American Journal of Infection Control 47 (2019) 65–68

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Changes in health care-associated infection prevention practices in Japan: Results from 2 national surveys

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Key Words:
Infection prevention
Device-associated infection
CAUTI
CLABSI
VAP

Background: A national survey conducted in 2012 revealed that the rates of regular use of many evidence-based practices to prevent device-associated infections were low in Japanese hospitals. We conducted a second survey 4 years later to evaluate changes in infection prevention practices.

Methods: Between July 2016 and January 2017, the instrument used in a survey of Japanese hospitals in 2012 was sent to 1,456 Japanese hospitals. The survey assessed general hospital and infection prevention program characteristics and use of practices specific to preventing catheter-associated urinary tract infection (CAUTI), central line-associated bloodstream infection (CLABSI), and ventilator-associated pneumonia (VAP). Independent sample chi-square tests were used to compare prevention practice rates between the first and second surveys.

Results: A total of 685/971 (71%) and 940/1,456 (65%) hospitals responded to the first and second surveys, respectively. For CAUTI, only use of bladder ultrasound scanners (11.1% - 18.1%; $P < .001$) increased. For CLABSI, use of chlorhexidine gluconate for insertion site antisepsis (18.5% - 41.1%; $P < .001$), antimicrobial dressing with chlorhexidine (3.4% - 7.1%; $P = .001$), and central line insertion bundle (22.9% - 33.0%; $P < .001$) increased. For VAP, use of semirecumbent positioning of patients (65.0% - 72.3%; $P = .002$), sedation vacation (31.5% - 41.6%; $P < .001$), oscillating/kinetic beds (4.7% - 8.6%; $P = .002$), and a collective VAP prevention bundle (24.8% - 34.8%; $P < .001$) increased. Fewer than 50% of Japanese hospitals reported conducting CAUTI and VAP surveillance.

Conclusions: Collaborative approaches and stronger incentives promoting infection prevention efforts may be warranted to further increase use of most evidence-based practices to reduce common health care-associated infections in Japan.

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Health care-associated infection (HAI) is one of the most common adverse events in hospitals. According to the World Health Organization, HAI affects an estimated 5% - 8% of patient populations in high- and middle-income countries.[1] HAIs with high disease burden include catheter-associated urinary tract infection (CAUTI), central line-associated bloodstream infection (CLABSI), and ventilator-associated pneumonia (VAP).[1-3] More than half of these infections could be prevented by implementing evidence-based strategies.[4]

In 2012, we conducted a large cross-sectional national survey to describe the use of evidence-based strategies to prevent these HAIs in Japan.[5] The results showed that the regular use of many prevention practices examined was low in Japanese hospitals. Since then, the Japanese government has tried to strengthen HAI prevention by providing hospitals with financial incentives for performing certain HAI prevention practices, such as holding environmental inspections,

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Conflicts of Interest: S.S. reports personal fees from Doximity and Jvion, outside the submitted work. All other authors report no conflicts of interest relevant to this article.

https://doi.org/10.1016/j.ajic.2018.06.015
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conducting training sessions, and participating in regional collaborative meetings focused on HAI prevention. Four years after the first survey, we conducted a second national survey using the same instrument to examine changes in the use of evidence-based infection prevention practices in hospitals across Japan.

METHODS

Between July 2016 and January 2017, a survey instrument, originally developed by Krein, Saint, and colleagues,[6-8] which was translated and used in the first survey,[5] was sent to 1,456 hospitals that had at least 1 certified nurse for infection control (CNIC) by the Japanese Nursing Association. The translated surveys for the second wave were mailed to each hospital and addressed to the lead infection preventionist. The survey responses were anonymous. The instrument contained questions about general hospital characteristics, structure and staffing of the infection prevention program, use of general infection prevention practices such as hand hygiene, and use of practices related to the prevention and monitoring of CAUTI, CLABSI, and VAP. These practices were selected from guidelines published by professional societies.[9-16] For each practice, responses about the frequency of use were assigned a value between 1 (never) and 5 (always). Responses of 4 (almost always) or 5 (always) were combined as "regular use" of the particular practice. All prevention practices examined were dichotomized into binary dependent variables, with regular use coded as 1 and 0 otherwise.

Statistical analysis

Descriptive statistics are given for each wave of the survey: n (%) for categorical variables and mean ± standard deviation for continuous variables. Given the anonymity of survey respondents, we were not able to link responses from the 2 survey waves to enable a pure longitudinal analysis. Therefore, all comparisons were treated as cross-sectional comparisons between 2 independent samples. Student's *t* tests were used to compare all continuous variables between the 2 survey waves, while chi-square tests were used to compare categorical variables. All analyses were performed with SAS version 9.4 software (SAS Institute, Cary, NC), and all statistical tests were at the .05 significance level.

RESULTS

A total of 685/971 (71%) and 940/1,456 (65%) hospitals responded to the first and second surveys, respectively. Table 1 shows descriptive characteristics of the responding hospitals in both time periods.

The average number of acute care beds and the proportions of hospitals with medical school affiliation were similar in both periods, although responding hospitals had fewer intensive care unit beds ($P < .001$) in 2016. Hospitals that had a CNIC as the lead infection preventionist significantly increased from 63.2% - 73.6% ($P < .001$), whereas hospitals that had infection control physicians as lead infection preventionists declined from 45.8% - 37.4% ($P = .001$).

The mean number of work hours per week for all infection prevention professionals combined in 2016 decreased by more than 25% from 2012 (77.0 hours vs 58.4 hours, $P < .001$). As was the case in 2012, few hospitals reported receiving adequate support from hospital leadership for infection prevention efforts. Similarly, many experienced difficulties implementing evidence-based preventive measures and reported nurse staffing issues.

Figure 1 shows the percentage of hospitals that reported regular use of the various infection prevention practices examined in 2012 and 2016. For CAUTI, use of bladder ultrasound scanners was the only practice that significantly increased between survey periods (11.1% - 18.1%; $P < .001$). For CLABSI, use of chlorhexidine for insertion site antisepsis (18.5% - 41.1%; $P < .001$), antimicrobial dressing with chlorhexidine (3.4% - 7.1%; $P = .001$), and a collective central line insertion bundle (22.9% - 33.0%; $P < .001$) increased. For VAP, use of semi-recumbent positioning of patients (65.0% - 72.3%; $P = .002$), sedation vacation (31.5% - 41.6%; $P < .001$), oscillating/kinetic beds (4.7% - 8.6%; $P = .002$), and a collective VAP prevention bundle (24.8% - 34.8%; $P < .001$) increased. In 2016, using a closed urinary drainage system, maintaining aseptic technique during urethral catheter insertion, maintaining maximum sterile barrier precautions during central-line insertion, avoiding routine central catheter changes, and using semi-recumbent positioning of intubated patients were the only practices used regularly by more than 70% of responding hospitals. Only about 35% of hospitals reported practicing CLABSI and VAP prevention bundles on a regular basis. Additionally, fewer than half of the responding hospitals conducted facility-wide or unit-specific monitoring of CAUTI and VAP rates.

DISCUSSION

In a 2016 cross-sectional wave of a large national survey occurring 4 years after the first national survey, the proportion of Japanese hospitals reporting regular use of many of the evidence-based HAI prevention practices recommended in published guidelines remained relatively unchanged. Although regular use of some of the practices, such as chlorhexidine skin antisepsis, central-line insertion bundle, and VAP prevention bundle, nearly doubled, they were implemented in fewer than 50% of the responding hospitals. Additionally, variability was observed in the regular use of prevention measures in each infection type, as observed in the first survey.[5] For example, while

Table 1
Hospital characteristics

Characteristic	2012	2016	*P*
Sample size and response rates	685/971 (71%)	940/1456 (65%)	
Number of acute care hospital beds, mean ± SD	321.9 ± 244.4	314.1 ± 220.6	.52
Number of adult ICU beds, mean ± SD	13.4 ± 36.3	8.1 ± 11.6	<.001
Medical school affiliation, n (%)	71 (10.4%)	89 (9.5%)	.55
Has infectious disease physicians, n (%)	125 (18.2%)	173 (18.4%)	.94
Has hospitalists, n (%)	281 (41.0%)	425 (45.2%)	.09
Lead ICP is an infection control doctor, n (%)	314 (45.8%)	352 (37.4%)	.001
Lead ICP is a CNIC, n (%)	433 (63.2%)	692 (73.6%)	<.001
Total number of work hours per week for all IPs combined, mean ± SD	77.0 ± 102.4	58.4 ± 56.5	<.001
Very good/excellent infection control program support from leadership, n (%)	21 (3.1%)	25 (2.7%)	.63
Nurse staffing is generally adequate to ensure patient safety, n (%)	108 (15.8%)	196 (20.9%)	.009
Easy to implement evidence-based recommendations to prevent HAI, n (%)	193 (28.2%)	276 (29.4%)	.60

CNIC, certified nurse for infection control; *HAI*, health care-associated infection; *ICP*, infection control physician; *ICU*, intensive care unit; *IP*, infection preventionist; *SD*, standard deviation.

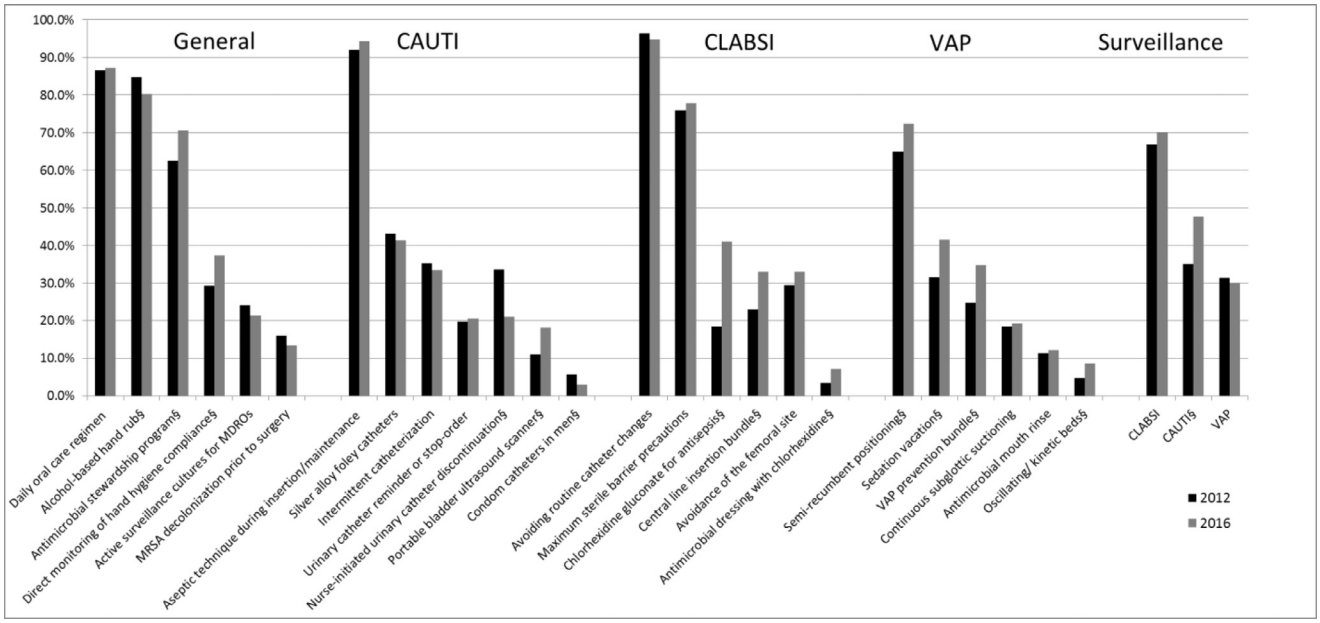

Fig 1. Reported regular use of infection prevention practices. *HCWs*, health care workers; *IP*, infection prevention; *MDROs*, multidrug-resistant organisms; *MRSA*, methicillin-resistant *Staphylococcus aureus*; §, $P < .05$.

most hospitals reported using aseptic techniques during urinary catheter insertion and maintenance, only 20.5% reported regular use of urinary catheter reminders or stop orders to prevent CAUTI. Likewise, while over 80% of hospitals used alcohol-based hand rub regularly, fewer than 40% conducted direct monitoring to evaluate hand hygiene compliance. In a study that compared regular use of HAI prevention practices among hospitals in Japan, Thailand, and the United States based on data from our first national survey and surveys conducted contemporaneously in the other 2 countries using a similar survey instrument, Japan had the lowest rates of regular use for most of the practices, including surveillance across all infection types.[17] Our study suggests that adoption and regular use of recommended infection prevention practices across several infection domains in Japan remain suboptimal and may lag behind hospitals surveyed in other countries.

Since 2012, the Japanese health care payment system has adopted an incentive system that financially rewards hospitals that have certain organizational structures in place to prevent HAIs. Hospitals are rewarded under this system for having the following organizational structures: an established infection prevention team consisting of at least 1 full-time nurse trained in infection prevention, a physician, a pharmacist, and a microbiology technician; participation by the team in regional HAI prevention collaborative meetings held 4 times a year; a schedule of HAI prevention educational sessions at least twice a year, each with a perfect (100%) participation rate; and regular environmental inspections throughout the organization at fixed intervals. Some of these elements are essential to operate HAI prevention activities, but some are not evidence-based and can be time-intensive. Apart from this incentive system, no additional financial support or punitive action has been implemented regarding placement of infection preventionists based on hospital size or complexity of health care services, monitoring HAI rates through surveillance, or implementing evidence-based practices to reduce the risk. The decrease in the mean number of work hours per week for all infection prevention professionals combined, reports of not receiving adequate support from hospital leadership for HAI prevention efforts, and having trouble implementing evidence-based preventive measures reported by many hospitals in 2016 all reflect such lack of incentives to proactively adopt and consistently implement best practices to prevent HAIs.

A recently published guideline on the core components of an infection prevention and control program by the World Health Organization[18] stresses the importance of implementing, monitoring, and training staff on evidence-based practices, performing facility-based HAI surveillance with timely feedback, adopting multimodal strategies associated with organization-wide safety culture, and involving champions or role models to support and encourage infection control efforts. Our results indicate that perhaps the Japanese health care system should consider shifting toward strengthening these evidence-based core components rather than expending limited resources on formalistic structures that have not been convincingly proven to reduce HAI.

The Japanese Nosocomial Infection Surveillance and the Japanese Healthcare-Associated Infections Surveillance systems provide information on selected HAI incidence rates and infections due to multidrug-resistant organisms in hospitals that elect to be in the program.[19] However, there is no legal obligation or financial incentive to participate, and the surveillance programs are targeted at large hospitals (>300 beds), so a national estimate of HAI burden in Japan is still unclear. Point prevalence studies are often used in the infection control literature to estimate national burden of HAI.[20-23] The incidence of HAI may be higher in Japan than other developed countries,[24-26] which could be partly explained by the fact that Japan has the longest average length of hospital admission in the world.[27] A large, multiprefecture prevalence study with participation from small and large hospitals would further inform the magnitude and distribution of HAI in Japanese acute care hospitals. Better national HAI estimates could also help target future national intervention efforts to be more successful than the strategies employed in the last decade in Japan to decrease HAI.

Our study had several limitations that should be considered when interpreting our data. First, our target hospitals have larger bed sizes compared with the Japanese average of about 180 beds. Rather than randomly selecting hospitals from over 8,000 hospitals in Japan,[28] we selected Japanese hospitals that had at least 1 CNIC, since knowledge of evidence-based practices and their frequencies of use in the institution were necessary to answer most of our survey questions. Most

hospitals surveyed are acute care, large hospitals with more resources available for HAI prevention.[29] Thus, the hospitals surveyed are perhaps even more likely to report using evidence-based prevention measures compared with the average Japanese hospital. Second, our response rate was less than 100%, which may limit the generalizability of our study. Third, since we decided to maintain anonymity of responding hospitals to increase response rates, we were unable to match hospitals that may have reported to both surveys to conduct a pure longitudinal analysis to evaluate predictors of long-term trends and patterns. Fourth, even though we targeted all hospitals with at least 1 CNIC in both surveys, the sample size for the second survey was much larger owing to an increase in the number of CNICs and hospitals newly hiring them since 2012. Finally, we did not measure patient demographics in either study. Therefore, our results may have been influenced by differences in hospital or patient characteristics that exist between the 2 survey samples.

Despite these limitations, our national study identified 3 possible goals that the Japanese Health System should consider to ensure progress in HAI prevention. First, the adoption of evidence-based prevention practices recommended in published HAI prevention guidelines should be facilitated by providing enhanced administrative support and guidance. Second, adherence to these practices should be continuously monitored, improved, and sustained. Finally, risks of HAIs with high disease burdens, such as CAUTI, CLABSI, and VAP,[1-3] should be monitored and improved through organization-wide, systematic, and continuous surveillance, coupled with the types of national collaboratives that have been successful in the United States.[30,31] To achieve these important and ambitious goals, institutional governance needs to be strengthened, which may be achieved by reforming the current financial incentives to reward high-impact activities. Such movement has the potential to result in changes in a cultural climate that prioritizes quality improvement through HAI prevention.

Acknowledgments

The authors would like to thank St. Luke's Life Science Institute for providing financial support.

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