

## RAPID REVIEW

# Risk of COVID-19 Transmission or Outbreaks Impacting Patients or Residents in Health Care Facilities

Date: 12/18/2020

## Key Findings

- Published outbreak reports of nosocomial COVID-19 transmission from infected health care workers (HCWs) to patients or residents in health care settings with HCW masking as source control are limited.
- Available evidence is insufficient to assess the role of universal masking in attenuating transmission risk between HCWs, patients/residents, and visitors in health care facilities.

## Scope

- The scope of this document is a rapid review of the risk of Coronavirus Disease 2019 (COVID-19) transmission events or outbreaks impacting patients or residents in health care settings. Hospitalized patients in acute or convalescent care facilities are in scope, as are residents of long-term care facilities. Also in scope are patients attending health care settings at high risk of infection transmission (e.g., hemodialysis units, infusion clinics, emergency departments). Residents of retirement homes or community-based assisted living facilities were considered out of scope for this rapid review. In addition, this rapid review does not include the acquisition of COVID-19 by HCWs at work.
- As part of this review, we aimed to explore evidence on the role of HCWs', patients', residents' or visitors' masking for source control in nosocomial COVID-19 transmission to patients.

## Background

- The use of non-medical masks by persons shedding infectious severe acute respiratory syndrome coronavirus 2 (the etiological agent of COVID-19) is likely beneficial in preventing the infected person from spreading their illness to others (source control). Mandatory public mask policies have been associated with a decrease in new COVID-19 cases compared to regions without such policies.<sup>1</sup> However, it is unclear if evidence at the population level can be applied at the individual level, and observations at the population level are not easily generalizable to health care settings.
- Several observational studies have proposed an association between universal masking with a surgical or procedure mask and attenuated transmission risk between HCWs, patients and/or visitors.<sup>2-4</sup> As the focus of these studies was on preventing acquisition of COVID-19 by HCWs

while at work, the extent of protection to patients offered by universal masking of HCWs is uncertain.

- In Ontario, all staff and essential visitors in long-term care homes have been required to wear surgical or procedure masks at all times since mid-April 2020 (except during breaks, when at least 2 metres distance from other staff must be maintained),<sup>5</sup> yet outbreaks of COVID-19 continue to occur. Between early June and early December 2020, the numbers of COVID-19 outbreaks reported in long-term care homes (which are relatively closed settings) and hospitals in Ontario have risen from 312 to 733 and 86 to 188, respectively.<sup>6,7</sup>
- In the Ministry of Health guidance for contact management for exposures in health care settings, patients within 2 metres of a HCW with COVID-19 for any duration of time were considered at low risk of exposure if the HCW was wearing a surgical or procedure mask.<sup>8</sup> The risk assessment guidance was updated on December 1, 2020 and patients may be considered at high risk of exposure even if the HCW was wearing a surgical or procedure mask, depending on the overall risk of the interaction, including whether the patient/resident was wearing a medical or non-medical mask.<sup>9</sup>
- The World Health Organization (WHO) also updated its guidance on universal masking in health care settings on December 1, 2020. Based on expert opinion, the WHO recommends wearing a medical or non-medical mask for inpatients when physical distance of at least 1 metre cannot be maintained or when outside of their care area, in areas where COVID-19 is known or suspected to be circulating in the community.<sup>10</sup>

## Methods

- In considering feasibility, scope, and a need for responsiveness, we chose a rapid review as an appropriate approach to examining the effectiveness of universal masking by HCWs in preventing nosocomial transmission of COVID-19 to patients and residents in hospital and long-term care settings. A rapid review is comprehensive but not exhaustive in scope.<sup>11</sup>
- On December 9, 2020, Public Health Ontario (PHO) Library Services developed and conducted a primary literature search in MEDLINE and the National Institutes of Health iSearch COVID-19 Portfolio (Appendix A). English-language peer-reviewed and non-peer-reviewed records that described nosocomial transmission of COVID-19 from health care workers to hospital inpatients and long-term care home residents were included. We reviewed citations from included studies to identify additional research. The search strategies are available upon request.
- Prior to posting, PHO subject matter experts review all Rapid Reviews.
- As the COVID-19 outbreak continues to evolve and the scientific evidence rapidly expands, the information provided in this document is only current as of the date of posting.

## Results

We found 11 reports documenting patient or resident exposure events in health care settings where universal masking of HCWs, patients and/or visitors as source control was in place for at least part of the study period. While an infected HCW was identified as the source of exposure in 6 reports,<sup>12-14</sup> transmission was detected in 3: one where only the HCW was masked,<sup>14</sup> one where the HCW was

masked in patient care areas only,<sup>13</sup> and one before universal masking policies for HCWs and patients were implemented.<sup>12</sup> In the other 3 reports that identify the source of exposure as an infected HCW, no transmission was detected.<sup>15-17</sup> Source of nosocomial COVID-19 infection was attributed to visitors in 2 reports,<sup>18,19</sup> and not explored in 3 reports.<sup>20-22</sup> None of these reports documented the extent of adherence to infection prevention and control measures such as personal protective equipment use, hand hygiene, equipment and environmental cleaning, or physical distancing. Also, the actual rates of nosocomial COVID-19 infection may be underreported as not all exposed contacts were tested.

## HCWs as Likely Source of Exposure

### TRANSMISSION NOTED

- In a prospective study to explore the risk of COVID-19 transmission to patients exposed to infected HCWs in a hospital in Boston, Massachusetts, 238 patients (253 exposures) were identified to have been exposed to 60 infected HCWs within 6 feet for at least 10 cumulative minutes from March 1 to June 10, 2020. Universal masking was implemented for HCWs on March 25 and for patients on April 6. Among these exposures, 166 occurred when only the HCW wore a mask and 87 occurred when neither the patient nor the HCW wore a mask. Baker et al. reported that 2 of the 92 exposed patients who were tested for COVID-19 were infected (1 of whom was also exposed to an infected household member). The only nosocomial transmission took place before universal masking policies for HCWs and patients were implemented.<sup>12</sup>
- Neu et al. reported nosocomial COVID-19 in two residents in a pediatric long-term care facility in New York in April 2020, despite universal masking policy for staff as of March 13. One resident had likely acquired the infection in early April 2020 from a HCW with COVID-19 before symptom onset, while the other resident was a roommate of the first case. Details on the nature of contact were not reported.<sup>14</sup>
- Yau et al. reported on a COVID-19 outbreak at a dialysis centre in April 2020 in Toronto, Ontario in which one of the two likely index cases was a HCW who spread the infection to multiple HCWs and dialysis patients, when universal masking policy for HCWs in patient care areas was in place. One element of the outbreak response included mandatory masking of HCWs throughout the facility, universal masking of patients, and universal Droplet and Contact Precautions for all dialysis patients.<sup>13</sup>

### NO TRANSMISSION NOTED

- Shea et al. reported no nosocomial transmission to 102 residents of two long-term care facilities in Hong Kong in March 2020, where a nurse with COVID-19 had provided routine nursing care for two days prior to symptom onset (details of the nature of contact not reported). The exposed residents were monitored for symptoms daily for 28 days after exposure and “most (n=102)” were tested for COVID-19 by reverse transcriptase polymerase chain reaction (RT-PCR) during the quarantine period. The infected nurse was wearing a surgical mask while on duty at the facility.<sup>16</sup>
- Saban et al. reported no transmission to 142 patients from an ophthalmologist with COVID-19, who had continued working at a retina clinic for 3 days while symptomatic. Amongst the 142 patient contacts, 71 (50%) were exposed while the ophthalmologist was symptomatic, and 33 (46.5%) of whom were wearing a mask during their visit. Surgical mask was only worn intermittently by the ophthalmologist on his last day of work prior to the diagnosis. However,

only 16/142 patient contacts were tested for COVID-19, including one who experienced symptoms.<sup>15</sup>

- Mponponsuo et al. reported on six patients exposed to two HCWs with COVID-19 for at least 15 minutes at less than 1 metre distance in Calgary between March 1 and April 15, 2020. Test results for COVID-19 were negative for 5/6 exposed patients while the sixth patient did not develop symptoms and was not tested. Both HCWs reported using surgical masks for all patient interactions.<sup>17</sup>

## Visitors as Likely Source of Transmission

### UNIVERSAL MASKING POLICIES IN PLACE

- Passarelli et al. reported that 6/150 asymptomatic visitors to a hospital in Spain tested positive for COVID-19 at a screening exercise one day, and two patient contacts developed symptoms on the following day and later tested positive for COVID-19. This was despite the hospital's universal masking policies that required all visitors and patients to wear cloth or surgical masks, and all HCWs to wear surgical masks. The authors stated that transmission from other patients or hospital staff could not be ruled out. Furthermore, consistency in mask use was not explored.<sup>18</sup>

### UNIVERSAL MASKING POLICIES NOT YET IMPLEMENTED

- Universal masking in a teaching hospital in Boston, Massachusetts started on March 25 for all HCWs and on April 6 for all visitors and patients. In a prospective study of 697 patients with COVID-19 admitted from March 7 to May 30, only one was thought to have acquired the infection during their hospitalization, likely from a presymptomatic spouse visiting before visitor restrictions and masking were implemented. In addition, Rhee et al. reported 11 COVID-19 infections identified on follow-up with 8,370 discharged patients hospitalized for non-COVID-19-related conditions through June 17, 2020. Only one of these 11 patients had received care from a HCW with COVID-19 but the patient's spouse had also tested positive for COVID-19 a week prior. Another patient diagnosed after discharge was considered likely nosocomial but no definitive exposure source was identified.<sup>19</sup>

## Source of Nosocomial Transmission not Identified

- Luong-Nguyen et al. reported on 15 possible nosocomial COVID-19 infections in 3 surgical departments for non-COVID-19 patients at a hospital in France between March 1 and April 5, 2020. To prevent further transmission, the hospital required visitors to wear masks on entry to the hospital as of March 18, started screening patients for COVID-19 on admission as of March 30, and required HCWs to wear surgical masks and gloves systematically (details and timing was not provided). The authors could not rule out presymptomatic infection at the time of admission (3/15 were diagnosed between 5 and 13 days of admission); or transmission from unrecognized asymptomatic infections in 2/15 patients, visiting caregivers (7 were later hospitalized for COVID-19), or infected HCWs (HCW screening was not required at that time).<sup>21</sup>
- Rampini et al. noted that some (exact number not given) patients were diagnosed with COVID-19 infection during their hospitalization at a university hospital in Zurich, Switzerland despite enhanced infection prevention measures including: universal surgical masking by hospital staff at all times on campus, eye protection when providing care within 2 metres of patients, and

requiring patients to wear surgical masks and perform hand hygiene on leaving their bed space. It is unclear to what extent these reflect late diagnosis of asymptomatic cases or nosocomial acquisition.<sup>20</sup>

- In a retrospective study, Lakhani et al. reported on nosocomial COVID-19 infections in 19 patients admitted between March 9 and May 4, 2020 to an orthopedic and traumatology department of a hospital in Spain. During that period, 8 members of the orthopedic team were diagnosed with COVID-19 as well. As 15/19 (78.9%) of cases occurred in March, the hospital stopped family visits as of March 16 and started to require all patients to wear surgical masks and be tested for COVID-19 on admission as of March 31. The authors believe these measures were beneficial in bringing the risk of nosocomial infection in the orthopedic department in line with that for the facility. Universal masking of HCWs was not mentioned in this report.<sup>22</sup>

## Conclusion

As transmission of COVID-19 can occur from infected persons approximately two days before symptoms appear,<sup>23</sup> wearing a surgical or procedure mask by HCWs at all times as a source control measure in health care settings has a role in reducing the risk of COVID-19 transmission to patients (and other HCWs).<sup>24</sup> However, there is some evidence nosocomial transmission continues to occur from infected HCWs despite their wearing surgical/procedure masks for source control. Available evidence assessing the extent of any additional protection that may be offered by masking patients/residents routinely is very limited. Further research is required to inform our understanding of the relative role contributed by specific infection prevention and control measures aimed at preventing COVID-19 transmission from HCWs to patients/residents, including but not limited to, universal masking of HCWs, visitors, patients. In the meantime, the risk of COVID-19 transmission to patients and residents in health care facilities should be assessed taking into consideration the nature and duration of the interaction, adherence to hand hygiene, and masking by the HCW and/or patient/resident.

## References

1. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Wearing masks in public and COVID-19 - what we know so far [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [cited 2020 Dec 10]. Available from: <https://www.publichealthontario.ca/-/media/documents/ncov/covid-wwksf/what-we-know-public-masks-apr-7-2020.pdf?la=en>
2. Suárez-García I, Martínez de Aramayona López MJ, Sáez Vicente A, Lobo Abascal P. SARS-CoV-2 infection among healthcare workers in a hospital in Madrid, Spain. *J Hosp Infect.* 2020;106(2):357-63. Available from: <https://doi.org/10.1016/j.jhin.2020.07.020>
3. Wang X, Ferro EG, Zhou G, Hashimoto D, Bhatt DL. Association between universal masking in a health care system and SARS-CoV-2 positivity among health care workers. *JAMA.* 2020;324(7):703-4. Available from: <https://doi.org/10.1001/jama.2020.12897>
4. Schwierzeck V, Correa-Martinez CL, Schneider KN, Mellmann A, Hennies MT, Hafezi W, et al. SARS-CoV-2 in the employees of a large university hospital. *Dtsch Arztebl Int.* 2020;117(19):344-5. Available from: <https://doi.org/10.3238/arztebl.2020.0344>
5. Ontario. Ministry of Health. Guidance for mask use in long-term care homes and retirement homes [Internet]. Version 1. Toronto, ON: Queen's Printer for Ontario; 2020 [modified 2020 Apr 01; cited 2020 Dec 10]. Available from: [http://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/2019\\_guidance\\_ltc\\_retirement\\_homes.pdf](http://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/2019_guidance_ltc_retirement_homes.pdf)
6. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Weekly epidemiologic summary: COVID-19 in Ontario - focus on November 22, 2020 to November 28, 2020 [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [cited 2020 Dec 10]. Available from: <https://www.publichealthontario.ca/-/media/documents/ncov/epi/covid-19-weekly-epi-summary-report.pdf?la=en>
7. Ontario Agency for Health Protection and Promotion (Public Health Ontario). Weekly epidemiologic summary: COVID-19 in Ontario: focus on May 31, 2020 to June 6, 2020 [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [cited 2020 Dec 14]. Available from: <https://www.publichealthontario.ca/-/media/documents/ncov/epi/2020/06/covid-19-weekly-epi-summary-report-june-6.pdf?la=en>
8. Ontario. Ministry of Health. Management of cases and contacts of COVID-19 in Ontario [Internet]. Version 9.1. Toronto, ON: Queen's Printer for Ontario; 2020 [modified 2020 Oct 09; cited 2020 Dec 08]. Available from: [https://c715071d-f9dd-43db-bfea-e0155fb1041c.filesusr.com/ugd/cf9c63\\_415b0c32d7dc4e9bb90c6001c742aa22.pdf](https://c715071d-f9dd-43db-bfea-e0155fb1041c.filesusr.com/ugd/cf9c63_415b0c32d7dc4e9bb90c6001c742aa22.pdf)
9. Ontario. Ministry of Health. Management of cases and contacts of COVID-19 in Ontario [Internet]. Version 10.0. Toronto, ON: Queen's Printer for Ontario; 2020 [modified 2020 Dec 01; cited 2020 Dec 06]. Available from: [http://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/contact\\_mngmt/management\\_cases\\_contacts.pdf](http://www.health.gov.on.ca/en/pro/programs/publichealth/coronavirus/docs/contact_mngmt/management_cases_contacts.pdf)

10. World Health Organization. Mask use in the context of COVID-19: interim guidance [Internet]. Geneva: World Health Organization; 2020 [cited 2020 Dec 03]. Available from: <https://apps.who.int/iris/rest/bitstreams/1319378/retrieve>
11. Khangura S, Konnyu K, Cushman R, Grimshaw J, Moher D. Evidence summaries: the evolution of a rapid review approach. *Syst Rev.* 2012;1:10. Available from: <https://doi.org/10.1186/2046-4053-1-10>
12. Baker MA, Fiumara K, Rhee C, Williams SA, Tucker R, Wickner P, et al. Low risk of coronavirus disease 2019 (COVID-19) among patients exposed to infected healthcare workers. *Clin Infect Dis.* 2020 Aug 28 [Epub ahead of print]. Available from: <https://doi.org/10.1093/cid/ciaa1269>
13. Yau K, Muller MP, Lin M, Siddiqui N, Neskovic S, Shokar G, et al. COVID-19 outbreak in an urban hemodialysis unit. *Am J Kidney Dis.* 2020;76(5):690-5.e1. Available from: <https://doi.org/10.1053/j.ajkd.2020.07.001>
14. Neu N, Nee M, Savitt J, Schneider Connelly L, Choi J, Mosiello L. COVID-19 in pediatric long-term care: how infection control and prevention practices minimized the impact of the pandemic on healthcare providers and residents. *J Pediatr Infect Dis Soc.* 2020;9(5):626-9. Available from: <https://doi.org/10.1093/jpids/piaa122>
15. Saban O, Levy J, Chowers I. Risk of SARS-CoV-2 transmission to medical staff and patients from an exposure to a COVID-19-positive ophthalmologist. *Graefes Arch Clin Exp Ophthalmol.* 2020;258(10):2271-4. Available from: <https://doi.org/10.1007/s00417-020-04790-w>
16. Shea YF, Lam HY, Yuen JKY, Cheng KCA, Chan TC, Mok WYW, et al. Maintaining zero coronavirus disease 2019 infection among long-term care facility residents in Hong Kong. *J Am Med Dir Assoc.* 2020;21(7):981-2. Available from: <https://doi.org/10.1016/j.jamda.2020.05.042>
17. Mponponsuo K, Kerkerian G, Somayaji R, Missaghi B, Vayalumkal JV, Larios OE, et al. Lack of nosocomial transmission to exposed inpatients and coworkers in an investigation of five SARS-CoV-2-infected healthcare workers. *Infect Control Hosp Epidemiol.* 2020 Aug 03 [Epub ahead of print]. Available from: <https://doi.org/10.1017/ice.2020.392>
18. Passarelli VC, Faico-Filho K, Moreira LVL, Cunha AP, Carvalho JMA, Barbosa GR, et al. Asymptomatic COVID-19 in hospital visitors: the underestimated potential of viral shedding. *Int J Infect Dis.* 2020;102:412-4. Available from: <https://doi.org/10.1016/j.ijid.2020.10.057>
19. Rhee C, Baker M, Vaidya V, Tucker R, Resnick A, Morris CA, et al. Incidence of nosocomial COVID-19 in patients hospitalized at a large US academic medical center. *JAMA Netw Open.* 2020;3(9):e2020498. Available from: <https://doi.org/10.1001/jamanetworkopen.2020.20498>
20. Rampini SK, Wolfensberger A, Sax H, Thienemann F. Preventing intrahospital transmission of COVID-19: experience from the University Hospital Zurich in Switzerland. *S Afr Med J.* 2020;110(8):709-10. Available from: <http://www.scielo.org.za/pdf/samj/v110n8/08.pdf>
21. Luong-Nguyen M, Hermand H, Abdalla S, Cabrit N, Hobeika C, Brouquet A, et al. Nosocomial infection with SARS-Cov-2 within departments of digestive surgery. *J Visc Surg.* 2020;157(3S1):S13-8. Available from: <https://doi.org/10.1016/j.jvisc Surg.2020.04.016>

22. Lakhani K, Minguell J, Guerra-Farfán E, Lara Y, Jambrina U, Pijoan J, et al. Nosocomial infection with SARS-CoV-2 and main outcomes after surgery within an orthopaedic surgery department in a tertiary trauma centre in Spain. *Int Orthop*. 2020;44(12):2505-13. Available from: <https://doi.org/10.1007/s00264-020-04798-1>
23. World Health Organization. Coronavirus disease (COVID-19): how is it transmitted? [Internet]. Geneva: World Health Organization; 2020 [cited 2020 Dec 10]. Available from: <https://www.who.int/news-room/q-a-detail/q-a-how-is-covid-19-transmitted>
24. Ontario Agency for Health Protection and Promotion (Public Health Ontario). COVID-19 - What we know so far about... the risks to health care workers [Internet]. Toronto, ON: Queen's Printer for Ontario; 2020 [cited 2020 Dec 09]. Available from: <https://www.publichealthontario.ca/-/media/documents/ncov/what-we-know-risks-feb-21-2020.pdf?la=en>

## Citation

Ontario Agency for Health Protection and Promotion (Public Health Ontario). Rapid review: risk of COVID-19 transmission or outbreaks impacting patients or residents in health care facilities. Toronto, ON: Queen's Printer for Ontario; 2020.

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Email: [EPIR@oahpp.ca](mailto:EPIR@oahpp.ca)

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