



A point-prevalence survey of healthcare-associated infection in fifty-two Chinese hospitals

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SUMMARY

Background: Healthcare-associated infection (HCAI) represents a major problem for patient safety worldwide.

Aim: To demonstrate the prevalence, causative agents, and risk factors for HCAI in Chinese hospitals.

Methods: A one-day point-prevalence survey was conducted in 52 Chinese hospitals between October 2014 and March 2015. A web-based software system was developed for data entry and management.

Findings: Among 53,939 patients surveyed, the prevalence of patients with at least one HCAI was 3.7%. Of 2182 HCAI episodes, the most frequently occurring types were lower respiratory tract infections (47.2%), followed by urinary tract infection (12.3%), upper respiratory tract infection (11.0%), and surgical site infection (6.2%). The prevalence of patients with at least one HCAI in critical care units was highest (17.1%). Device-associated infections, including ventilator-associated pneumonia, catheter-associated urinary tract infection, and central catheter-associated bloodstream infection, accounted for only 7.9% of all HCAs. The most frequently isolated micro-organisms were *Pseudomonas aeruginosa* [206 infections (9.4%)], *Acinetobacter baumannii* [172 infections (7.9%)], *Klebsiella pneumoniae* [160 infections (7.3%)], and *Escherichia coli* [145 infections (6.6%)]. Of the survey patients (18,206/53,939), 33.8% were receiving at least one antimicrobial agent at the time of the survey. Risk factors for HCAI included older age (≥ 80 years), male gender, days of hospital admission, admission into a critical care unit, and device utilization.

Conclusion: Our study suggests that the overall prevalence of HCAI in surveyed Chinese hospitals was lower than that reported from most European countries and the USA. More attention should be given to the surveillance and prevention of non-device-associated HCAI in China.

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Introduction

Healthcare-associated infection (HCAI) is a major problem for patient safety and could result in prolonged hospital stay,

long-term disability, high costs for patients and their families, and excess deaths.^{1,2} Despite rapid advances in modern medical science, HCAI still represents a worldwide public health issue and cause a significant additional financial burden for the health system. It has been revealed in previous reviews that HCAI causes annual financial losses of about €7 billion in Europe and about \$6.5 billion in the USA, whereas the burden of HCAI in developing countries was even higher.^{2,3}

Activities designed to improve infection control practices in healthcare settings have advanced the understanding of how to prevent certain HCAs, such as device-associated infections including ventilator-associated pneumonia (VAP), catheter-associated urinary tract infection (CAUTI), and central line-associated BSI (CLABSI), which were the main targets of many surveillance programmes. However, a multi-state point-prevalence survey of HCAI from the USA showed that device-associated infections accounted for only 25.6% of all the HCAs.⁴ In order to cover all types of nosocomial infection to estimate and monitor the complete HCAI disease burden, hospital-wide prevalence surveys are conducted in many regions or countries besides the targeted surveillance programmes. In 2011–2012, a point-prevalence survey of HCAI and antimicrobial use in acute care hospitals conducted by the European Centre for Disease Control and Prevention (ECDC) revealed that the overall prevalence of HCAI and patients receiving at least one antimicrobial agent in 29 countries was 6.0% (country range: 2.3%–10.8%) and 35.0% (country range: 21.4–54.7%), respectively.⁵ Another point-prevalence survey conducted at 740 hospitals across mainland China in 2010 showed that the prevalence of HCAI and antimicrobial use was 3.6% and 49.6%, respectively.⁶

In recent years, the Chinese government has paid more attention to the role of infection prevention programmes. 'Administrative Measures of Healthcare Associated Infection' was issued by the National Health and Family Planning Commission of the People's Republic of China (NHFPCC; formerly the Chinese Ministry of Health) in 2006, and stated that all Chinese hospitals with more than 100 beds should have infection prevention teams. In addition, several standards or guidelines covering many fields of infection prevention, including hand hygiene, antimicrobial use, disinfection and sterilization, and surveillance of HCAI have been published in the past ten years.^{7,8} As one important part of healthcare quality assessment, HCAI surveillance is mandatory in Chinese hospitals, with point-prevalence surveys being one of the most widely used surveillance programmes.

To deepen our understanding about current prevalence of HCAI and for making comparisons with previous studies, a point-prevalence survey of HCAI and antimicrobial use was conducted at 52 Chinese hospitals; this report describes the major findings of this survey.

Methods

Survey design and participating hospitals

A one-day point-prevalence survey protocol was drafted and revised based on literature review and discussions with an expert panel in mid-2014. Seventy hospitals were selected and invited to participate in this survey according to their

representativeness in different parts of China. Finally, 52 hospitals (74.3%) participated in the survey and submitted data to our centre between October 2014 and March 2015. The other hospitals failed to participate due to various reasons, such as unable to obtain sufficient administrative support or investigators, or conflict with other surveillance programmes. Institutional review boards of Academy of Military Medical Science and participating hospitals reviewed the protocol and approved the survey with a waiver of the requirement for informed consent.

The participating hospitals were located in 37 cities of 22 provinces (Supplementary Figure 1), including 47 tertiary care hospitals and five secondary care hospitals. They accounted for 0.6% of all the secondary and tertiary care hospitals ($N=8984$) in 2015 in China.⁹ The secondary care hospitals tend to be affiliated with a medium-sized city, county, or district, and are responsible for providing comprehensive health services, as well as medical education, on a regional basis, whereas the tertiary care hospitals are comprehensive or university hospitals at the city, provincial or national level, and are responsible for providing specialist health services and performing a bigger role in medical education and scientific research.

Patient selection and case definitions

Inpatients of any age in participating hospitals were eligible for inclusion. Patients in outpatient areas, emergency departments, and psychiatry, and rehabilitation units, and those who were admitted for less than 48 h were excluded. All the eligible patients were obtained from the morning census on the survey date.

HCAs were identified according to diagnosis guideline from NHFPCC in 2001. The major differences between NHFPCC definitions and CDC/NHSN definitions are shown in Supplementary Table 1. Briefly, their differences involve the categorization of respiratory tract infection (RTI), the classification of an infection as present on admission or an HCAI, and the definition of device-associated infections. In China, the case definition of lower RTI includes the CDC categories of 'pneumonia' and 'lower respiratory tract infection other than pneumonia'. HCAI primary refers to infection acquired >48 h after admission, unless there is a clear incubation period for the infection in NHFPCC definitions, whereas many more objective surveillance definitions and guidance were used in CDC/NHSN definitions. The device-associated infections were not clearly defined in NHFPCC definitions.

As the NHFPCC guideline did not cover device-associated infections, these infections were determined according to a slightly revised definition from CDC/NHSN surveillance definition criteria.¹⁰ In brief, VAP was defined as pneumonia in which the patient had been on mechanical ventilation for >2 calendar days on the date of event, with day of ventilator placement being day 1; CAUTI was defined as urinary tract infection in which an indwelling urinary catheter had been in place for >2 calendar days on the date of event, with day of device placement being day 1; CLABSI was defined as laboratory-confirmed bloodstream infection in which central line or umbilical catheter had been in place for >2 calendar days on the date of event, with day of device placement being day 1. A device-associated infection acquired <48 h after admission was not included in this study.

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