

## ORIGINAL ARTICLE

## HOSPITAL INFECTION CONTROL IN CAMBODIA

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**Background:** Hospital infection control and research is established in most large hospitals in industrialised nations. Cambodia is a low-income country in Southeast Asia. **Methods:** Published infection control studies in Cambodia are reviewed in this study, and observational study data from a hospital in Cambodia are reported. **Results:** No studies regarding the transmission of helminthic infections (e.g., *Ascaris lumbricoides*), malaria, vector-borne viral infections (e.g., Dengue), or food borne diseases (e.g., *Entamoeba histolytica*) in hospital were identified. In the studied hospital airborne transmission precautions were limited to use of surgical masks. Contact precautions for diarrhoea and droplet precautions for meningitis were not used. Sharps container and educational wall posters were used. Safe needle handling procedures were limited and intravenous medications were administered by trainee nurses. **Conclusion:** Potential routes of transmission of *Mycobacterium tuberculosis* among patients and from patients to healthcare workers and visitors were observed.

**Keywords:** hospital infection control, Cambodia, low-income country

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## INTRODUCTION

Hospital infection control and research is established in most large hospitals in industrialised nations.<sup>1</sup> Transmission of infections in hospital with, for example, *Mycobacterium tuberculosis*<sup>2</sup> and hepatitis B virus<sup>3</sup> continue to be reported in the United States.<sup>2,3</sup> Infection control research in low-income countries is less well developed than in industrialised nations<sup>4</sup>, and the extent of hospital transmission of *Mycobacterium tuberculosis* or hepatitis B virus is likely to be similar or more frequent than in industrialised nations.

Blood-borne transmission in hospital has potentially unrecognised routes, e.g., transmission during medication administration. Education of health care workers and patients regarding hand hygiene and needle safety and surveillance for nosocomial outbreaks should be established in low-income countries.

To identify areas for improvement, this article studies hospital infection control in a low-income country, Cambodia, based on a review of published infection control studies in the country and presents observational study data from a public hospital in the capital city Phnom Penh.

## METHODS

Pubmed was used to collect relevant publications between 1967 and August 2011 by using the search terms: infection control, hospital transmission, nosocomial, Cambodia.

The investigator attended the medical ward for human immunodeficiency virus-infected patients of Khmer Soviet Friendship Hospital in Phnom Penh, Cambodia as visiting physician and collected observational data regarding the use of contact, droplet, and airborne precautions and routes for blood-borne

transmission. The study was approved by the Internal Review Board of the hospital.

## RESULTS

No reports of transmission in hospital were identified. One report of possible H5N1 influenza transmission modes in hospital was identified.<sup>5</sup> No reports of blood-borne transmission in hospital were identified. No reports of transmission in hospital were identified.<sup>6,7</sup> No reports of blood-borne transmission in hospital were identified.<sup>8,9</sup> No reports of airborne transmission in hospital were identified.

Table-1 summarises examples of patients with tuberculosis sharing a room with patients without tuberculosis and patients with diarrhoea sharing a room with patients without diarrhoea. Patients with either tuberculosis or diarrhoea were assigned to a bed in a room without consideration of airborne or contact transmission precautions.

Contact precautions were used for open wounds. Examination gloves were available and gowns were not available. Contact precautions were not used for patients with diarrhoea.

Droplet precautions for patients with meningitis were not used. Patients with pulmonary tuberculosis were not assigned to airborne precautions (e.g., single rooms or use of N95 respirator masks). Negative pressure rooms were not available.

Surgical masks were used for airborne precautions (Figure-1). Patients with pulmonary tuberculosis were attended by relatives including children without surgical masks and respirators. N95 or equivalent standardized respirator masks were not available because of lack of funding.

Improvised sharps container prepared from cardboard were used and overfilled (Figure-2). Recapped needles were left in trays (Figure-3A) and

syringes and needles were discarded in general waste container (Figure-3B). A ward nurse could become infection control practitioner after receiving training and supervise safe sharps disposal and injection practice. Medication administration was performed by student nurses.

**Table-1: Examples of patients sharing rooms**

Examples	Airborne precautions
1	<ul style="list-style-type: none"> <li>• 38-year-old man with wasting syndrome and chronic cough</li> <li>• 24-year-old man with malaria</li> <li>• 46-year-old woman with lower back pain</li> </ul>
2	<ul style="list-style-type: none"> <li>• 30-year-old man with pneumonia (possible tuberculosis)</li> <li>• 30-year-old woman with tuberculous lymphadenopathy</li> <li>• 57-year-old man with myocardial infarction</li> </ul>
3	<ul style="list-style-type: none"> <li>• 40-year-old man with pulmonary tuberculosis</li> <li>• 39-year-old man with paraparesis</li> </ul>
4	<ul style="list-style-type: none"> <li>• 30-year-old man with suspected pulmonary tuberculosis</li> <li>• 43-year-old woman with chronic diarrhoea</li> <li>• 24-year-old woman with cryptococcal meningitis</li> </ul>
5	<ul style="list-style-type: none"> <li>• 28-year-old man with pulmonary tuberculosis</li> <li>• 39-year-old man with paraparesis</li> <li>• 40-year-old man with disseminated tuberculosis</li> </ul>
	• Contact precautions
1	<ul style="list-style-type: none"> <li>• 27-year-old man with typhoid fever</li> <li>• 19-year-old pregnant woman with undiagnosed sepsis</li> </ul>
2	<ul style="list-style-type: none"> <li>• 43-year-old woman with chronic diarrhoea</li> <li>• 30-year-old man with pulmonary tuberculosis</li> <li>• 24-year-old woman with cryptococcal meningitis</li> </ul>
3	<ul style="list-style-type: none"> <li>• 28-year-old woman with acute diarrhoea</li> <li>• 28-year-old man with malaria</li> </ul>
4	<ul style="list-style-type: none"> <li>• 39-year-old woman with chronic diarrhoea</li> <li>• 55-year-old man with acute diarrhoea</li> <li>• 51-year-old man with acute on chronic renal failure</li> </ul>
5	<ul style="list-style-type: none"> <li>• 33-year-old man with chronic diarrhoea</li> <li>• 31-year-old woman with tuberculous meningitis</li> <li>• 39-year-old man with paraparesis</li> </ul>

A hand wash basin in the main health care worker office (Figure-4) was available. Nurses were observed using the hand wash basin. Doctors were not observed using the hand wash basin. Powder soap was available and supply maintained. The hand wash basin remained functional and was serviced by Khmer health care worker. Several other hand wash basins (not shown) instituted by non-governmental organizations on the ward corridor were not maintained.

An autoclave was used on the ward (Figure-5). Disposable needles and syringes were used for blood-drawing and medication administration. A sign in Khmer and English language explaining the use of respirator masks (Figure-6A) was displayed next to the door of an unused room. The sign was located in a part of the ward not in use and had been set up by a non-governmental organization in the past. The respirator mask displayed in the sign was not available. The majority of patients and health care worker did not speak English.

In the main health care workers office of the ward a wall poster (Figure-6B) was used depicting text in Khmer language with a drawing of needles, hands,

and a sharps container. The text explains the danger of recapping needles and insertion of hands into sharps container.

A sign in Khmer and English language explaining the use of respirator masks (A) was displayed next to the door of an unused room in a part of the ward not in use, and had been set up by a non-governmental organization in the past. In the main health care worker office of the ward a wall poster (Figure 6B) was used depicting text in Khmer language with a drawing of needles, hands, and a sharps container.



**Figure-1: Surgical masks**



**Figure-2: Sharps container for disposal of needles to avoid needle stick injuries prepared with cardboard boxes and overfilled**





Figure-3A



Figure-3B

Figure-3: (A) Recapped needles left in trays, (B) syringes and needles discarded in general waste container



Figure-4: A hand wash basin in the main health care worker office



Figure-5: An autoclave used in the ward



Figure-6A



Figure-6B

Figure 6A and B. Use of educational wall posters to support infection control

## DISCUSSION

This article reviewed infection control research publications in Cambodia and reported the results of an infection control study at a public hospital in the capital city Phnom Penh. Four published studies of nosocomial infections with observational data regarding potential routes for transmission of influenza and methicillin-resistant *Staphylococcus aureus* (MRSA) were identified. Two additional studies have published data regarding the role of hospital infection control in Khmer society<sup>10</sup> and injection practice in Cambodia<sup>11</sup>.

The main finding of this study at a public hospital in the capital city Phnom Penh is that potential airborne routes for tuberculosis transmission in hospital were identified. Another finding is the observation that limited needle safety is a potential route for blood borne transmission of hepatitis B and C virus in hospital.

The findings regarding use of airborne precautions on the ward demonstrate that patients were not isolated and only surgical masks were used. HIV frequency in tuberculosis patients has been reported as 9.9%<sup>12</sup> and lack of effective airborne precautions probably causes infection transmission in hospital. This has not been investigated in Cambodia, but transmission in hospital was demonstrated in South Africa<sup>13</sup> and United Kingdom<sup>14</sup>. Transmission of tuberculosis can also contribute to an increase of the frequency of multidrug-resistant tuberculosis (MDR) in Cambodia (5.1% in 2009).<sup>15</sup>

Negative-pressure rooms are a component of airborne precautions and because of a cost<sup>16</sup> of about \$100,000 are not available in most hospitals in Cambodia. An improvement of airborne precautions would be the institution of an infection control practitioner in charge of admitting patients with active tuberculosis or possible tuberculosis to single rooms. Patients should be instructed to use surgical masks when coughing. If funding for N95 or equivalent respirators is not available, then the production of low-cost locally produced N95 alternatives may be explored.

The use of contact precautions was limited to patients with open wounds. Patients admitted with acute and chronic diarrhoea shared the same rooms with patients without diarrhoea, and therefore transmission of *Salmonella* species, *Entamoeba histolytica*, and *Giardia lamblia* is a concern.<sup>17</sup> No research studies were identified investigating how often patients develop diarrhoea in hospital, or how nurses and doctors can transmit *Salmonella* species or *Entamoeba histolytica* among patients. Patients and healthcare worker may not realise the potential of transmitting *Salmonella* species or *Entamoeba histolytica* due to limited hand hygiene. Appreciation of hand hygiene of healthcare worker is limited in Cambodian society.<sup>10</sup> Educational hand

hygiene wall poster and hand hygiene educational meetings could be considered.

This study found that syringes and needles were discarded in regular garbage containers, and intravenous medications were administered by trainee nurses. Blood-borne infections including hepatitis B and C can be transmitted in hospital. Even in industrialised countries such as United States transmission of hepatitis B virus in hospital has been reported through the use of multivials for injections.<sup>18</sup> Therefore, the frequency of blood borne nosocomial infection with hepatitis B and C virus should be investigated.

This study provides only limited quality observational data. However, a limited amount of other data regarding tuberculosis and hepatitis B and C transmission in hospital were identified.<sup>11</sup> An advantage of small research projects is less dependence on funding and donor-defined objectives.<sup>19</sup>

## CONCLUSION & RECOMMENDATIONS

Potential routes of transmission of *Mycobacterium tuberculosis* among patients and from patients to healthcare workers and visitors were observed. Airborne precautions should include use of N95 respirator masks and isolation of patients in single rooms under airborne precautions. Potential transmission of blood-borne pathogens during medication administration should be reviewed. An infection control practitioner should be instituted to review the room occupancy with patients with diarrhoea or tuberculosis and support transmission precautions.

## REFERENCES

1. 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:S65–164.
2. Cruz AT, Medina D, Whaley EM, Ware KM, Koy TH, Starke JR. Tuberculosis among families of children with suspected tuberculosis and employees at a children's hospital. *Infect Control Hosp Epidemiol* 2011;32:188–90.
3. Centers for Disease Control and Prevention (CDC). Potential transmission of viral hepatitis through use of stored blood vessels as conduits in organ transplantation—Pennsylvania, 2009. *MMWR Morb Mortal Wkly Rep* 2011;60:172–4.
4. Apisarnthanarak A, Mundy LM. Infection control for emerging infectious diseases in developing countries and resource-limited settings. *Infect Control Hosp Epidemiol* 2006;27:885–7.
5. Buchy P, Mardy S, Vong S, Toyoda T, Aubin JT, Miller M, et al. Influenza A/H5N1 virus infection in humans in Cambodia. *J Clin Virol* 2007;39:164–8.
6. Nickerson EK, Wuthiekanun V, Kumar V, Amornchai P, Wongdeethai N, Chheng K, et al. Emergence of community-associated methicillin-resistant *Staphylococcus aureus* carriage in children in Cambodia. *Am J Trop Med Hyg* 2011;84:313–7.
7. Swaddiwudhipong W, Peanumlom P. A case of nosocomial cholera during a community outbreak in a Thai-Myanmar border area. *J Med Assoc Thai* 2010;93:1112–4.
8. Pilszczek FH. Infection control in developing countries: Phnom Penh and Kabul. *Am J Infect Control* 2009;37:81–2.

9. Petit PH. Do reproductive health care practices create a risk of HIV, HVB, and HVC transmission? Case studies in Cambodia. *Sante* 2010;20:3–8.
10. Hancart-Petit P, Dumas C, Faurand-Tournaire AL, Desclaux A, Vong S. Social and cultural dimensions of hygiene in Cambodian health care facilities. *BMC Public Health* 2011;11:83.
11. Vong S, Perz JF, Sok S, Som S, Goldstein S, Hutin Y, *et al.* Rapid assessment of injection practices in Cambodia, 2002. *BMC Public Health* 2005;5:56.
12. Tamura M, Eam KK, Kimura K, Yoshihara N, Miura T, Yanai H, *et al.* National HIV prevalence surveillance among TB patients through periodic surveys: experience in Cambodia. *Int J Tuberc Lung Dis* 2008;12:20–5.
13. O'Donnell MR, Jarand J, Loveday M, Padayatchi N, Zelnick J, Werner L, *et al.* High incidence of hospital admissions with multidrug-resistant and extensively drug-resistant tuberculosis among South African health care workers. *Ann Intern Med* 2010;153:516–22.
14. Breathnach AS, de Ruiter A, Holdsworth GM, Bateman NT, O'Sullivan DG, Rees PJ, *et al.* An outbreak of multi-drug-resistant tuberculosis in a London teaching hospital. *J Hosp Infect* 1998;39:111–7.
15. Sar B, Keo C, Leng C, Saman M, Min DC, Chan S, *et al.* Anti-tuberculosis drug resistance and HIV co-infection in Phnom Penh, Cambodia. *Southeast Asian J Trop Med Public Health* 2009;40:104–7.
16. Jensen PA, Lambert LA, Iademarco MF, Ridzon R, CDC. Guidelines for preventing the transmission of *Mycobacterium tuberculosis* in health-care settings, 2005. *MMWR Recomm Rep* 2005;54:1–141.
17. Johnston CP, Qiu H, Ticehurst JR, Dickson C, Rosenbaum P, Lawson P, *et al.* Outbreak management and implications of a nosocomial norovirus outbreak. *Clin Infect Dis* 2007;45:534–40.
18. Center for Disease Control and Prevention (CDC). Transmission of hepatitis B and C viruses in outpatient settings—New York, Oklahoma, and Nebraska, 2000–2002. *MMWR Morb Mortal Wkly Rep* 2003;52:901–6.
19. Pilszczek FH. Research as a visiting doctor in Afghanistan and Cambodia. *Pharmacoepidemiol Drug Saf* 2001;10:583–5.

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