significant independent predictors of the presence of this policy (Table 3).

Mandatory reporting (OR, 2.25; 95% CI: 1.09-4.64; *P* = .028), teaching status (OR, 2.68; 95% CI: 1.36-5.29; *P* = .004), and use of electronic surveillance systems (OR, 1.95; 95% CI: 1.00-3.82; *P* = .050) were positively associated with a policy to screen periodically after admission in bivariate analyses. Additionally, ICUs in hospitals with 201 to 500 beds were more likely to report this policy as compared with smaller hospitals (OR, 2.47; 95% CI: 1.03-5.94; *P* = .043), and ICUs located in the Midwest and West were less likely to report this policy versus the Northeast (OR, 0.20; 95% CI: 0.08-0.53, *P* = .001 and OR, 0.28; 95% CI: 0.10-0.79, *P* = .016, respectively). However, the presence of an electronic surveillance system, Midwest location, and hospital size remained the only independent predictors of periodic screening in multivariable regression (Table 3).

Mandatory reporting status was negatively associated with having a policy for presumptive isolation/contact precautions pending a screen (OR, 0.47; 95% CI: 0.26-0.85; *P* = .012) and was the only significant predictor of this policy in bivariate analysis. Although mandatory reporting was significantly associated with a policy to cohort colonized patients in bivariate

analysis (OR, 1.91; 95% CI: 1.06-3.42; $P = .031$), it was not an independent predictor of having this policy after controlling for region and the number of infection control staff.

In bivariate analyses, ICUs in hospitals with a full-time epidemiologist were more likely to monitor compliance with cohorting of colonized patients (OR, 6.65; 95% CI: 1.08-40.96; $P = .041$) but was not significantly associated with monitoring the implementation of this policy after controlling for state mandatory reporting, region, number of infection control staff, and proportion of IPs certified in infection control (data not shown).

Several setting characteristics predicted correct implementation of infection control policies 75% of the time. ICUs in hospitals with a greater proportion of certified IPs were less likely to report correct implementation of policy to screen new admissions (OR, 0.19; 95% CI: 0.05-0.64; $P = .008$) after controlling for the number of infection control staff and region. In bivariate analyses, higher infection control staffing hours were positively associated with correct implementation of periodic screening (OR, 1.01; 95% CI: 1.00-1.02; $P = .004$) and the presence of any hospital epidemiologist approached statistical significance (OR, 6.11; 95% CI: 0.86-43.47; $P = .070$). Higher number of infection control staff, and infection control staffing hours were positive predictors of correct implementation of the policy to isolate culture-positive patients in bivariate analysis (OR, 1.32; 95% CI: 1.01-1.71; $P = .042$ and OR, 1.01; 95% CI: 1.00-1.01, $P = .017$, respectively). Lastly, ICUs in the Midwest were significantly less likely to report correct implementation of a policy to cohort colonized patients (OR, 0.03; 95% CI: 0.01-0.40; $P = .008$). However, we lacked sufficient power to assess these variables in multivariable analysis or to assess the relationship between setting characteristics and contact precautions for patients with pending screens.

DISCUSSION

To our knowledge, this is one of the first studies to examine adoption of these specific policies and to identify predictors of their presence and implementation. In our study, over half the ICUs routinely screened for MRSA; but only a small proportion screened for VRE, MDR, GNR, and *C difficile* (11%-22%). The vast majority reported a policy for contact/isolation precautions for culture-positive patients, which is congruent with other studies that reported high use of barrier/isolation precautions for infected patients.^{12,18,21} The presence of other MDRO-related infection control policies in our sample was low and may reflect wide variation in published recommendations on these interventions or their interpretation.

State mandatory reporting was a significant independent predictor of screening for MDRO, which is expected given that hospitals may have an incentive to screen new admissions for MDRO to identify infections not attributable to the hospital stay. Teaching status was an independent predictor of screening all admissions for any MDRO. Other studies found similar relationships among teaching status, use of procedures to monitor antimicrobial resistance, and greater surveillance scores.^{13,15} Interestingly, ICUs in hospitals with higher percent of IPs certified in infection control were less likely to report correct implementation of policy to screen all admissions. One explanation is that more experienced IPs may be more accurate in reporting implementation, whereas less experienced IPs may over report adherence. Additionally, it may be the case that certified IPs are less strict about complying with policies for which the evidence base is lacking.

Infection control staffing did not independently predict the presence and/or implementation of interventions, which suggests that factors other than staffing are influencing the likelihood of implementing these policies. Several studies have examined the role of organizational factors such as institutional culture and suggest that these may be important in fostering adoption of infection control policies^{22,23}; however, we did not assess these in

this analysis. Future studies should investigate the relationship between staffing and organizational support and the effect both may have on policy implementation. Additionally, with the current increase in mandatory reporting, IPs may be focusing on fulfilling mandates rather than implementing policies based on their experience and hospital needs. Further studies are warranted to assess how mandatory reporting influences the role, activities, and goals of the infection control department including policy implementation.

This study has several limitations. The data are cross-sectional preventing us from establishing temporality. Our study involved a convenience sample of NHSN hospitals, which in 2008 tended to be larger and more likely to be teaching. In addition, our eligibility criteria included a minimum number of device-days; therefore, surveyed hospitals were on the larger end of the NHSN spectrum. Hospitals located in the Northeast were overrepresented, which may further limit generalizability. Data were self-reported by IPs, which may be problematic in that IPs may have overestimated adoption of policies. Additionally, reported compliance may not be accurate because IPs do not spend substantial amounts of time in the ICU. Because this was an exploratory analysis, we did not adjust for the multiple comparisons made. Our response rate was 57%, leaving potential for nonresponse bias. To examine the possibility of this type of bias, we compared HAI rates in surveyed hospitals to those found in published estimates of all NHSN hospitals and found them to be similar.^{24,25} Despite these limitations, we were able to observe several significant predictors of full compliance with policies.

There is significant variation in adoption of screening and infection control interventions aimed at MDRO and *C difficile* in NHSN ICUs, which is congruent with data from other studies and may reflect wide variation in published recommendations or their interpretation. Several setting characteristics hypothesized to be important in predicting these interventions did have an independent effect on their presence and implementation, specifically, mandatory reporting, geographic region, bed size, presence of a hospital epidemiologist, teaching status, and presence of an electronic surveillance system. Further research is needed to confirm these findings and to identify additional factors that foster adoption of these interventions. Additional research is also needed to strengthen the evidence base on the effectiveness of these interventions and facilitate the development of more standardized guidelines to aid in implementing these interventions in the acute care setting.

Acknowledgments

The authors thank all of the participating hospitals.

Supported by Award Number R01NR010107 from the National Institute of Nursing Research, Bethesda, MD.

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Nursing Research or the National Institutes of Health.

References

1. Klevens RM, Edwards JR, Richards CL Jr, Horan TC, Gaynes RP, Pollock DA, et al. Estimating health care-associated infections and deaths in US hospitals, 2002. Public Health Rep. 2007; 122:160–6. [PubMed: 17357358]
2. Marshall J, Agniel D, Fraser VJ, Doherty J, Warren DK. Gram-negative bacteraemia in non-ICU patients: factors associated with inadequate antibiotic therapy and impact on outcomes. J Antimicrob Chemother. 2008; 61:1376–83. [PubMed: 18344548]
3. CDC. National Nosocomial Infections Surveillance System Report, data summary from January 1992 through June 2004, issued October 2004. Am J Infect Control. 2004; 32:470–85. [PubMed: 15573054]

4. Jansen WTM, van der Bruggen JT, Verhoef J, Fluit AC. Bacterial resistance: a sensitive issue. Complexity of the challenge and containment strategy in Europe. *Drug Resistance Updates*. 2006; 9:123–33. [PubMed: 16807066]
5. Sunenshine RH, McDonald LC. *Clostridium difficile*-associated disease: new challenges from an established pathogen. *Cleve Clin J Med*. 2006; 73:187–97. [PubMed: 16478043]
6. Meier BM, Stone PW, Gebbie KM. Public health law for the collection and reporting of health care-associated infections. *Am J Infect Control*. 2008; 36:537–51. [PubMed: 18926306]
7. Backman C, Taylor G, Sales A, Marck PB. An integrative review of infection prevention and control programs for multi-drug resistant organisms in acute care hospitals: a socio-ecological perspective. *Am J Infect Control*. 2011; 39:368–78. [PubMed: 21429622]
8. Siegel JD, Rhinehart E, Jackson M, Chiarello L. Healthcare Infection Control Practices Advisory Committee. Management of multidrug-resistant organisms in healthcare settings, 2006. *Am J Infect Control*. 2007; 35:S165–93. [PubMed: 18068814]
9. LeDell K, Muto CA, Jarvis WR, Farr BM. SHEA guideline for preventing nosocomial transmission of multidrug-resistant strains of *Staphylococcus aureus* and *Enterococcus*. *Infect Control Hosp Epidemiol*. 2003; 24:639–41. [PubMed: 14510243]
10. Wertheim HF, Vos MC, Boelens HA, Voss A, Vandenbroucke-Grauls CM, Meester MH, et al. Low prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) at hospital admission in The Netherlands: the value of search and destroy and restrictive antibiotic use. *J Hosp Infect*. 2004; 56:321–5. [PubMed: 15066745]
11. Jarvis WR, Schlosser J, Chinn RY, Tweeten S, Jackson M. National prevalence of methicillin-resistant *Staphylococcus aureus* in inpatients at US health care facilities, 2006. *Am J Infect Control*. 2007; 35:631–7. [PubMed: 18063126]
12. Hansen S, Schwab F, Asensio A, Carsauw H, Heczko P, Klavs I, et al. Methicillin-resistant *Staphylococcus aureus* (MRSA) in Europe: which infection control measures are taken? *Infection*. 2010; 38:159–64. [PubMed: 20232107]
13. Flach SD, Diekema DJ, Yankey JW, BootsMiller BJ, Vaughn TE, Ernst EJ, et al. Variation in the use of procedures to monitor antimicrobial resistance in US hospitals. *Infect Control Hosp Epidemiol*. 2005; 26:31–8. [PubMed: 15693406]
14. Gravel D, Gardam M, Taylor G, Miller M, Simor A, McGeer A, et al. Infection control practices related to *Clostridium difficile* infection in acute care hospitals in Canada. *Am J Infect Control*. 2009; 37:9–14. [PubMed: 19171246]
15. Zoutman DE, Ford BD, Bryce E, Gourdeau M, Hébert G, Henderson E, et al. The state of infection surveillance and control in Canadian acute care hospitals. *Am J Infect Control*. 2003; 31:266–72. [PubMed: 12888761]
16. Richet HM, Benbachir M, Brown DE, Giamarellou H, Gould I, Gubina M, et al. Are there regional variations in the diagnosis, surveillance, and control of methicillin-resistant *Staphylococcus aureus*? *Infect Control Hosp Epidemiol*. 2003; 24:334–41. [PubMed: 12785406]
17. Krein SL, Kowalski CP, Hofer TP, Saint S. Preventing hospital-acquired infections: a national survey of practices reported by US hospitals in 2005 and 2009. *J Gen Intern Med*. 2012; 27:773–9. [PubMed: 22143455]
18. Stone PW, Dick A, Pogorzelska M, Horan TC, Furuya EY, Larson EL. Staffing and structure of infection prevention and control programs. *Am J Infect Control*. 2009; 37:351–7. [PubMed: 19201510]
19. Donabedian A. The quality of care: how can it be assessed? *JAMA*. 1988; 260:1743–8. [PubMed: 3045356]
20. Huber P. Robust estimation of a location parameter. *Ann Math Stat*. 1964; 35:73–101.
21. Sunenshine RH, Liedtke LA, Fridkin SK, Strausbaugh LJ. Management of inpatients colonized or infected with antimicrobial-resistant bacteria in hospitals in the United States. *Infect Control Hosp Epidemiol*. 2004; 26:138–43. [PubMed: 15756883]
22. Ward MM, Diekema DJ, Yankey JW, Vaughn TE, BootsMiller BJ, Pendergast JF, et al. Implementation of strategies to prevent and control the emergence and spread of antimicrobial-resistant microorganisms in US hospitals. *Infect Control Hosp Epidemiol*. 2005; 26:21–30. [PubMed: 15693405]

23. Chou AF, Yano EM, McCoy KD, Willis DR, Doebbeling BN. Structural and process factors affecting the implementation of antimicrobial resistance prevention and control strategies in US hospitals. *Health Care Manage Rev.* 2008; 33:308–22. [PubMed: 18815496]
24. Furuya EY, Dick A, Perencevich EN, Pogorzelska M, Goldmann D, Stone PW. Central line bundle implementation in US intensive care units and impact on bloodstream infections. *PLoS One.* 2011; 6:e15452. [PubMed: 21267440]
25. Pogorzelska M, Stone PW, Furuya EY, Perencevich EN, Larson EL, Goldmann D, et al. Impact of the ventilator bundle on ventilator-associated pneumonia in intensive care units. *Int J Qual Health Care.* 2011; 23:538–44. [PubMed: 21821603]

Fig 1.
Conceptual framework.

Table 1

Description of hospitals and intensive care units

Hospital characteristics (N = 250)	n	%
Region		
Northeast	109	44
South	66	26
Midwest	40	16
West	35	14
Mandatory reporting (state)	189	76
Bed count		
<201	50	20
201-500	145	58
>501	55	22
Length in NHSN/NNIS, yr		
<1	33	13
1-3	78	31
>3	134	54
Missing	5	2
Electronic surveillance system		
Yes	63	25
No	183	73
Missing	4	2
Presence of hospital epidemiologist		
Full-time	15	6
Part-time	105	42
Proportion of IPs certified in infection control, median (range)	50%	(0%-100%)
Number of IP FTE per 100 beds, median (range)	0.61	(0-4.75)
ICU characteristic/type (N = 413), n (%)		
Medical	102	(25)
Medical/surgical	222	(54)
Surgical	89	(22)

FTE, Full-time equivalent; *ICU*, intensive care unit; *IP*, infection preventionist; *NHSN*, National Healthcare Safety Network; *NNIS*, National Nosocomial Infection Surveillance.

Table 2

Extent to which ICUs have written infection control policies related to MDRO, monitor their implementation, and proportion of time these policies are correctly implemented: N = 413

	<u>Presence of written policy</u>		<u>Presence of monitoring for implementation</u> [*]		<u>ICUs reporting correct implementation at least 75% of the time</u> [*]	
	n	%	n	%	n	%
Screen ALL patients for any MDRO upon admission	164	40	131	80	126	96
Screen periodically after admission	110	27	87	79	79	91
Presumptive isolation pending screen results	128	31	61	48	59	97
Contact precautions for culture-positive patients	404	98	264	65	255	97
Cohorting of colonized patients	175	42	87	50	50	57

ICU, Intensive care unit; MDRO, multidrug-resistant organism.

^{*} Monitoring of implementation was assessed among those ICUs that reported the presence of a written policy and correct implementation was assessed among those ICUs that reported monitoring of implementation of the written policy.

Table 3

Predictors of presence of infection control policies in multivariable analysis

	OR	95% CI	P value
Screening all patients on admission for any MDRO (n = 361)			
Mandatory reporting	3.34	1.51-7.38	.003
No. of FTE IPs per 100 beds	1.01	0.54-1.88	.987
Teaching	2.30	1.18-4.46	.014
Region (vs Northeast)			
South	1.38	0.64-2.97	.413
Midwest	0.97	0.34-2.78	.949
West	0.28	0.10-0.78	.015
Bed size (vs <201)			
201-500	2.74	0.93-8.10	.068
>500	1.78	0.56-5.78	.326
Screening periodically after admission (n = 411)			
Mandatory reporting	1.62	0.56-4.67	.375
Electronic surveillance system	2.45	1.05-5.71	.038
Teaching	2.44	0.95-6.24	.063
Region (vs Northeast)			
South	1.64	0.65-4.12	.294
Midwest	0.22	0.05-0.93	.040
West	0.37	0.11-1.31	.123
Percent IP certified	1.67	0.53-5.01	.397
Number of infection control staff	1.00	0.76-1.32	.988
Bed size (vs < 201)			
201-500	7.05	1.12-44.40	.037
>500	4.43	0.61-31.88	.139
Contact precautions for culture positive patients (n = 355)			
Mandatory reporting	0.73	0.13-4.16	.725
No. of FTE IPs per 100 beds	0.63	0.32-1.22	.172
Percent of IPs certified	0.02	0.01-1.18	.060
Cohorting of patients			
Mandatory reporting	1.16	0.51-2.62	.727
Region (vs Northeast)			
South	0.52	0.21-1.29	.157
Midwest	0.30	0.10-0.92	.035
West	0.47	0.17-1.32	.154
Number of infection control staff	1.14	0.96-1.35	.127

FTE, Full-time equivalent; IP, infection preventionist; MDRO, multidrug-resistant organism.

NOTE. All variables entered into each model are presented in the Table.