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State of Infection Prevention in US Hospitals Enrolled in NHSN

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Abstract

Background—This report provides a national cross-sectional snapshot of infection prevention and control programs and clinician compliance with the implementation of processes to prevent healthcare associated infections (HAI) in intensive care units (ICUs).

Methods—All hospitals, except for Veterans Affairs hospitals, enrolled in the National Healthcare Safety Network (NHSN) were eligible to participate. Participation included: 1) completion of a survey that assessed presence of evidence-based prevention policies and clinician adherence, and 2) joining our NHSN research group. Descriptive statistics were computed. Facility characteristics and HAI rates by ICU type were compared between respondents and non-respondents.

Results—Of the 3,374 eligible hospitals, 975 hospitals provided data (29% response rate) on 1,653 ICUs; and, there were complete data on the presence of policies in 1,534 ICUs. The average number of infection preventionists (IPs) per 100 beds was 1.2. Certification of IP staff varied across institutions and the average hours per week of data management and secretarial support were generally low. There was variation in the presence of policies and clinician adherence to these policies. There were no differences in HAI rates between respondents and non-respondents.

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Conclusions—Guidelines around IP staffing in acute care hospitals should be updated. In future publications we will analyze the associations between HAI rates and infection prevention and control program characteristics, presence of and clinician adherence to evidence-based policies.

Healthcare associated infections (HAIs) are a serious patient safety problem. Many of these infections occur in the intensive care unit (ICU) setting and are associated with an invasive device (such as a central line, ventilator or indwelling urinary catheter).[1] The annual hospital costs of HAIs in the U.S. have been estimated to be up to 33 billion dollars per year.[2] Because of the pervasiveness of HAIs that are largely preventable and the associated costs, the U.S. Department of Health and Human Services has placed a priority on the national reduction of HAIs, with the goal of building a safer, more affordable healthcare system for all Americans.[3]

In the mid 1970's, the Centers for Disease Control and Prevention (CDC) undertook a national study entitled Study on the Effectiveness of Nosocomial Infection Control (SENIC), which provided strong evidence that hospitals with well organized infection control programs had lower HAI rates.[4] Based on these results, for over 30 years the Joint Commission has required a formal infection prevention and control program in each accredited hospital. Furthermore, in a jointly published position paper published in 1998, a panel of experts outlined consensus requirements for infrastructure and essential activities of infection prevention and control in hospitals.[5–6] The major functions outlined included surveillance of nosocomial infections; proper analysis of infection control data; capacity to detect and control outbreaks; written policies for infection control and prevention; collaboration with employee health programs; ongoing education programs; and adequate resources, including a trained hospital epidemiologist (HE), a certified infection preventionist (IP), and adequate computer and clinical microbiology laboratory support.

However, it is not clear how to best organize infection prevention and control programs to help front-line clinicians deliver effective bedside care given the contemporary context of mandatory reporting of HAIs, increased acuity of hospitalized patients, and the increased incidence of multiple drug resistant organisms (MDROs) and *Clostridium difficile* infections (CDI). Furthermore, there are controversies regarding published recommendations for important infection prevention, surveillance and control processes.[7] Despite high infection rates and the need to implement clinically effective processes, there are wide gaps in knowledge illustrating that additional studies are needed.

To fill some of these gaps, and build upon our previous research, we undertook the "**P**revention of **N**osocomial **I**nfections and **C**ost **E**ffectiveness **R**efined" (**P-NICER**) study (R01NR010107).[8–11] The aims of this national study were to: 1) qualitatively describe infection prevention and control in U.S. hospitals, 2) examine the comparative effectiveness of various strategies used by infection control departments to improve clinician adherence to evidence-based practices and decrease HAIs in ICUs across the nation, and 3) examine the impact of state mandatory reporting on infection prevention processes and HAI rates. This report provides a cross-sectional snapshot of the structure and resources of infection prevention and control programs around the country and clinician compliance with the implementation of processes to prevent device-associated infections. While the larger P-NICER study includes all ICUs, here we report on only the adult settings.

Methods

A mixed method study that included both qualitative and quantitative approaches was conducted. The qualitative results, which are reported elsewhere, informed the quantitative approach described here.[12] Specifically, based on the qualitative results we adapted the survey from our previous research (which was originally adapted from the SENIC study).[8–11]

All hospitals, except for Veterans Affairs hospitals, were eligible to participate if they were enrolled in the National Healthcare Safety Network (NHSN). We considered opening eligibility to all hospitals across the nation and decided against this option because using only NHSN hospitals maximized the quality and validity of the data collected. To enroll hospitals while protecting the confidentiality of the participating NHSN hospitals, the CDC e-mailed an invitation letter and posted it on the NHSN website. A modified Dillman technique was used for recruitment in the Fall of 2011 with weekly reminder e-mails and a last chance communication. Additionally, respondents were entered into lotteries with $100 incentives to increase participation rates.

We asked the hospitals to 1) complete a web-based survey, and 2) join the P-NICER NHSN research group. By joining the P-NICER research group, hospitals provided the research team access to data from the NHSN annual survey and up to six years (2006–2011) of ICU-level data for the deviceassociated module (e.g., central line-associated bloodstream infection [CLABSI] rates) and hospital wide data for the MDRO/CDI module (data not discussed here). A number of hospital characteristics were collected from the annual NHSN survey and the P-NICER survey. These included setting (urban, suburban, rural), medical school affiliation (major, graduate, limited, non-teaching), location (Northeast, Midwest, South, West, other), ownership (for profit, not for profit/other), and size (captured by the number of patient days, admissions, ICU beds, specialty beds, all other beds). Hospital staffing questions asked about the use of hospitalists (yes, no, don't know) and use of intensivists (yes, no, don't know).

Infection prevention and control program characteristics included in the P-NICER survey were: department to which infection prevention and control reports (medicine, nursing, other); use of electronic surveillance systems (yes, no) and if present, commercially available system or custom developed; and, presence of feedback mechanism of HAI rates to senior management, physicians, and to nursing units (yes, no, don't know for each item). Detailed staffing data were also assessed including: presence of physician Hospital Epidemiologist (HE) [yes, no]; number of Infection Preventionists (IP) fulltime equivalents (FTEs) per 100 beds; proportion of IPs with certification (none, some, all); and number of hours of data management and secretarial support per week. The percentage of total IP hours spent in various locations [i.e., inpatient wards, office, other] and, percentage of IP time spent on various activities (i.e., surveillance, teaching, other) were also assessed.

The adult ICUs were defined consistently with NHSN definitions: burn, medical, medical cardiac, medical/surgical, neurologic, neurosurgical, respiratory, surgical, surgical cardiothoracic and trauma. In the P-NICER survey, we inquired about the implementation of evidence-based infection prevention policies and clinician adherence to these polices for the prevention of device-associated HAIs for the largest ICU of each type. For CLABSI prevention this included the use of an insertion checklist and 5 individual recommended evidence-based processes (i.e., monitoring hand hygiene at insertion, using maximal barrier precautions for insertion, using chlorhexidine at insertion site, selecting optimal catheter site and checking the line daily for necessity). Ventilator-associated pneumonia (VAP) prevention included the use of a ventilator bundle checklist and the 5 processes that make up most checklists (i.e., raising the head of the patient's bed between 30 to 45 degrees, daily sedation vacation and assessment of readiness to extubate, giving patient medications to prevent stomach ulcers, deep venous thrombosis prophylaxis and use of chlorhexidine mouth care).[13] For prevention of catheter-associated urinary tract infection (CAUTI) 4 processes were assessed (i.e., using a urinary catheter reminder or stop order, allowing nurse-initiated urinary catheter discontinuation, using portable bladder ultrasound for determining post void residual and, for men, using condom catheters).[14] Based on previous research, which found that clinician adherence to these policies needs to be consistently high to impact HAI rates, we dichotomized these variables into those that achieved 95 percent or greater adherence the last time the policy was monitored versus other (lower compliance, no monitoring or don't know).[10–11]

Descriptive statistics of the hospital and infection prevention and control program characteristics were computed using Stata Statistical Software, Version 11 (College Station, TX). Cross-tabulations with chi-square or Fisher's exact tests, as appropriate, were used to examine the presence of the different evidence-based policies overall and by ICU type. In these analyses, only those ICUs with complete policy data were included. Due to small cell sizes, clinician adherence was examined only in the medical, medical cardiac, medical/surgical, surgical and surgical cardiothoracic ICUs. To assess the generalizability of our sample to the nation at large, the CDC compared our respondents (those that completed the P-NICER survey and/or joined our NHSN research group) to non-respondents (non-participants in both the P-NICER survey and the NHSN research group) on the facility characteristics from the NHSN annual survey and the CLABSI rates by ICU type for the fourth quarter of 2011. All research procedures were approved by Columbia University Medical Center's and the RAND Corporation's Institutional Review Boards.

Results

Of the 3,374 eligible hospitals, 975 hospitals provided data (29% response rate) on 1,653 ICUs; and, there were complete data on the presence of policies in 1,534 ICUs. Table 1 presents the hospital characteristics of these facilities. The hospitals were located in all settings across the nation with the largest proportions being rural (42%), in the South (36%), non-teaching (66%) and not for profit (75%). The hospitals had on average 52,578 annual patient days with 11,377 admissions, 32 ICU beds, 12 specialty beds and 182 other beds. Most facilities used hospitalists (n=817, 84%) and just about half used intensivists (n = 480, 49%).

Table 2 presents the infection prevention and control program characteristics. The majority of programs report to neither medicine nor nursing. Approximately one third (n = 334, 34%) of the departments had an electronic surveillance system and the majority of these were commercially developed (n = 287, 86%). Feedback mechanisms were common to senior management (93%), physicians (81%) and nursing units (88%). Approximately half of the departments reported having a physician HE (n = 489, 50%), and the average number of FTE IPs per 100 beds was 1.2 (s.d. = 1.2). Certification of IP staff varied across institutions and the average hours per week of data management and secretarial support were generally low. On average, IPs spent close to half of their time in their offices and on activities related to surveillance.

Table 3 reports on the presence of the written policies overall across all ICU types and by ICU type. Overall, CLABSI prevention policies were widespread (range 87% for checking daily line necessity to 97% for chlorhexidine use at insertion site). This was followed by VAP prevention policies (range 69% for chlorhexidine mouthcare to 91% for raising the head of the bed). The presence of CAUTI policies was not as frequent (range 27% for nurse-initiated urinary catheter to 68% for portable bladder ultrasound). The presence of only two of the policies differed by ICU type ($p < 0.05$); the use of optimal catheter site selection ranged from 98% in trauma ICUs to 71% in neurological ICUs and the use of chlorhexidine for mouth care ranged from 90% in burn ICUs to 50% in neurological ICUs.

Overall, adherence to CLABSI prevention policies ranged from 37% to 71%; adherence to VAP prevention policies ranged from 45% to 55%; and adherence to CAUTI prevention policies was reported infrequently (range 6% to 27%). Table 4 reports on clinician adherence to these policies in medical, medical cardiac, medical/surgical, surgical and surgical cardiothoracic ICUs. Due to small sample sizes for remaining ICU types, adherence data are not reported. Adherence to only two of the CLABSI bundle policies varied by ICU type ($p < 0.05$): use of chlorhexidine at the insertion site and optimal catheter site selection. There were no differences in reported adherence by ICU type for VAP or CAUTI prevention policies.

When compared by CDC to non-respondents, there were differences in the hospital characteristics non-respondents were comprised of smaller facilities with fewer patient days (46,907 versus 52,578, $p = 0.005$), fewer admissions (10, 069 versus 11,377, $p <0.001$), fewer ICU beds on average (28 versus 32, $p = 0.022$), and fewer other beds on average (161 versus 182, $p <0.001$). The non-respondents also had a different location profile (non-respondents: Northeast 17.0%, Midwest 21.5%, South 39.8%, West 20.3% and Other 1.4% versus respondents: Northeast 18.8%, Midwest 27.8%, South 36.4%, West 16.0% and Other 1.0%, $p <0.001$). There were no differences in the hospitals' medical school affiliation or ownership and, importantly, there were no differences found in the average CLABSI rates for each ICU type for respondents and non-respondents.

Discussion

This study provides the most comprehensive examination to date of the structures and support of infection prevention and control programs in the U.S. since the SENIC study. We provide a description of infection prevention and control programs in almost 1,000 acute care hospitals across the nation as well as the process and clinician adherence to these processes in adult ICUs. We found considerable variation in the organization and structure of infection prevention and control programs across the nation.

In relationship to staffing, we found that over a third of the hospitals did not have any certified IPs and the mean IP staffing ratio was 1.2 per 100 beds. Originally, the 1985 SENIC study recommended 1 IP per 250 beds. Over a decade ago, a survey of IPs recommended a staffing ratio of 0.8 to 1.0 IP per 100 hospital beds.[15] We found the average IP staffing ratio exceeded these recommendations, which are most likely out of date due to the complexity and responsibilities of infection prevention in hospitals today. The lack of IP certification is not consistent with the SHEA/APIC guidelines.[5–6] Previously we have found that having a certified infection control director was a significant independent predictor of lower MDRO HAI rates.[16] Furthermore, Krein, et. al.., have found an association between the presence of a certified IP and the use of policies aimed at reducing CLABSI.[17] The lack of HE in almost 50% of the hospitals is also concerning and not in keeping with current recommendations.

The findings that on average IPs devote about half of their time in their offices and working on surveillance is consistent with other relatively recent surveys;[8, 18] and, higher than the 39% of IP time estimated by a Delphi study published in 2002.[15] Computer support and administrative and data management personnel are a key component of the operations of an infection control program. In 2000, Stevenson surveyed 77 rural hospitals and found that a third of them utilized software to facilitate surveillance.[19] In a previous survey of 289 hospitals in 2007, 32% of hospitals reported having an electronic surveillance system.[8] Our current finding of 34% of hospitals using electronic surveillance systems shows a slow trend of uptake. The low average number of hours for data management was surprising given the complexity of electronic surveillance systems and the need for useful data reports to provide feedback to bedside clinicians and hospital administration.

The high prevalence of CLABSI and VAP prevention policies yet the relatively few hospitals with policies aimed at decreasing CAUTIs is consistent with surveys of 200 Californian hospitals conducted pre- and post-implementation of mandatory reporting in the state.[9] The relatively low uptake of CAUTI prevention policies described was also consistent with a recently published survey of 78 Michigan hospitals and 392 non-Michigan hospitals.[20] These findings are surprising given that CAUTI is the most frequent HAI and was the first hospital-acquired condition selected for nonpayment. [21, 22] Furthermore, Saint et. al. has found a greater reduction in CAUTI rates in the state of Michigan, where the hospitals were more likely to have CAUTI prevention policies than the rest of the nation.[20] Establishing policies does not ensure clinician adherence at the bedside. In previous studies, it has been found that clinician adherence to infection prevention policies needed to be very high to result in decreased HAIs.[10–11] Unfortunately, the hospitals that monitored clinician adherence reported relatively low rates. Furthermore, we found little time spent on prevention process education and some hospitals not having feedback mechanisms. There is a large evidence base supporting the use of audit and feedback interventions to improve professional practice and ultimately improve patient outcomes.[23]

Our study has both strengths and weaknesses. While the response rate to the P-NICER survey was moderate, this is the largest survey of acute care hospital infection prevention and control programs to date. Both the survey and HAI rate data were self-reported by infection control department personnel, however, because there was variability across institutions there was no reason to believe this resulted in systematic bias. Furthermore, there were no differences in CLABSI rates of those that responded to our survey compared with those that did not respond giving us some confidence in the generalizability of the data. And, previously we have found high test-retest reliability of our survey.[8]

Based on our findings, IP staffing in acute care hospitals is not consistent with published guidelines. The Certification Board of Infection Control and Epidemiology (CBIC) has documented the changing role of IPs;[24] however, there has not been a subsequent update of staffing guidelines.

The United States has seen vast improvements in CLABSI rates with impressive progress to the 5-year targets as set out in the HAI Action Plan.[25] In the present descriptive study, infection prevention and control program characteristics, presence of policies and clinician adherence were not linked to actual HAI rates. Multivariate analyses are needed and in future publications we will report these associations. However, our results suggest that the reduction in CLABSI rates may be a result of the advancement of infection prevention and control programs in their ability to fully implement evidence-based care, such as bundled care policies, to drive down CLABSI and VAP rates.

Evidence-based care bundles were first promoted by the Institute for Healthcare Improvement (IHI) who led the initial Campaign to save 100,000 lives or more.[26] Campaigns such as this focused clinicians and leadership on infection prevention and resulted in increased investment in the infection control and prevention program. However, focusing on infection prevention uses limited and competing resources and requires an ongoing financial commitment by the institution. We should continue to monitor the trends to ensure continued positive outcomes.

Evidence-based practices related to CAUTI prevention have not been well implemented. The CAUTI CDC guidelines were not published until 2009 and as documented in this study hospitals across the country have been in varying stages of implementing, reinforcing and measuring the outcomes related to this set of guidelines. [27] But clearly, more focus on CAUTI is needed and dissemination and implementation studies to inform how best to improve evidence based practices should be helpful.

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Table 1

Hospital Characteristics (N = 975)

Setting	**n (%)**
Urban	243 (24.9)
Suburban	320 (32.8)
Rural	406 (41.6)
Missing	6 (0.6)
Location	
Northeast	183 (18.8)
Midwest	271 (27.8)
South	355 (36.4)
West	156 (16.0)
Other	10 (1.0)
Medical School Affiliation	
Major	121 (12.4)
Graduate	93 (9.5)
Limited	114 (11.7)
Non-Teaching	647 (66.4)
Ownership	
For Profit	181 (18.6)
Not for profit/Other	794 (81.4)
Hospitalists	
Yes	817 (83.8)
No/Don't Know	155 (15.9)
Missing	3 (0.3)
Intensivists	
Yes	480 (49.2)
No/Don't Know	493 (50.6)
Missing	2 (0.2)
Size	mean (s.d.)
Patient Days	52,578 (34,923)
Admissions	11,377 (7,800)
ICU Beds	32 (16)
Specialty Beds	12 (0)
All Other Beds	182 (141)

Table 2

Infection Prevention and Control Program Characteristics (N = 975)

Department to which Infection Prevention and Control reports	n(%)
Medical	123 (12.6)
Nursing	281 (28.8)
Other	551 (56.5)
Missing	20 (2.0)
Electronic Surveillance System	
Yes	334 (34.3)
No/Don’t Know	639 (65.5)
Missing	2 (0.2)
Feedback Mechanisms	
Senior management	
Yes	910 (93.3)
No	32 (3.3)
Missing	33 (3.4)
Physicians	
Yes	786 (80.6)
No/Don’t Know	153 (15.7)
Missing data	36 (3.7)
Nursing	
Yes	860 (88.2)
No/Don’t Know	80 (8.2)
Missing data	35 (3.6)
Staffing	
Presence of Physician HE	484 (49.6)
IP Certification in Infection Prevention and Control (N = 739)	
None	284 (38.4)
Some	206 (27.8)
All	249 (33.7)
	Mean (s.d.)
IP fulltime equivalents per 100 beds (N = 942)	1.2 (1.2)
Hours of data management support (N = 967)	6.0 (16.1)
Hours of data secretarial support (N = 967)	5.6 (11.8)
IP Percent of time in Various Locations (N = 974)	
Inpatient units	33.1 (20.9)
Office	53.1 (23.0)
Other	13.9 (13.6)
IP Percent of time in Various Activities (N = 974)	
Surveillance	46.7 (15.8)

Department to which Infection Prevention and Control reports	**n(%)**
Teaching	11.9 (6.7)
Other	41.4 (14.4)

Note: N of 975 unless otherwise specified. HE: Hospital Epidemiologist; IP: Infection Preventionist

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Table 3

Presence of Evidence Based Infection Control Policies in Adult ICUs (N = 1,534)

	Overall	Burn (n = 20)	Medical (n = 333)	Medical Cardiac (n = 169)	Medical/ Surgical (n = 603)	Neurologic (n = 24)	Neurosurgical (n = 56)	Respiratory (n = 26)	Surgical (n = 120)	Surgical Cardiothoracic (n = 140)	Trauma (n = 43)
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
CLABSI Prevention											
Insertion Checklist	1430 (92)	18 (90)	310 (93)	159 (92)	557 (92)	21 (88)	53 (95)	25 (96)	115 (96)	130 (93)	42 (98)
Monitor HH at insertion	1442 (94)	18 (90)	312 (94)	160 (95)	570 (95)	21 (88)	51 (91)	26 (100)	112 (93)	130 (93)	42 (98)
Maximal barrier precautions	1477 (96)	20 (100)	322 (97)	161 (95)	581 (96)	20 (83)	53 (95)	25 (96)	117 (98)	135 (96)	43 (100)
Chlorhexidine use at insertion	1487 (97)	20 (100)	324 (97)	162 (96)	587 (97)	21 (88)	53 (95)	25 (96)	117 (98)	135 (96)	43 (100)
Optimal catheter site selection*	1398 (91)	18 (90)	295 (89)	155 (92)	558 (93)	17 (71)	50 (89)	24 (92)	107 (89)	132 (94)	42 (98)
Checking line daily for necessity	1339 (87)	15 (75)	284 (85)	153 (91)	526 (87)	18 (75)	48 (86)	24 (92)	105 (88)	124 (89)	42 (98)
VAP Prevention											
Ventilator bundle checklist	1131 (74)	13 (65)	240 (72)	127 (75)	439 (73)	14 (58)	45 (80)	23 (89)	92 (77)	107 (76)	31 (72)
Raising head of bed	1401 (91)	18 (90)	301 (90)	160 (95)	551 (91)	18 (75)	52 (93)	24 (92)	110 (92)	127 (91)	40 (93)
Sedation vacation	1372 (89)	19 (95)	294 (88)	157 (93)	529 (88)	18 (75)	54 (96)	24 (92)	110 (92)	127 (91)	40 (93)
Stomach ulcer prevention	1303 (85)	15 (75)	285 (86)	147 (87)	516 (86)	18 (75)	43 (77)	24 (92)	99 (83)	118 (84)	38 (88)
DVT prophylaxis	1344 (88)	17 (85)	288 (87)	149 (88)	537 (89)	18 (75)	47 (84)	25 (96)	103 (86)	122 (87)	38 (88)
Chlorhexidine mouthcare*	1054 (69)	18 (90)	211 (63)	127 (75)	391 (65)	12 (50)	43 (77)	22 (85)	93 (78)	101 (72)	36 (84)
CAUTI Prevention											
Urinary reminder/stoporder	792 (52)	8 (40)	168 (51)	90 (53)	325 (54)	13 (54)	24 (43)	16 (62)	53 (44)	74 (53)	21 (49)
Nurse-initiated urinary catheter	420 (27)	6 (30)	82 (25)	49 (29)	165 (27)	9 (38)	19 (34)	6 (23)	28 (23)	43 (31)	13 (30)
Portable bladder ultrasound	1037 (68)	16 (80)	227 (68)	111 (66)	406 (67)	17 (61)	35 (63)	11 (42)	85 (71)	104 (74)	25 (58)
Condom catheters	785 (51)	10 (50)	164 (49)	97 (57)	300 (50)	18 (75)	24 (43)	11 (42)	64 (53)	76 (54)	21 (49)

Note: The Overall column presents the variation in the presence of policies across all ICU types.

* p-value <0.05

HH: Hand Hygiene; DVT: Deep Vein Thrombosis

Table 4

Adherence to Infection Control Policies in Adult Intensive Care Units

	Overall	Medical	Medical Cardiac	Medical/Surgical	Surgical	Surgical Cardiothoracic
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
CLABSI Prevention						
Insertion Checklist (n = 1228)	636 (52)	160 (53)	70 (46)	294 (54)	51 (46)	61 (50)
Monitor HH at insertion (n = 1237)	764 (62)	197 (66)	93 (60)	345 (63)	60 (56)	69 (55)
Maximal barrier precautions (n = 1266)	787 (62)	199 (64)	89 (58)	365 (65)	60 (54)	74 (57)
Chlorhexidine use at insertion* (n = 1275)	909 (71)	231 (74)	107 (69)	422 (75)	68 (61)	81 (63)
Optimal catheter site selection* (n = 1200)	549 (46)	150 (53)	54 (36)	250 (47)	43 (42)	52 (41)
Checking line daily for necessity (n = 1444)	428 (37)	100 (37)	47 (32)	194 (38)	45 (45)	42 (36)
VAP Prevention						
Ventilator bundle checklist (n = 953)	491 (52)	123 (54)	52 (44)	229 (55)	41 (48)	46 (46)
Raising head of bed (n = 1184)	575 (49)	150 (53)	60 (40)	269 (51)	45 (44)	51 (42)
Sedation vacation (n = 1151)	518 (45)	124 (45)	64 (44)	241 (48)	42 (41)	47 (39)
Stomach ulcer prevention (n = 1101)	593 (54)	148 (56)	71 (52)	275 (55)	43 (47)	56 (51)
DVT prophylaxis (n = 1137)	624 (55)	153 (56)	74 (53)	295 (58)	41 (43)	61 (53)
Chlorhexidine mouthcare (n = 879)	419 (48)	98 (49)	52 (43)	185 (49)	35 (40)	49 (52)
CAUTI Prevention						
Urinary reminder or stop-order (n = 184)	184 (27)	43 (27)	25 (29)	80 (26)	13 (26)	23 (32)
Nurse-initiated urinary catheter (n = 343)	74 (22)	20 (25)	10 (23)	29 (19)	6 (24)	9 (24)
Portable bladder ultrasounds (n = 863)	102 (12)	25 (12)	9 (9)	46 (12)	7 (9)	15 (15)
Condom catheters (n = 657)	37 (6)	8 (5)	5 (6)	12 (4)	4 (7)	8 (11)

Note: The Overall column presents the variation in adherence to policies across all the ICU types.

* p-value <0.05

HH: Hand Hygiene; DVT: Deep Vein Thrombosis