

JPC Chau 周柏珍
 DR Thompson 湯迪偉
 S Twinn 程思雅
 DTF Lee 李子芬
 V Lopez 羅考思
 LSY Ho 何倩儀

An evaluation of SARS and droplet infection control practices in acute and rehabilitation hospitals in Hong Kong

Key Messages

1. This study has demonstrated that great efforts have been made by the Hospital Authority and the studied hospital cluster to contain and prevent infection, and that high levels of vigilance have been enforced in anticipation of future outbreaks of SARS and other droplet infections.
2. Most health care workers and support workers have good hospital infection control and isolation precaution knowledge levels.
3. Compliance with infection control guidelines is satisfactory and has increased compared with previous studies.
4. Most participants had positive perceptions of the guidelines and found the training programmes useful.
5. This study has identified several structures and infection control practice areas that need strengthening, including improving the clarity of some guidelines and minimising barriers to their implementation.

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The Nethersole School of Nursing, The Chinese University of Hong Kong, Shatin, NT, Hong Kong SAR, China

JPC Chau, DR Thompson, S Twinn, DTF Lee, V Lopez

Shatin Hospital, Shatin, NT, Hong Kong SAR, China

LSY Ho

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Principal applicant and corresponding author:
 Prof Janita Chau

The Nethersole School of Nursing, The Chinese University of Hong Kong, Shatin, NT, Hong Kong SAR, China

Tel: (852) 2609 6226

Fax: (852) 2603 5935

E-mail: janitachau@cuhk.edu.hk

Introduction

The SARS outbreak in 2003 had a profound impact on the Hong Kong health care system, leading to an increased focus on the prevention and control of infection. From the beginning, infection of health care workers (HCW) and support workers (SW) has been a common feature of SARS. Of the 1746 cases of SARS reported in Hong Kong, 385 involved HCW, SW, or medical students, seven of whom died.

The lessons learned from these experiences have highlighted the need for health care professionals to take infection control measures seriously. Hospital-acquired infections remain the most common complications affecting hospitalised patients,¹ resulting in increased morbidity and mortality, extended lengths of stay,² increased health care costs and loss of productivity.³

A report by the SARS Expert Committee⁴ in Hong Kong found that hospital infection control standards are inadequate and identified a need for the development, implementation and auditing of guidelines, as well as infection control education and training for hospital staff. Although infection control audits have been conducted in some hospitals since the outbreak of SARS, no systematic evaluation of the resources and activities directed towards infection surveillance and control in acute and rehabilitation hospitals in Hong Kong has been performed.

This project aimed to investigate the infection surveillance and control compliance with Hospital Authority (HA) guidelines in acute and rehabilitation hospitals and examine the appropriateness of infection control practices among HCW (nurses, doctors, physiotherapists [PT] and occupational therapists [OT]), and SW (health care assistants [HCA], technical service assistants [TSA], workmen, cleaners, and porters).

Methods

This study was conducted from November 2004 to January 2006.

A multi-method research design was used. A cross-sectional survey was conducted in one acute and two rehabilitation hospitals to assess respondents' knowledge of isolation precautions and infection control guidelines. A review examining the infection control surveillance activities and comparing and contrasting the hospital infection control guidelines with the Centre for Disease and Control (CDC) recommendations was performed. A non-participant observation method was used to identify omissions in the implementation of guidelines. Interviews were conducted to explore perceptions of the appropriateness of infection control measures, barriers to implementation, and training needs.

Results

Knowledge survey

The Hospital Infection Control Knowledge Questionnaire (HICKQ) was developed to assess respondents' knowledge of hospital infection control

Table. Means, standard deviations (SDs) of total Hospital Infection Control Knowledge Questionnaire (HICKQ) scores and scores on three aspects of knowledge

	Minimum	Maximum	Mean	SD
Total HICKQ scores	5	24	19.19	2.52
Knowledge of				
Hospital infection control	0	11	8.93	1.57
Droplet isolation precautions	0	6	4.93	0.97
Mode of transmission of droplet infection	0	7	5.33	1.17

guidelines, in particular droplet isolation precautions. A cross-sectional survey was conducted and 582 participants, comprising 367 HCW and 215 SW from one acute and two rehabilitation hospitals were recruited. The response rate for nurses, SW, PT and OT was around 30% and for doctors 11%. The Table presents the mean scores and standard deviations for the entire HICKQ and three aspects of knowledge.

Items that had the highest number of correct responses included those measuring knowledge of the elements of infection transmission (91%), characteristics of standard precautions (94%), use of special air ventilation to prevent the transmission of *Mycobacterium tuberculosis* in untreated pulmonary tuberculosis (92%), the disposal of hospital wastes (91%), the use of protective gowns (94%), and the mode of transmission of droplets by sneezing (99%), suctioning (93%), and coughing (97%).

Items that had the lowest number of correct responses (<75%) concerned knowledge of hospital infection control, including sterilisation procedures (52%) and personal protective devices required during the transfer of patients infected with the SARS coronavirus (61%).

More than two thirds of the respondents gave correct answers to all six items concerned with droplets isolation precautions, indicating good knowledge of this area.

Items that had the lowest number of correct responses (<75%) concerned the mode of transmission of droplet infection, including: "transmission of droplets through contaminated equipment" (31%) and "body fluids" (39%).

There were significant differences between the total HICKQ scores achieved by nurses, PT/OT and SW. Nurses had significantly higher total HICKQ scores and knowledge scores concerning hospital infection control and the mode of transmission of droplet infection compared with SW; PT/OT had significantly higher total HICKQ scores and knowledge scores concerning hospital infection control compared with SW. No significant differences were found between nurses, doctors, PT/OT. Health care assistants had significantly higher HICKQ scores compared with TSA, workmen and support staff (porters and cleaners). Of SW,

workmen and support staff achieved the lowest knowledge scores.

Review of the infection control surveillance activities and structures in the hospitals

A review to compare and contrast the HA infection control guidelines for SARS and droplet infections with CDC recommendations and interim reports was performed. The results showed that there were, in general, consistencies between the CDC and HA guidelines, which were clearly based on the CDC recommendations. Additional precautions were implemented by ward staff, based on their perceptions of the need for such measures and also on the type of ward, eg the intensive care unit (ICU) and accident and emergency departments (AED). The review also demonstrated that infection control structures, including surveillance, infection control activities, infection control policies and infection control personnel, were in place in the HA and the studied cluster hospitals.

Non-participant observations

A prospective, non-blinded, observational study was used to identify omissions in the infection control practices of HCW and SW in four clinical wards in an acute hospital (medical wards, surgical wards, AED, and ICU), and the medical and surgical wards of two rehabilitation hospitals. A non-probability quota sampling method that incorporated elements of stratification was used. A stratified sample based on years of working experience and hospital was assembled. We hypothesised that the overall compliance rates of HCW and SW increase with years of experience, and assumed compliance rates of 60%, 70% and 80% with years of working experience of ≤ 5 , 6-10, >10 respectively. To account for hospital differences, this sample was also stratified on the basis of total numbers of HCW and SW working in the studied units. Of the 101 HCW and SW approached, 96 agreed to take part (response rate, 95%). The infection control practices followed by each participant were recorded and observed over four separate 15-minute time slots.

In 1361 observed infection control practice episodes, the average rate of compliance with all isolation precautions was 78%. The average rate of compliance was calculated by summing the compliance rates with hand hygiene; proper wearing of a mask; use of goggle/face shield, gloves, gown; the handling of patient care equipment, linen laundry; routine and terminal cleaning (after patient discharge or transfer); and terminal cleaning of an isolation room and divided by nine.

There was 82% compliance with hand hygiene, 97% compliance with wearing a mask, 65% and 64% compliance with gown, goggle/face shield precautions, 71% compliance with glove use, 81% compliance with handling patient care equipment and articles, 56% compliance with routine and terminal cleaning, 100% compliance with handling linen, laundry as well as terminal cleaning of an isolation room.

A performance score, which took into consideration all the recommended steps for each procedure, was calculated for each individual. There were no significant differences in total performance scores and performance scores for hand washing, use of a hand rub, proper wearing of a mask, use of goggles, gloves, gown, the handling of patient care equipment, routine and terminal cleaning, and terminal cleaning of an isolation room between the three groups, with ≤ 5 , 6-10, and >10 years of working experience.

Significant differences were found between the total performance scores and performance scores on hand rub use of participants working in acute hospital and those working in the rehabilitation hospitals. Those working in rehabilitation hospitals performed better. Nurses in both acute and rehabilitation hospitals performed better in a number of isolation precautions, including hand washing, hand rub use, glove use, handling of linen and laundry, and handling patient care equipment. Doctors in both acute and rehabilitation hospitals performed better when it came to wearing masks and putting on gowns. We were unable to compare PT/OT with other HCW and SW due to the small sample size.

Interviews

Semi-structured interviews were conducted to explore perceptions of HCW, SW and managers of the appropriateness of the infection control guidelines, barriers to the implementation of the infection control guidelines, and their infection control training needs. All 109 staff members approached (32 HCW, 30 HCA, and 47 managers including nursing officers, ward managers, nurse specialists, infection control nurses) agreed to participate.

Content analysis of the qualitative narrative data demonstrated a wide range of perceptions about the appropriateness of the guidelines. An important finding was the category of the changes in the guidelines. This was illustrated by comments from one doctor, who said: "A lot of changes, because we have to adjust it according to the conditions in mainland China, according to the HA infection control protocol...that changes often. The criteria for admission change often. Some time ago, there was an avian flu scare in Tsing Hai, China. Therefore, the protocol specified that we must ask whether a patient has been to Tsing Hai." (129:74,76)

Participants also demonstrated positive perceptions of the guidelines. The guidelines were described as easier to follow and as facilitating increased alertness to possible infectious diseases. Guideline auditing was also described as a helpful process. Once again, however, individual views within groups differed with some staff in each group describing negative perceptions of the guidelines. These negative perceptions included the guidelines being difficult to follow and too long.

This was illustrated by one nursing officer who said:

"However, to tell the truth, when frontline workers receive such a thick pile of documents, they may not have time to go through them point by point. It may be adequate to give us summaries for us to get an idea of the principles." (132:34)

Barriers to the implementation of the infection control guidelines

Content analysis demonstrated that the barriers identified in the qualitative data could be put into four major categories: lack of understanding; communication between staff, patients and visitors; non-compliance with the guidelines; and lack of resources. Barriers identified by most staff included issues with communication; lack of understanding; resources and the structure of the environment as well as non-compliance by patients and visitors. Other common barriers identified by the three groups were the workload and poor practices by colleagues, highlighting the need for further training and education for all grades of staff.

The training needs of health care workers and support staff

Recommended improvements in infection control training included: the need for tailored information; the need for more programmes in Chinese with a more interactive approach to learning; the need to make the courses more practical; and the need to educate the public and patients. The following comments provided by two registered nurses illustrated the need for tailored programmes. "The minor staff or cleaner are particularly vulnerable. The cleaner may not receive training and has started to work in ward already." (44:61,62)

Discussion

The SARS outbreak led to a heightened staff awareness of both workplace health hazards and the need for precautionary measures to combat infectious diseases. It is encouraging to find that the infection control committees in the study hospitals appear to be effective at instituting infection control practices and policies. A high level of vigilance in the study hospitals was also enforced, in anticipation of future outbreaks. Policy makers and health service managers should continue to support their committees' endeavours to conduct infection control surveillance, audits, reviews, and disseminate infection control guidelines.

This study has found that the majority of HCW and SW have a good level of knowledge about hospital infection control and isolation precautions. It is of concern, however, that some SW, especially workmen, had limited knowledge of infection control practices and guidelines, given their potentially major role in breaking the chain of infection. Additional training is warranted to enhance their knowledge of infection control guidelines. Health service managers and service providers should provide ample opportunities for on-the-job training and continuous monitoring of infection control knowledge.

The level of compliance with HA and CDC infection control guidelines was also satisfactory and showed a higher compliance rate than overseas studies.⁵⁻⁷ Several infection control practices followed by HCW and SW need improvement including the use of hand rubs, use of gowns and the handling of patient care equipment. Education on the need for full compliance is required.

Most health care staff had positive perceptions of the infection control guidelines and found the training programmes useful. The guidelines were described as easier to follow and as facilitating increased alertness to possible infectious diseases. These results suggest that factors influencing the uptake of infection control practice are multi-dimensional. Overall, HCW and SW understand the value of implementing appropriate infection control practices; however, they need the support of policy makers and health service managers, particularly in the provision of resources.

Finally, very few visitors were observed rubbing their hands with the alcohol hand rub provided in the hospital. The non-compliance with the infection control policy by visitors was also perceived as a major barrier to the implementation of the guidelines. Educating the public about the importance of hospital infection control policies such as: when not to visit, the maximum number of visitors attending one patient, and other precautionary measures

such as general hygiene and hand hygiene, could help to minimise hospital-acquired infections and cross infection.

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