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PATIENTS' MEDICAL CHARTS IN INTENSIVE CARE UNIT: A POTENTIAL SOURCE OF NOSOCOMIAL INFECTIONS

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ABSTRACT

This study was carried out to determine the degree of contamination of patients' medical charts in ICU settings. A total of 100 medical charts were randomly selected from ICU. The swab samples were collected from outer surface of charts with sterile swabs moistened with sterile normal saline. The swabs were immediately transferred to Trypticase soy broth and incubated aerobically for 48h and then subcultured in MacConkey, Blood and Eosin-methylene blue agars. The isolates were identified by using standard microbiological and biochemical techniques. Out of 100 charts sampled, 89% charts were found to be contaminated with pathogenic or potentially pathogenic bacteria. *Staphylococcus aureus* was the most commonly isolated bacteria in ICU (n=32, 28.3%) followed by *Citrobacter freundii* (n=27, 24%), Coagulase Negative Staphylococci (CoNS) (n=23, 20.3%) and *Acinetobacter* spp. (n=12, 10.7%). It is concluded that medical chart contains pathogenic and potentially pathogenic bacteria. Thus, contaminated charts can act as vector of pathogenic bacteria and source of cross-infection in hospital.

Key words: Intensive care unit, Nosocomial infection, Patients' medical charts

INTRODUCTION

Hospital Acquired Infections (HAIs) or Nosocomial infections (NIs), significant cause of morbidity and mortality of hospitalized patients as well as a large financial burden worldwide, are becoming increasingly common worldwide (Marinella & Elder 2000, Tolpadi *et al.* 2014). The highest prevalence of nosocomial infections occur in busy areas of hospital such as Intensive care units (ICUs) and wards in which patients undergo invasive procedures and frequent handling of infected wounds. Transmission route and source of infectious agent are two important elements in transmission of infection in hospital settings (Fridkin *et al.* 1997, Teng *et al.* 2009, Tolpadi *et al.* 2014). Susceptibility to such infections has been associated with use of invasive devices, extremes of age, immune status and infection control practices (Teng *et al.* 2009). Most nosocomial infections are thought to be transmitted by the hands of health care workers. It has long been known that hand hygiene among health care workers plays a vital role in preventing the transmission of infectious agents (Allegranzi *et al.* 2009, WHO, 2009). HAIs

may be caused by infectious agents from endogenous (body sites) or exogenous sources (patient care personnel, visitors, patient care equipment, medical devices or the health care environment (Horan *et al.* 2008). Commonly used items such as stethoscopes, latex gloves, white coats, mobile phones, writing pens, case notes and medical charts have been noted to be contaminated with various bacterial species some of which are pathogenic (Loh *et al.* 2000, Cohen *et al.* 2003, Teng *et al.* 2009, Halton *et al.* 2011, Tekerekoglu *et al.* 2011, Chen *et al.* 2014). Patients' files are common inanimate objects, which have the potential to be contaminated by pathogenic bacteria, and work as fomites in spreading nosocomial infections.

Although a number of methods, including hand washing, have been used to minimize the occurrence of related infections, there has not been much focus on the source of potential infection in the environment acquired through inanimate objects, particularly, the role of hospital medical charts as a possible vector of pathogens (WHO 2009; Chen *et al.* 2014). Medical charts are

routinely handled by multiple hospital personnel whose hands could potentially become contaminated with pathogenic bacteria after handling. The extent to which bedside files become contaminated and the range of bacterial flora attributable to contamination in high risk areas of hospital are not known with certainty. This cross-sectional study was thus carried out with an aim to determine the degree of contamination of patients' medical charts in ICU settings and to find out prevalence of nosocomial microorganisms present on the surface of patients' medical charts.

MATERIALS AND METHODS

This cross-sectional study was conducted at National Institute of Neurological and Allied Sciences, Bansbari, Kathmandu, Nepal, from March 2014 to August 2014. A total of 100 medical chart samples were randomly collected from ICU (n=100). The samples were collected from entire outer surface (plastic covers) of the selected medical charts with sterile cotton swabs moistened in normal saline by an investigator wearing sterile gloves. The sampled swabs were immediately inoculated into Trypticase soy broth and incubated for 48h and then subculture in MacConkey, Blood and Eosin-methylene blue agars (Teng *et al.* 2009). The isolates from the cultures were identified using standard microbiological and biochemical

techniques at hospital's microbiology laboratory. In case *S. aureus* was isolated from culture, then Methicillin Resistant *Staphylococcus aureus* (MRSA) was further confirmed by antibiotic susceptibility testing using Kirby-Bauer disk diffusion method.

RESULTS AND DISCUSSION

Of the 100 charts sampled in the ICU, 89 (89%) were contaminated with pathogenic or potentially pathogenic bacteria of which 13 (14.6%) showed monomicrobial and 76 (85.4%) showed polymicrobial contamination. Similar results have been reported in the previous studies carried out by the different researchers (Teng *et al.* 2009, Chen *et al.* 2014). Eight out of 100 charts were contaminated with environmental flora. Only 3 charts were not contaminated by either pathogenic or environmental bacteria (Table 1). Research on contamination of patients' medical charts in a large district general hospital in the United Kingdom found a 99.6% contamination rate, but most of the isolates were environmental organisms, with *S. aureus* being isolated from 3.9% of charts and no gram-negative bacteria were isolated (Bebbington *et al.* 2003). Two studies in Saudi Arabia found that 57-100% of patients' charts were contaminated with pathogenic or potentially pathogenic bacteria (Alothman *et al.* 2003, Panhotra *et al.* 2005).

Table 1. Percentage of contamination of patients' medical charts in ICU

Variable	Total Number	Percentage (%)
Charts with pathogenic isolates	89	89
a) monomicrobial	13	14.6
b) polymicrobial	76	85.4
Charts with environmental bacteria	8	8
Charts without isolates	3	3
Total	100	100

Table 2. Bacteria isolated from patients' medical charts in ICU

Bacterial isolates	Number	Percentage (%)
A. Pathogenic		
1. Gram positive bacteria		
Coagulase-negative staphylococci	23	20.3
<i>S. aureus</i>	32	28.3
<i>Enterococcus</i> spp.	7	6.2
<i>Micrococcus</i> spp.	1	0.9
2. Gram negative bacteria		
<i>Citrobacter freundii</i>	27	24
<i>C. koseri</i>	4	3.5
<i>Acinetobacter</i> spp.	12	10.7

<i>Pseudomonas aeruginosa</i>	2	1.7
<i>Klebsiella pneumoniae</i>	3	2.7
<i>K. oxytoca</i>	2	1.7
Total	113	100
B. Environmental		
<i>Bacillus</i> spp.	76	91.6
<i>Corynebacterium</i> spp.	7	8.4
Total	83	100

In this study, 196 bacterial isolates were obtained from 97 culture positive medical charts, of which 113 were pathogenic or potentially pathogenic whereas 83 were environmental flora. The predominant organism was found to be environmental species (*Bacillus* spp.), which tend to occur in almost all medical chart (n=76, 91.6%). Similar results were also reported by Marinella and Elder (2000). Among the pathogenic or potentially pathogenic isolates, *S. aureus* was the most predominating organism in ICU (n=32, 28.3%). However, in other studies by Teng *et al.* (2009), Chen *et al.* (2014) and Tolpadi *et al.* (2014), it has been shown that Coagulase negative Staphylococci (CoNS) were the most predominating organism from ICU. Similarly, study carried out by Panhotra *et al.* (2005) reported *Pseudomonas aeruginosa* as the most predominating organism from ICU. After *S. aureus*, the most commonly isolated bacteria were *Citrobacter freundii* (n=27, 24.0%), CoNS (n=23, 20.3%) and *Acinetobacter* spp. (n=12, 10.7%) (Table 2). Similar results were reported in the study by Panhotra *et al.* (2005), Veena Kumari *et al.* (2012). However, other studies reported *Streptococcus* and *Enterococcus* spp. as the second most prevalent organism (Marinella & Elder 2000, Teng *et al.* 2009, Chen *et al.* 2014). The prevalence of gram positive bacteria colonization was significantly higher than that of gram negative bacteria in ICU. This result is analogous to studies carried out by other researchers (Teng *et al.* 2009, Chen *et al.* 2014).

Among 32 isolates of *S. aureus*, methicillin resistance was found in 12 isolates (37.5%). The occurrence of methicillin resistant *S. aureus* (MRSA) was slightly higher in this study compared to study carried out by other researchers (Panhotra *et al.* 2005, Hamza *et al.* 2007, Teng *et al.* 2009, Chen *et al.* 2014, Tolpadi *et al.* 2014). This difference might be due to different hospital settings, different patient natures and strict measures for formulation of definite antibiotics policy to reduce the incidence of MRSA followed

by hospitals. Two isolates of enterococci showed resistance to Vancomycin. Zimbudzi *et al.* (2011) also demonstrated that the medical chart covers can be contaminated with Vancomycin-resistant enterococci (VRE).

CONCLUSION

Medical charts are handled by multiple hospital personnel while recording, looking-up and handing over to the next shifts. Also, medical charts are in continuous circulation throughout hospital, so they are prone to bacterial contamination. Based on the finding that most hospital charts are contaminated by bacteria, this study also confirms that a hospital chart is indeed not only a medical record but also an important source of potential infection. Occurrence of MRSA in chart covers also highlighted serious threat for patients in ICUs. Thus, patients' medical charts have the potential to act as vector of bacterial pathogens which once again highlighted the importance of effective hand washing before and after contact with patients' charts.

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