Journal of Hospital Infection 78 (2011) 284–288

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevierhealth.com/journals/jhin

Ventilator-associated pneumonia in intensive care units in Hubei Province, China: a multicentre prospective cohort survey

Duo-shuang Xie [a,b,†], Wei Xiong [c,†], Rui-ping Lai [b], Li Liu [a], Xiu-min Gan [a], Xiao-hui Wang [a], Min Wang [a], Yuan-xia Lou [b], Xiang-yun Fu [b], Hui-fang Wang [b], Hao Xiang [d], Yi-hua Xu [a,*], Shao-fa Nie [a,*]

[a] Department of Epidemiology and Biostatistics, School of Public Health, Tongji Medical College of Huazhong University of Science and Technology, Wuhan, Hubei, China
[b] Department of Infection Control, Taihe Hospital, Hubei University of Medicine, Shiyan, Hubei, China
[c] Department of Infection Control, Tongji Hospital, Tongji Medical College of Huazhong University of Science and Technology, Wuhan, Hubei, China
[d] Department of Epidemiology and Biostatistics, School of Public Health, Wuhan University, Wuhan, Hubei, China

ARTICLE INFO

Article history:
Received 22 November 2010
Accepted 2 March 2011
by S.J. Dancer
Available online 20 April 2011

Keywords:
China
Intensive care unit
Risk factors
Ventilator-associated pneumonia

SUMMARY

A multicentre prospective cohort study was performed in 17 intensive care units (ICUs) in tertiary care hospitals in Hubei Province, China. Ventilator-associated pneumonia (VAP) was defined according to modified criteria from the published literature. Among 4155 ventilated patients, the crude incidence and incidence rate of VAP were 20.9% and 28.9 cases per 1000 ventilator-days. Multivariate analysis using logistic regression revealed risk factors including male sex [risk ratio (RR): 1.5; $P<0.001$], coma (RR: 2.1; $P<0.001$), chronic obstructive pulmonary disease (RR: 1.4; $P<0.001$), infections at other sites (RR: 1.6; $P=0.001$), serious disease predating the onset of VAP (RR: 1.6; $P<0.001$) and interventions including antacid treatment (RR: 1.4; $P<0.001$), antimicrobial treatment (RR: 5.1; $P<0.001$), bronchoscopy (RR: 1.5; $P=0.041$) and tracheostomy (RR: 1.4; $P=0.014$). The most frequently isolated causative pathogens were *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. Of all *Staphylococcus aureus* isolates, 45.7% were meticillin resistant. Rates, risk factors and causal pathogens of VAP in ICUs in Hubei differ from those reported from developed countries. These data show the need for more effective infection control interventions in Hubei, China.

© 2011 The Healthcare Infection Society. Published by Elsevier Ltd. All rights reserved.

Introduction

Ventilator-associated pneumonia (VAP), defined as pneumonia that develops at least 48 h after introduction of mechanical ventilation (MV), is one of the most common healthcare-associated infections (HAIs) and an important cause of morbidity, prolonged intensive care unit (ICU) stay and additional hospital costs.[1–5]

Most studies of VAP have been conducted in developed countries.[6–11] In China there have been relatively few studies of nosocomial infection and these have generally been limited to small sample sizes and short time periods.[12] This investigation reports the incidence rate, risk factors and pathogens associated with VAP in a large cohort of mechanically ventilated patients in 17 ICUs in Hubei Province, China, with the aim of benchmarking against international standards and assessing the needs for further specific infection control interventions.

Methods

Hospitals and ICUs

We performed a continuous, prospective, multicentre cohort study of patients who received MV in 17 ICUs in 17 tertiary care hospitals in Hubei Province, China, from January 2007 to June 2009. The hospitals, all members of the Surveillance System of Healthcare Associated Infections of Hubei Province, were located in the cities of Wuhan (7), Shiyan (2), Yichang (2), Xiangfan (2), Xiaogan (1), Suizhou (1), Jingzhou (1) and Jingmen (1). In China, tertiary care hospitals are referral centres for additional care with medical teaching and research. Among these 17 hospitals, there were six

* Corresponding author. Address: Department of Epidemiology and Biostatistics, School of Public Health, Tongji Medical College of Huazhong University of Science and Technology, No. 13 Hangkong Road, Wuhan, Hubei 430030, P.R China. Tel./fax: +86 27 83693763.
E-mail addresses: xuyihua@mails.tjmu.edu.cn (Y.-h. Xu), tjnsf2007@163.com (S.-f. Nie).
† These authors contributed equally to this paper.

0195-6701/$ – see front matter © 2011 The Healthcare Infection Society. Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.jhin.2011.03.009

university-affiliated hospitals and 11 regional hospitals of the public health system. In the university hospitals, bed numbers ranged from 1200 to 3200 and annual admissions from 45 500 to 95 000. In the regional hospitals, bed numbers ranged from 501 to 1500 and annual admissions from 12 000 to 49 000. Each hospital had one ICU, all of which were general in scope, offering intensive care to severely unwell patients from the medical, surgical and paediatric departments. P_{50} of length of ICU stay was 5 days (P_5–P_{95} was 2–38 days).

Patients

We included all patients who had been hospitalised in these ICUs for more than 48 h during the study period. Exclusion criteria were absence of MV, or MV initiated after onset of pneumonia. Patients were recruited consecutively and followed until VAP diagnosis, death or discharge from the ICU. The study was approved by the ethics committee of Tongji Medical College of Huazhong University of Science and Technology, and received Institutional Review Board approval in 2007.

Data collection and definitions

Data were collected by teams consisting of ICU nurses, senior physicians and infection control professionals in each hospital. All team members in each hospital were trained at the Surveillance Centre of HAI of Hubei Province. ICUs were visited weekly by an infection control professional. Between visits, one ICU nurse was responsible for recording new admissions to the ICU, the number of inpatients, and the number of patients with MV, together with background medical information. Information on potential risk factors for patients receiving MV was collected from medical and nursing records and recorded on a proforma, including the existence of serious prior disease before the onset of VAP (including diabetes mellitus, respiratory failure, heart failure, cancer, or dialysis), coma, chronic obstructive pulmonary disease (COPD), thoracic or major abdominal surgery 24 h before MV, use of immunosuppressants (glucocorticoid, cyclophosphamide, azathioprine, methotrexate or cyclosporin during the previous three months, or systemic corticosteroids for at least one month), infection at other sites, and duration of antimicrobial treatment. After discharge from the ICU patients were followed up for the development of infection for a further 48 h. Diagnosis of VAP was made by ICU physicians and confirmed by infection control professionals to ensure data quality. The study was led by the departments of infection control in each hospital, which were responsible for providing methodological assistance when needed and feeding back the completed forms to the Surveillance Centre of HAI of Hubei Province.

Diagnosis of VAP was based on modified criteria from published literature.[13,14] VAP was considered in the presence of a new or progressive and persistent (≥48 h) radiographic infiltrate, consolidation, cavitation, or pleural effusion, plus at least two of the following: (i) temperature ≥38 or <35 °C; (ii) purulent tracheal secretions or change in character of sputum; (iii) leucocytosis [>10 000 white blood cells (WBC)/mm^3] or leucopenia (<4000 WBC/mm^3).

Diagnosis was further confirmed by positive microbial cultures of sputum or tracheal aspirate: (a) non-protected bronchoscopic specimen cultures ≥10^6 cfu/mL; (b) specimen cultures obtained by transbronchial or transartificial airway aspirate ≥10^5 cfu/mL; (c) protected bronchoscopic lavage cultures ≥10^4 cfu/mL; or (d) Wimberley brushing or protected tracheal aspirate cultures ≥10^3 cfu/mL.

When considering the diagnosis of VAP, alternative diagnoses were considered and excluded, such as myocardial infarction, pulmonary embolism, respiratory distress syndrome, atelectasis, malignancy, chronic obstructive pulmonary disease, hyaline membrane disease, bronchopulmonary dysplasia, etc.

Organisms were identified using the conventional methods employed locally. Susceptibility to antimicrobial agents was tested by disc diffusion on Mueller–Hinton agar plates according to Clinical and Laboratory Standards Institute guidelines.[15]

Data analysis

Results are expressed as means and ranges with 95% confidence intervals (CIs) where appropriate. Univariate and multivariate logistic regression analyses were performed to identify risk factors for VAP. Risk was expressed as crude and adjusted risk ratio (RR) and 95% CIs. Statistical analysis was performed using SPSS 12.0 (SPSS, Inc., Chicago, IL, USA).

Results

Patient population and incidence rate

During the study period, 12 105 patients were admitted to the ICUs, 4155 (34.32%) of whom received MV. Of these, 60.11% were male and the mean age was 46.65 years (range: 1–95 years). During the study 30 035 MV-days were accumulated, and 868 patients (20.9%; 95% CI: 19.7–22.1) were diagnosed with VAP. The crude incidence of VAP was 28.9 episodes per 1000 ventilator-days, ranging from 8.4 to 49.3 between units (Table I).

Risk factors for VAP

The characteristics of patients with VAP included in the study are shown in Table II. On multivariate analysis we found the following to be independently associated with the development of VAP: male sex, coma, COPD, bronchoscopy, tracheostomy, use of antacids, serious disease predating the onset of VAP, infection at other sites and duration of prior antibiotic use >4 days.

Micro-organisms associated with VAP

Most VAP episodes (76.8%, 667/868) were associated with positive results from bacteriological tests, and 857 potential

Table I
Cumulative incidence of ventilator-associated pneumonia by intensive care units (ICUs) in Hubei, China, from January 2007 to June 2009

ICU	Incidence per 100 admissions		Incidence per 1000 mechanical ventilation-days
	N	%	
A[a]	50	20.4	24.8
B[a]	120	25.2	22.8
C[a]	18	35.3	34.8
D[a]	149	35.8	49.3
E	52	35.4	33.1
F	13	16.9	28.0
G	13	12.0	8.4
H[a]	56	30.9	34.6
I	48	25.1	19.6
J	32	4.7	32.2
K	90	29.9	26.9
L[a]	55	30.4	24.9
M	43	7.6	28.7
N	40	32.5	46.5
O	36	45.6	47.0
P	43	19.9	27.6
Q	10	8.1	32.8
Total	868	20.9	28.9

[a] University hospital.

Download English Version:

https://daneshyari.com/en/article/3372147

Download Persian Version:

https://daneshyari.com/article/3372147

Daneshyari.com