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Infection control influence of Middle East respiratory syndrome coronavirus: A hospital-based analysis

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Background: Middle East respiratory syndrome coronavirus (MERS-CoV) caused multiple outbreaks. Such outbreaks increase economic and infection control burdens. We studied the infection control influence of MERS-CoV using a hospital-based analysis.

Methods: Our hospital had 17 positive and 82 negative cases of MERS-CoV between April 1, 2013, and June 3, 2013. The study evaluated the impact of these cases on the use of gloves, surgical masks, N95 respirators, alcohol-based hand sanitizer, and soap, as well as hand hygiene compliance rates.

Results: During the study, the use of personal protective equipment during MERS-CoV compared with the period before MERS-CoV increased dramatically from 2,947.4 to 10,283.9 per 1,000 patient-days ($P<.0000001$) for surgical masks and from 22 to 232 per 1,000 patient-days ($P<.0000001$) for N95 masks. The use of alcohol-based hand sanitizer and soap showed a significant increase in utilized amount ($P<.0000001$). Hand hygiene compliance rates increased from 73% just before the occurrence of the first MERS case to 88% during MERS cases ($P=.0001$). The monthly added cost was $16,400 for included infection control items.

Conclusions: There was a significant increase in the utilization of surgical masks, respirators, soap and alcohol-based hand sanitizers. Such an increase is a challenge and adds cost to the healthcare system.
In the most recent updates by the World Health Organization, a total of 2,040 (31%) cases were healthcare facility–associated infections.\textsuperscript{14} In addition, initial MERS-CoV symptoms tend to be nonspecific and might not be noticed. Thus, adherence to standard precautions is a critical factor in the prevention of MERS-CoV transmission.\textsuperscript{14} This adherence, as well as the initial uncertainty about transmission routes early in the course of the disease, had resulted in widespread fear of MERS-CoV. It is known that application of standard infection control results in the termination of MERS-CoV outbreaks.\textsuperscript{2,4,15,16} Here, we showed a significant increase in the use of PPE (mainly surgical masks, respirators, alcohol-based hand sanitizer, and soap). There was a significant increase in the utilization of surgical masks and respirators during the study period. There are mixed recommendations for the care of patients with MERS-CoV with regard to placing patients in airborne isolation and thus the use of N95 respirators, droplet precautions, and surgical masks.\textsuperscript{7,15,17,18} The use of surgical masks was noted to increase significantly during the 2009 H1N1 influenza pandemic, with a reported 52% increase in use.\textsuperscript{19} This increase in the use of PPE is paralleled by an increase in cost. It is recommended that hospitals maintain an adequate supply of PPE for use during infectious disease outbreaks. In 1 study, it was calculated that 4 sets of PPE (N95 respirators, double gloves, gowns, and goggles) per day are needed for each healthcare worker in the high-risk group, and 2 sets of PPE are required for medium- and low-risk groups.\textsuperscript{19} Another implication for the increased use of PPE is the generation of medical waste, which we did not address in this study. In 1 simulation exercise, an additional 570 L of waste was generated per day.\textsuperscript{21}

We were not able to show a significant increase in hand hygiene practices despite the significant increase in utilization of alcohol-based hand sanitizers. This observation may be related to the fact that baseline hand hygiene was about 88% in the preceding months. However, the hand hygiene compliance...
rate dropped to 73% just before the occurrence of the first MERS case and then picked up to 88% ($P = .0001$). It has been shown that both observation and a multifaceted approach increase hand hygiene compliance, and that utilization of secret shoppers may give a false sense of the actual rates of hand hygiene compliance. Another possible explanation is that the utilized soap and hand sanitizer may have been used by patients and visitors.

Although the data are from 2013, which may be considered a limitation, they are still valid because this is the only study documenting the burden of this new virus on health infrastructure even though 5 years have elapsed since its emergence. Other limitations of the study include the fact that the presented data are small and represent only one non–Ministry of Health hospital, and it was not possible to use the data to draw conclusions regarding a national estimate of disease burden. There are multiple hospitals supervised by the Ministry of Health, in addition to other hospitals supervised by various institutions and the private sector.

**CONCLUSIONS**

There was a significant increase in the utilization of surgical masks, respirators, soap, and alcohol-based hand sanitizers during

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**Fig 2.** A run chart showing the utilization of alcohol-based hand sanitizers (solid line) and soap (dashed line) in the period before Middle East respiratory syndrome cases (May 2012 to March 2013) and during Middle East respiratory syndrome cases (April to July 2013).

**Fig 3.** A run chart showing hand hygiene compliance rates in the period before Middle East respiratory syndrome cases (May 2012 to March 2013) and during Middle East respiratory syndrome cases (April to July 2013). UCL, Upper Control Limits; LCL, lower control limits.
the study period. Such an increase is a challenge and adds cost to the healthcare system.

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