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ORIGINAL ARTICLE

An effective active surveillance method for controlling nosocomial MRSA transmission in a Japanese hospital

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Abstract Hospital-wide active surveillance for methicillin-resistant *Staphylococcus aureus* (MRSA) targeted to adult patients with a history of MRSA carriage within the past 5 years was performed in Juntendo University Hospital (JUH) over a 2-year period. In the first year, MRSA screening culture was ordered by physicians in charge. In the second year, infection-control practitioners (ICPs) took samples for active surveillance culture. The average monthly transmission rate of MRSA in JUH was 0.35 per 1,000 bed-days in the first year and decreased significantly to 0.26 per 1,000 bed-days in the second year ($P < 0.05$). In the second year, more active commitment of ICPs to MRSA screening was effective in improving the performance rate of screening, shortening turn-around time of screening results, and decreasing transmission rate. Increasing compliance with active MRSA surveillance by involvement of ICPs, targeting patients with a previous history of MRSA carriage in the previous 5 years, was effective to control nosocomial MRSA transmission.

Keywords Methicillin-resistant *Staphylococcus aureus* · Active surveillance · Horizontal transmission

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Introduction

Since its discovery in 1961 [1], methicillin-resistant *Staphylococcus aureus* (MRSA) has remained a major nosocomial pathogen throughout the world, causing grave clinical and financial problems in healthcare facilities [2]. Implementation of contact precautions for MRSA carriers is essential for preventing its nosocomial spread, so early detection of newly hospitalized patients carrying MRSA is a critical issue [3]. Active surveillance culture (AS-C) for MRSA has been conducted in Juntendo University Hospital (JUH) since 2006 for hospitalized patients having a history of MRSA carriage in the past 5 years. While waiting for the results of screening culture, healthcare workers (HCWs) followed a pre-emptive contact precaution policy, but the efficacy of this policy has not been evaluated. We postulated that a shorter turnaround time (TAT) of screening results could be expected by more active involvement of infection-control practitioners (ICPs) and shorter TAT might cause higher compliance to implement the contact precaution policy and to reduce nosocomial transmission of MRSA.

In this study, we analyzed the effect of our active surveillance practice on the rate of horizontal MRSA transmission in the hospital, especially of the commitment of ICPs to active MRSA screening.

Patients and methods

Study setting and periods

JUH is a large, 1,020-bed teaching hospital with an average hospital stay of 13.2 days. All adult wards (922 beds) were included in this study. The study periods were divided into two phases: January–December 2009 (phase 1), and January–December 2010 (phase 2).

Candidates for active surveillance of MRSA and screening procedures

AS-C was conducted in both phases of the study. All patients with a history of MRSA carriage in the last 5 years were candidates for AS-C on admission. The following patients were excluded: (1) those who had history of confirmed MRSA carriage/infection within 14 days before admission (regarded as MRSA carriers on admission); (2) those previously assigned as MRSA carriers but who had at least three successive negative culture results from anterior nares and other body sites on three separate days before admission (regarded as ex-carriers); and (3) patients who declined to participate in the study (regarded as MRSA carrier throughout their hospitalization). Electronic medical records of patients with a past history of MRSA carriage were flagged automatically on admission. In phase 1, nasal culture for MRSA screening was ordered by physicians in charge when they recognized that their new patients had a history of MRSA carriage. For patients admitted at nights or on holidays, physicians in charge ordered screening culture on earliest business days after their admission.

In phase 2, ICPs identified candidates for AS-C from electronic medical records of scheduled admission cases 1 day before admission. On admission, ICPs immediately visited inpatients' rooms to obtain nasal swabs. In cases of urgent admissions or admissions on holidays, patients were screened by ICPs on the day after their admission. Specimens were taken from patients' anterior nares using sterile cotton swabs moistened with saline. The swab sample was streaked onto MRSA screening agar (CHROMagar^{TM} MRSA; CHROMagar Microbiology, Paris, France) [4] and incubated at 35 °C for 48 h. When colonies were found on screening agar, the patient was regarded as a MRSA carrier. The culture results were returned to HCWs in charge via electronic hospital medical charts.

Infection-control policies, isolation, and compliance monitoring

The usual contact precaution policy was implemented immediately after admission of all candidates for AS-C while awaiting culture results. Isolation in single rooms was encouraged if they were available, and the patients agreed with isolation. Contact precaution and isolation policy was continued if the first culture on admission revealed the presence of MRSA or the candidate did not participate in AS-C. When the first culture was negative, two additional cultures of anterior nares and cultures from another body sites where MRSA had been positive previously were taken by physicians in charge. If all additional cultures were negative, screening candidates were released from isolation. Average days from admission to confirmation of culture results were calculated as TAT in phase 1 and phase 2. Use of alcohol hand rub (AHR) was monitored monthly throughout all adult wards in phase 1 and phase 2 as an indirect indicator of compliance with hand-hygiene procedures for preventing MRSA nosocomial transmission. In order to examine the effect of AHR on the transmission rate, the entire study period was also divided into four subphases: phases 1a (6 months from January to June 2009), 1b (6 months from July to December 2009), 2a (5 months from January to May 2010), and 2b (7 months from June to December 2010).

MRSA transmission rate

An event of MRSA transmission was defined as a positive culture obtained for the first time later than 48 h after admission. The monthly transmission rate was calculated as the number of MRSA transmission events in all adult wards, divided by the number of bed-days. The outcome was calculated as the average monthly transmission rate and expressed as events per 1,000 bed-days.

Statistical analysis

Data analysis was performed with the Mann–Whitney U test or the chi-square test using Excel (Microsoft Corporation, USA). Values of $P < 0.05$ were considered as significant difference.

Ethical disclosure

This study was approved by the ethical committee of JUH with the approval number 21–84. Written informed consent was obtained from all participants.

Results

Implementation of active surveillance culture

Table 1 shows the results of implementation of AS-C in phases 1 and 2. A total of 239 patients were enrolled for AS (1.12 % of 21,399 annual admissions) in phase 1 and 255