

EXECUTIVE SUMMARY

Evidence Review and Revised Recommendations for the Control of Vancomycin-Resistant Enterococci in All Ontario Health Care Facilities

March 2019

Background

Vancomycin-resistant enterococcal (VRE) infections are a serious threat to human health as they are associated with increased illnesses and deaths. The Provincial Infectious Diseases Advisory Committee (PIDAC) has recommended:

1. screening all persons on admission to health care facilities for VRE risk factors; testing for VRE if risk factors are present). (Risk-factor–based screening)
2. using Contact Precautions for those who test positive for VRE.

Since 2012, some facilities have discontinued these measures due to disagreements over their effectiveness. PIDAC has re-assessed the evidence for these measures in 2018 and revised its recommendations. (The full [Evidence Review](#) is available from the Public Health Ontario website.)

Key Messages

- The risk of VRE spreading in health care facilities is higher when asymptomatic carriage of VRE is not identified.
- Risk-factor–based VRE screening on admission identifies far more asymptomatic carriage than reliance on clinical cultures.
- In facilities where VRE is constantly present, risk-factor–based screening on admission and Contact Precautions (as part of the control measures) are effective strategies to reduce transmission.
- Long-term care homes can be places that harbour VRE.
- The number of patients with VRE bloodstream infection is rising faster at those hospitals that stopped screening on admission and Contact Precautions for VRE than at hospitals that did not.
- PIDAC recommends that all acute care and chronic care hospitals and long-term care homes continue to perform VRE risk-factor–based screening on admission and Contact Precautions for those who test positive for VRE.
- Health care facilities should ensure patients and residents on Contact Precautions receive the same high quality care provided to patients not on Contact Precautions.
- Periodic re-assessment should be performed where screening on admission is not performed for certain acute care units due to low numbers of asymptomatic carriage of VRE, especially if VRE spread or infection is recognized in that unit.

Results of Evidence Review

1. Effectiveness of screening on admission and Contact Precautions for VRE

- 31 studies were reviewed (Canada, 4;¹⁻⁴ US, 19;⁵⁻²³ Europe, 4;²⁴⁻²⁷ Australia, 1;²⁸ Asia, 3²⁹⁻³¹).
- For outbreak control, screening on admission and Contact Precautions for VRE could reduce VRE spread [13 reports: 183 hospitals,^{8,9,17,24,27,29,30} 8 intensive care units (ICU),^{14,20,21,26,28,31} 2 nurseries²⁸].
- In facilities where VRE is constantly present, screening on admission and Contact Precautions for VRE could reduce VRE cases (6 studies: 184 hospitals,^{10,18,19,30} 2 ICUs,²³ 40 long-term care homes^{16,18}). However, 1 study (18 ICUs) did not find screening on admission effective at limiting VRE spread within ICUs,¹³ and 1 study did not directly investigate the effectiveness of screening on admission and Contact Precautions for VRE.²⁵
- In acute care hospitals, screening on admission could reduce the slope of increase of VRE bloodstream infections; discontinuing screening on admission and Contact Precautions for VRE would result in an increase in VRE cases (1 study: 118 Ontario hospitals).²
- Inconsistent impact of discontinuing screening on admission and Contact Precautions for VRE was reported in another 11 studies (13 hospitals,^{1,3-7,11,15,22,32} 1 ICU¹²).

1a. Regional or provincial approach to VRE control

- 3 studies were reviewed (US, 2;^{18,33} Asia, 1³⁰).
- A regional approach to VRE control was effective in reducing VRE cases in an entire region (2 studies: 181 hospitals,^{18,30} 28 long-term care homes¹⁸).
- Increased VRE cases at one or more hospitals may negatively impact VRE control at other regional hospitals, and use of effective VRE controls at all facilities would yield a large benefit for VRE control (1 mathematical modelling study).³³

1b. Impact of VRE control in long-term care homes on regional acute care hospitals

- 2 US studies (4 hospitals,¹⁸ 28 long-term care homes,¹⁸ 1 mathematical modelling³³) were reviewed.
- Increasing VRE cases in an interconnected facility would impact the number of VRE cases at other facilities within a network (mathematical modelling).³³
- Reducing VRE spread and number of cases in long-term care homes may reduce spread at acute care hospitals (4 hospitals, 28 long-term care homes).¹⁸

2. Harms associated with an increased number of VRE asymptomatic carriage or infection

- 3 systematic reviews³⁴⁻³⁶ (32 studies) and 1 additional study³⁷ were reviewed (Canada, 2; US, 23; Europe, 3; Australia, 2; Asia, 2; South America, 1).
- VRE bloodstream infections occur mainly in hospitals that care for patients at high risk of infectious complications of VRE (e.g., teaching hospitals, ICUs) and in patient populations at high risk of infectious complications of VRE (e.g., patients with hematological malignancy, bone marrow transplant, solid organ transplant) (1 study: all 219 Ontario hospitals).³⁷

- VRE bloodstream infection may be associated with 1.8 to 2.6 times more deaths [27 studies: 1,421 VRE bloodstream infection, 3,447 vancomycin-sensitive enterococcal (VSE) bloodstream infection]³⁴⁻³⁶ and a longer length of stay than bloodstream infection of VSE (18 studies: 986 VRE bloodstream infection, 2,724 VSE bloodstream infection).^{34,36} These may be overestimates due to flaws in the study design.

3. Harms of Contact Precautions

- 22 studies were reviewed (Canada, 3;³⁸⁻⁴⁰ US, 11;^{12,41-50} Europe, 7;⁵¹⁻⁵⁷ Asia, 1⁵⁸). No data were found from long-term care homes.
- Important harms (e.g., increased depression and anxiety scores, reduced contact with health care providers, falls, pressure ulcers, electrolyte imbalances) have been associated with Contact Precautions (19 studies: 5,970 patients on Contact Precautions for various reasons, 32,311 patients not on Contact Precautions, 75 caregivers).^{12,38-45,47,48,50-53,55-58} Due to design flaws, it is unclear if Contact Precautions result in harm, or if patients with VRE are more likely to have these outcomes for other reasons.
- No difference in patient satisfaction was observed (8 studies: 825 patients on Contact Precautions, 873 patients not on Contact Precautions, 70 caregivers).^{38,39,46,47,49-51,54}
- No data on mortality associated with Contact Precautions were identified.

4. Cost-effectiveness of screening on admission and Contact Precautions for VRE

- 4 studies (Canada, 1;¹ US, 3⁵⁹⁻⁶¹) and 1 cost-effectiveness analysis were reviewed.
- Screening on admission for VRE is considered cost-effective in 3 studies (4 tertiary care hospitals).⁵⁹⁻⁶¹ Another study found screening on admission limited to hospital wards that provide care primarily to patients at high risk of infectious complications from VRE are more cost-effective than hospital-wide screening on admission.¹
- In a cost-effectiveness model, implementing risk-factor–based VRE screening and Contact Precautions was shown to be highly cost effective. This PHO-affiliated study was submitted for publication in a peer-review journal in February 2019.⁶² This result is considered highly cost-effective as current standards suggest that health care interventions that cost less than \$50,000 to \$100,000 dollars per year of life in perfect health added should be considered cost-effective.⁶³
- No cost-effectiveness data were identified for lower risk community hospitals, long-term care homes, and regional VRE control programs.

Limitations

Most of the evidence evaluating whether screening on admission and Contact Precautions can stop the spread of VRE is of limited quality and is focused on acute care hospitals and high-risk patient populations. This includes studies that suggest screening on admission and Contact Precautions may be effective and studies that suggested screening on admission and Contact Precautions may not be effective.

Despite the limited quality of the evidence, the majority of studies do suggest that screening on admission and Contact Precautions are effective at stopping the spread of VRE. Also, the one study that included all Ontario acute care hospitals showed that the number of patients with VRE bloodstream infection is rising faster at those hospitals that stopped screening on admission and Contact Precautions than at hospitals that did not stop.² Since that study was completed, the number of patients with VRE bacteremia has continued to increase rapidly in Ontario.

Higher quality studies on the effectiveness and cost-effectiveness of screening for VRE on admission, and more studies from the long-term care home setting as well as at the regional or provincial level are needed to better inform VRE control programs in Ontario. In the meantime, the best available evidence suggests that risk-factor–based screening on admission and Contact Precautions are important interventions to reduce the spread of VRE and reduce the harm associated with VRE.

Research Questions and Research Methods

In addressing the four topics above, Public Health Ontario reviewed relevant evidence published since the 2012 PIDAC literature review and results of Public Health Ontario’s five-year [research program on VRE](#). For details on the methodology, please refer to the PIDAC document: [*Evidence Review and Revised Recommendations for the Control of Vancomycin-Resistant Enterococci in All Ontario Health Care Facilities*](#).

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