Poorly cleaned public cruise ship restrooms may predict norovirus outbreaks

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A team of researchers from Boston University School (BUSM), Carney Hospital, Cambridge Health Alliance and Tufts University School of Medicine, have found that widespread poor compliance with regular cleaning of public restrooms on cruise ships may predict subsequent norovirus infection outbreaks (NoVOs). This study, which appears in the November 1st issue of *Clinical Infectious Diseases,* is the first study of environmental hygiene on cruise ships.

Outbreaks of acute gastroenteritis (AGE) often occur in close populations, such as among cruise ship passengers. Recent epidemiologic investigations of outbreaks of AGE confirmed that 95 percent of cruise ship AGE outbreaks are caused by norovirus. Despite biannual sanitation monitoring and hand hygiene interventions among passengers and crew members, 66 ships monitored by the United States Centers for Disease Control and Prevention experienced NoV infection outbreaks (NoVOs) between 2003 and 2008.

Trained health care professionals evaluated the thoroughness of disinfection cleaning of six standardized objects (toilet seat, flush handle or button, toilet stall inner handhold, stall inner door handle, restroom inner door handle, and baby changing table surfaces) with high potential for fecal contamination in cruise ship public restrooms.

The researchers found only 37 percent of the 273 randomly selected public restrooms that were evaluated on 1,546 occasions were cleaned daily. The overall cleanliness of the six standardized surfaces on each

ship ranged from four to 100 percent. Although some objects in most restrooms were cleaned at least daily, on 275 occasions no objects in a restroom were cleaned for at least 24 hours.

Overall, the toilet seat was the best-cleaned object and the least thoroughly cleaned object was the baby changing table. Furthermore, 19 objects in 13 ships were not cleaned at all during the entire five-to-seven-day monitoring period. Toilet area handholds were largely neglected, accounting for more than half of the uncleaned objects on 11 ships. Although almost all standardized objects were assessed at the time of each evaluation, baby changing tables were not found in public restrooms on 79 percent of vessels. On three ships, none of the changing tables were cleaned during the study period. The thoroughness of cleaning did not differ by cruise line and did not correlate with Center for Disease Control and Prevention Vessel Sanitation Program inspection scores which averaged 97 out of a possible 100 points for the study vessels.

According to the researchers these findings are of particular note because five of the six evaluated objects could readily be directly contaminated by pathogens during regular use. "Although hand hygiene with soap after toileting may diminish the transmission of enteric pathogens via bathroom door knobs or pulls, hand washing is unlikely to mitigate the potential for any of the other toilet area contact surfaces to serve as a source of transmission of enteric pathogens," said lead author Philip Carling, MD, a professor of clinical medicine at BUSM. "Furthermore, there was a substantial potential for washed hands to become contaminated while the passenger was exiting the restroom, given that only 35 percent of restroom exit knobs or pulls were cleaned daily. Only disinfection cleaning by cruise ship staff can reasonably be expected to mitigate these risks," he added.

Although the thoroughness of disinfection cleaning was 30 percent on

more than half of the ships, near-perfect cleaning was documented on several vessels, providing evidence that a high level of environmental hygiene is achievable. "We believe that additional studies on the role of contaminated surfaces in cruise ship NoV transmission are warranted to determine whether improved environmental hygiene will decrease the incidence, duration, or severity of outbreaks," added Carling.

Source: Boston University Medical Center