



Using an integrated infection control strategy during outbreak control to minimize nosocomial infection of severe acute respiratory syndrome among healthcare workers

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Summary Healthcare workers (HCWs) are at risk of acquiring severe acute respiratory syndrome (SARS) while caring for SARS patients. Personal protective equipment and negative pressure isolation rooms (NPIRs) have not been completely successful in protecting HCWs. We introduced an innovative, integrated infection control strategy involving triaging patients using barriers, zones of risk, and extensive installation of alcohol dispensers for glove-on hand rubbing. This integrated infection control approach was implemented at a SARS designated hospital ('study hospital') where NPIRs were not available. The number of HCWs who contracted SARS in the study hospital was compared with the number of HCWs who contracted SARS in 86 Taiwan hospitals that did not use the integrated infection control strategy.

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Two HCWs contracted SARS in the study hospital (0.03 cases/bed) compared with 93 HCWs in the other hospitals (0.13 cases/bed) during the same three-week period. Our strategy appeared to be effective in reducing the incidence of HCWs contracting SARS. The advantages included rapid implementation without NPIRs, flexibility to transfer patients, and re-inforcement for HCWs to comply with infection control procedures, especially handwashing. The efficacy and low cost are major advantages, especially in countries with large populations at risk and fewer economic resources.

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Introduction

Severe acute respiratory syndrome (SARS) has claimed 73 lives in Taiwan including two first year resident physicians and five critical care nurses. The initial SARS epidemic among healthcare workers (HCWs) in Taiwan started at the Taipei Municipal Hoping Hospital (TMHH). Seventeen HCWs contracted SARS between 22 and 23 April 2003 from six different locations within the hospital; interestingly, none of the 17 HCWs had known direct contact with the index SARS patients admitted from the community.¹ Health officials decided to quarantine the hospital because it was postulated that Taiwan SARS cases involving HCWs were occurring as a result of nosocomial transmission. More than 1000 patients, HCWs and visitors were not allowed to leave the TMHH for three days. Subsequently, the President of Taiwan made an executive decision on 26 April 2003 to evacuate the hospital. Within 48 h, renovation of a military hospital was completed to accommodate transfer of the SARS patients from TMHH to the study hospital.

Ultimately, 150 individuals contracted SARS from one index case admitted to TMHH, including 113 patients and 37 HCWs.² To protect our HCWs and non-infected patients from contracting SARS, we introduced a new approach that we have named the 'integrated infection control strategy'. We assessed the effectiveness of the integrated infection control strategy by comparing the rate of SARS transmission in HCWs in the study hospital with that in other major hospitals in Taiwan without the integrated infection control strategy.

Methods

Description of the study hospital

The study was conducted between 27 April and 21 May 2003 in a 67-bed military hospital, with four

stories in a single building. For the purposes of this article, we refer to this hospital as the study hospital. The first floor is an admission office that has a special designated pathway which leads directly to the elevator. The second floor is restricted to patients that are ready to be discharged. The third floor is the designated ward for suspect cases, and the fourth floor is designated for probable or confirmed cases. Patients who advanced from suspect to probable cases were moved from the third to the fourth floor and vice versa.

Negative pressure isolation rooms (NPIRs) were not available in the study hospital given the urgency of the initial situation. A 'negative-pressure-like' environment was created in the study hospital as follows. All windows of the rooms facing due east (next to a residential building) were sealed air tight. All gaps at the bottom of the doors of patients' rooms (one patient per room) were sealed. Sixteen-inch exhaust fans were installed in patients' rooms facing due west to create a negative-pressure-like airflow within the rooms. The exits and staircases of each floor were sealed to prevent air interflow between floors. Four separate central air conditioning systems provided ducted air for each floor. Each ventilation system was set up to use a mixture of 50% fresh air taken from the outside and, as an economy measure, 50% air extracted from all areas of the hospital building within the same floor. All of the exhaust air to the west was blown outside to a 60×30 m restricted area, and N95 respirators were required for all personnel who entered this area. This approach was inspected by US Centers for Disease Control and Prevention (CDC) personnel and approved by the Taiwan Department of Health.

During the study period, 193 suspect and probable SARS cases were admitted to the study hospital. Eighty-five medical doctors (708 person×day), 203 nurses (1768 person×day) and 171

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