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BACTERIAL CONTAMINATION OF PATIENTS' FILES IN INTENSIVE CARE UNITS : IMPACT ON NOSOCOMIAL INFECTIONS.

Microbiology

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ABSTRACT

INTRODUCTION: Patient's files could be a potential source for the spread of nosocomial infections especially in critical areas. The aim of the present study was to determine the degree of contamination of the patient's files and also to analyze the spectrum of contaminant bacterial flora in the intensive care unit (ICU) and Neonatal intensive care unit (NICU), the two most high-risk areas for nosocomial transmission of infection.

METHODS: Surface swabs were collected from the exposed outer surface of the patients' files kept bedside in the ICU and NICU . Isolation & Identification was carried out using standard microbiological and biochemical laboratory techniques.

RESULTS: In total, 76% (152/200) of patient's files were found to be contaminated with pathogenic and potentially pathogenic bacteria. CoNS was the most commonly isolated bacteria (37.5%, 57/152). Methicillin-resistant Staphylococcus aureus (MRSA) was isolated from 3 ICU patient's files.

CONCLUSION: The majority of the patient's files in critical areas were contaminated and could be a source of nosocomial infection. To prevent this, health care workers should wash their hands and should perhaps be the most prudent approach to prevent patient-patient transmission of infection in high-risk areas

KEYWORDS

nosocomial infections, patient's files, hand washing

Introduction:

Intensive care unit (ICU)-acquired infections are a major cause of morbidity and mortality worldwide [1]. Infections caused by multidrug-resistant (MDR) bacteria is a daily challenge for the clinician dealing with critically ill patients . In critical areas, inanimate surfaces and equipment (e.g., bedrails, stethoscopes, medical charts, ultrasound machine) may be contaminated by bacteria, including MDR isolates. Cross-transmission of microorganisms from inanimate surfaces may have a significant role for ICU-acquired colonization and infections. Contamination may result from healthcare worker's hands or by direct shedding of bacteria by patient ,which are able to survive up to several months on dry surfaces [2,3]. A higher environmental contamination has been reported around infected patients than around patients who are only colonized[4].

It has been reported that both Gram-positive and Gram-negative bacteria are able to survive up to months on dry inanimate surfaces, with longer persistence under humid and lower-temperature conditions [5]. Factors that may affect the transfer of microorganisms from one surface to another and cross contamination rates are: type of organisms, source and destination surfaces, humidity level, and size of inoculums [6,7]. However, other factors playing a role in contamination and cross transmission rate in the ICU may include hand hygiene compliance, nurse-staffing levels, frequency/number of colonized or infected patients, and adoption of antibiotic stewardship programs[8,9]. Moreover, in different outbreak reports and observational studies, MDR isolates are responsible for environment contamination[10,11,12].

Reducing healthcare-associated infection (HAI) remains a critical issue for clinicians and managers in hospitals and healthcare institutions all over the world. It has been observed that stethoscopes, white coats, keyboards, faucets, mobile phones, writing pens, case notes, medical charts, and even wrist watches can be contaminated by environmental or pathologic microorganisms [13,14 ,15]. Such opportunistic or causative pathogens can be found on the surfaces of these personal belongings and facilities within the wards [16,17,18,19]. The extent to which bedside patients' files become contaminated and the range of bacterial flora attributable to contamination in high-risk areas of the hospital are not known with certainty.

The aim of the present study was to determine the degree of contamination of the patient's files and also to analyze the spectrum of contaminant bacterial flora in the intensive care unit (ICU) and Neonatal Intensive Care Unit (NICU) , the 2 most high-risk areas for

nosocomial transmission of infection.

Material & Methods

Study design : This was a prospective study, approved by the Ethics Committee, carried out in a tertiary care hospital & medical college in North India for a period of nine months. Microbiologic samples were collected from the exposed outer surface of the patients' files kept bedside in the Intensive Care Unit and Neonatal ICU , with sterile swabs moistened with sterile normal .As most of the patients would be in hospital for less than 2 weeks, samples were randomly collected at 2-week intervals to avoid repetition of sampling.

Sampling and identification : Two bacteriological swabs were taken from patient's files using a standard technique. Briefly, hands were properly washed and gloved before handling the case-notes. Two moistened swabs (swabbed both horizontally and vertically) were taken from an area of 5 cm2 of the cover file. The swabs were immediately transferred to the department of Microbiology to know the incidence of file contamination and the bacterial species responsible for said contamination. After transportation, each swab was immediately inoculated into a tripticase soy broth and incubated aerobically for 48 hours, then subcultured on medium composed of sheep blood agar and MacConkey agar. The identification was carried out using standard microbiological and biochemical laboratory techniques. 20 If the culture yielded Staphylococcus aureus, the presentation of MRSA was further confirmed by antibiotic susceptibility testing using the disk diffusion technique. Antibiotic susceptibility of the isolated bacteria was determined by the disk diffusion technique according to the criteria of Clinical Laboratory Standards International (CLSI) [20].

Results

Of the 200 total charts sampled, 152 (76%) were contaminated by potentially pathogenic, environmental or pathogenic bacteria. In ICU, 80% (104/130) and in NICU , 68.5% (48/70) of patient's files were found to be contaminated with pathogenic and potentially pathogenic bacteria.

Coagulase negative staphylococci (CoNS) was the peak contaminant in both the areas, isolated from 27.5% patients' files and was categorized as potentially pathogenic. Bacillus spp was the next common isolate (16.4%) categorized as environmental contaminant hence were deemed to be environmental flora.

Among the pathogenic, Klebsiella pneumoniae and Escherichia coli were the most common isolates and contributed to 16.42 % & 13 % of

the growths. The ratio of the other less common isolates (figure-1) and comparison of contamination of the patients' charts are depicted in table-1. More than one (two or more bacteria) were isolated from 55 charts.

The kind of isolated microorganism from patients' samples correlated with the isolated ones from the contaminated files. On comparison, the multidrug-resistant (MDR) Klebsiella pneumoniae and Acinetobacter spp isolated from the patient's files had same antibiotic resistance patterns as of these bacteria isolated from the patients .

In ICU, 80% (104/130) and in NICU , 68.5% (48/70) of patient's files were found to be contaminated with pathogenic and potentially pathogenic bacteria . Methicillin-resistant Staphylococcus aureus (MRSA) was isolated from 3 of ICU patient's files, whereas none of patient's files in NICU was contaminated with MRSA .

Discussion: Hospital associated infections(HAIs), are the most common complications affecting inpatients [21,22]. The contamination varies in different hospitals and in different parts of the world and can be related to the infection control practices in different hospitals. More than 20% of HAIs are acquired in the ICU setting [23]. Therefore, the surveillance of HAIs and the development of appropriate policies for infection control must be a high priority. Hand hygiene is the single most important approach to reduce the transmission of infectious agents [24,25], but this behavioural change remains a formidable obstacle [22,]. Our data suggest that the medical file is indeed a possible vector and also a potential source of infection. This is particularly true of medical files in the ICUs. In addition to CoNS, other causative and opportunistic pathogens were found on the surfaces of medical files   and can serve as a source of cross-infection [26]

A similar study done in a large district general hospital in the UK[22], isolated CoNS from the maximum file covers, which matches the outcome of our study. In comparison, two studies done in Saudi Arabia,[27]also found 57% to 100% of the patients' charts contaminated with pathogenic or potentially pathogenic bacteria (93.4%), which shows that majority of the hospital charts are contaminated by bacteria with most of the isolates being environmental organisms.

Debilitated patients in the ICU are at increased risk for HAIs compared with those in other areas of the hospital because of the higher number of contacts with the contaminated hands of HCP and the more frequent need for invasive procedures performed by HCP. Cross-infection due to poor compliance with hand washing may result from an increased workload in an overcrowded ICU. Many studies have demonstrated that overcrowding and understaffing appear to play an important role in outbreaks of HAIs and should be avoided [27-29].

A study documents isolation of CoNS from all patient charts (100%) [23] , a potentially significant source of nosocomial infection in susceptible healthcare workers and their patients; in comparison, our study revealed 27 % of CoNS from the charts. CoNS are one of the most common flora colonized on the skin, and are considered relatively avirulent. However, these potentially pathogenic bacteria have become increasingly recognized as infectious agents, especially in high-risk immunocompromised patients with prosthetic devices, intravascular catheters, or other implanted devices. [30]. However, even though CoNS were the most common contaminating bacteria of the charts in this study but no corresponding patients with CoNS infection were noted Multiple methods like disposable covers, periodic wiping with antiseptic solutions of   the files have been described, but frequent hand washing before and after chart handling remains the cost-effective method of choice[4], but this behavioural change remains a formidable obstacle.

The majority of the patient's files in ICUs were contaminated with multidrug-resistant bacteria and even MRSA. Contaminated files could be a source of transmission of infection. . The outcome of this study delivers the message that development of effective preventive strategies is an essential need to contain nosocomial infections. The patient chart should not be allowed to be placed on bed, but remain on the file rack after use and medical file covers need to be cleaned by periodical wiping with appropriate antiseptic solution or alcohol rubs thus may decrease the risk of cross-contamination. It is also recommended that health care workers should wash their hands also

after attending the patient and before entering the case notes in the patient's file and should perhaps be the most prudent approach to prevent patient-patient transmission of infection in high-risk areas

Table 1: Bacteria isolated from patients charts in Intensive Care Unit and Neonatal Intensive Care Unit

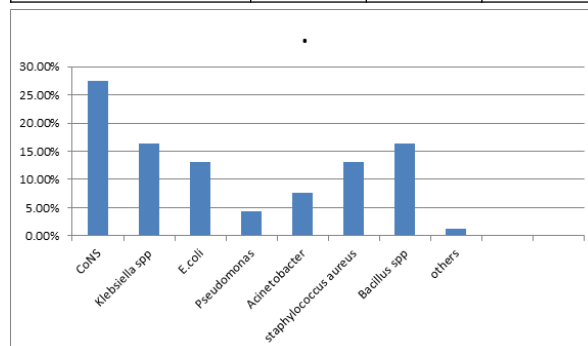| Bacterial isolates	ICU(%)	NICU(%)	Total
Coagulase negative Staphylococcal spp(CoNS)	41(29)	16(24.24)	57(27.5)
Bacillus spp	21(14.9)	12(18.18)	34(16.42)
Klebsiella spp	22(15.6)	12(18.18)	34(16.42)
Escherichia coli	18(12.8)	09(13.63)	27(13)
Acinetobacter spp	12(8.5)	04(6)	16(7.7)
Psuedomonas	06(4.25)	03(4.54)	9(4.34)
Staphylococcus aureus	18(12.8)	09(13.6)	27(13)
Others	03(2.1)	01(1.51)	4(1.3)
Total	141	66	207

Figure 1: Incidence of bacterial contamination from sampled medical files

References
1. Vincent J-L, Rello J, Marshall J, Silva E, Anzueto A, Martin CD, et al. International study of the prevalence and outcomes of infection in intensive care units. JAMA. 2009;302(21):2323–9.
2. Russotto V, Cortegiani A, Graziano G, Saporito L, Raineri SM, Mammina C, et al. Bloodstream infections in intensive care unit patients: distribution and antibiotic resistance of bacteria. Infect Drug Resist. 2015;8:287.
3. Tabah A, Koulenti D, Laupland K, Misset B, Valles J, De Carvalho FB, et al. Characteristics and determinants of outcome of hospital-acquired bloodstream infections in intensive care units: the EUROBACT International Cohort Study. Intensive Care Med 2012;38(12):1930–45.
4 . LaBan MM, Singh J, Moll V, Zervos MJ. Pertinacious Habit on a Rehabilitation Unit-Repetitive Finger Licking While Paging Through the Clinical Chart.American Journal of Physical Medicine & Rehabilitation 2004; 83:75-78.
5 Kramer A, Schwebke I, Kampf G. How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. BMC Infect Dis. 2006; 6(1):130.
6. Dancer SJ. Importance of the environment in meticillin-resistant Staphylococcus aureus acquisition: the case for hospital cleaning. Lancet Infect Dis. 2008;8(2):101–13.
7. Pittet D, Allegranzi B, Sax H, Dharan S, Pessoa-Silva CL, Donaldson L, et al. Evidence-based model for hand transmission during patient care and the role of improved practices. Lancet Infect Dis. 2006;6(10):641–52.
8 Montero JG, Lerma FÁ, Galleymore PR, Martínez MP, Rocha LÁ, Gaite FB, et al. Combatting resistance in intensive care: the multimodal approach of the Spanish ICU "Zero Resistance" program. Crit Care. 2015;19(1):114.
9. Rohr U, Kaminski A, Wilhelm M, Jurzik L, Gatermann S, Muhr G. Colonization of patients and contamination of the patients' environment by MRSA under conditions of single-room isolation. Int J Hyg Environ Health. 2009;212(2): 209–15.
10 Huang SS, Datta R, Platt R. Risk of acquiring antibiotic-resistant bacteria from prior room occupants. Arch Intern Med. 2006;166(18):1945–51.
11. Nseir S, Blazejewski C, Lubret R, Wallet F, Courcol R, Durocher A. Risk of acquiring multidrug-resistant Gram negative bacilli from prior room occupants in the intensive care unit. Clin Microbiol Infect. 2011;17(8): 1201–8.
12. Bonten MJ, Hayden MK, Nathan C, van Voorhis J, Matushek M, Slaughter S, et al. Epidemiology of colonisation of patients and environment with vancomycin-resistant enterococci. Lancet. 1996;348(9042):1615–9.
13 . Cohen SR, McCormack DJ, Youkhana A, Wall R (2003) Bacterial colonization of stethoscopes and the effect of cleaning. J Hosp Infect 55: 236–237.
14 Loh W, Ng VV, Holton J (2000) Bacterial flora on the white coats of medical students. J Hosp Infect 45: 65–68.
15 Jeans AR, Moore J, Nicol C, Bates C, Read RC (2010) Wristwatch use and hospital-acquired infection. J Hosp Infect 74: 16–21.
16 Bures S, Fishbain JT, Urehara CFT, Parker JM, Berg BW (2000) Computer keyboards and faucet handles as reservoirs of nosocomial pathogens in the intensive care unit. Am J Infect Control 28: 465–470
17 Panhotra BR, Saxena AK, Al-Mulhim AS (2005) Contamination of patients' files in intensive care units: an indication of strict handwashing after entering case notes. Am J Infect Control 33: 398–401.
18 Hamza N, Bazoua G, Al-Shajerie Y, Kubiak E, James P, et al. (2007) A prospective study of the case-notes of MRSA-positive patients: a vehicle of MRSA spread. Ann R Coll Surg Engl 89: 665–667.
19 Zimbudzi1 E, Stuart RL, Korman TM, Kotsanas D (2011) Contamination of renal patients' hospital chart covers with vancomycin-resistant enterococci: Handle with care. Australas Med J 4: 538–541.
20 Clinical and Laboratory Standards Institute (CLSI). Performance Standards for Antimicrobial Susceptibility Testing; Twenty- Fourth Informational Supplements.

M100-S24. Wayne, PA: CLSI; 2014.

21 Slack RCB. Hospital infection. In: Greenwood D, Slack RCB, Peutherer JF (Eds.). Medical microbiology. 16th ed. Churchill Livingstone; 2003. p. 662_69.

22 Bebbington A, Parkin I, James PA, Chichester LJ, Kubiak EM. Patients' case-notes: look but don't touch . Journal Hospital Infection 2003;55:299-301.

23. Marinella MA, Elder BL. Bacterial contamination of patient hospital charts.Infectious diseases in clinical practice 2000; 9: 39-40.

24 Siegel JD, Rhinehart E, Jackson M, Chiarello L; Health Care Infection Control Practices Advisory Committee. 2007 guideline for isolation precautions: preventing transmission of infectious agents in health care settings. Am J Infect Control. 2007;35(10 Suppl 2):S65-164.

25. Silvestri L, Petros AJ, Sarginson RE, de la Cal MA, Murray AE, van Saene HK. Handwashing in the intensive care unit: a big measure with modest effects. J Hosp Infect. 2005;59: 172-9.

26. Alothman A, Jelani A, Althaqafi A, Rich M, Williams E. Contamination of patient hospital charts by bacteria. J Hosp Infect. 2003;55:304-5.

27. Harbarth S, Sudre P, Dharan S, Cadenas M, Pittet D. Outbreak of Enterobacter cloacae related to understaffing, overcrowding, and poor hygiene practices. Infect Control Hosp Epidemiol. 1999;20:598-603.

28. Archibald LK, Manning ML, Bell LM, Banerjee S, Jarvis WR. Patient density, nurse-to-patient ratio and nosocomial infection risk in a pediatric cardiac intensive care unit. Pediatr Infect Dis J. 1997;16:1045-8.

29. Mayhall CG, Lamb VA, Gayle WE Jr, Haynes BW Jr. Enterobacter cloacae septicemia in a burn center: epidemiology and control of an outbreak. J Infect Dis. 1979;139:166-71. diseases in clinical practice 2000; 9: 39-40.

30. Huebner J, Goldmann DA. Coagulase-negative staphylococci: role as pathogens. Annu Rev Med. 1999;50:223-36.