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CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Screening for Vancomycin-Resistant Enterococci in Patients Admitted to Hospital: Clinical Effectiveness, Cost-Effectiveness, and Guidelines

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About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

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Questions or requests for information about this report can be directed to **requests@cadth.ca**

Research Questions

1. What is the clinical effectiveness of selective screening versus universal screening or no screening of vancomycin-resistant enterococci in patients admitted to hospital?
2. What is the cost-effectiveness of selective screening versus universal screening or no screening of vancomycin-resistant enterococci in patients admitted to hospital?
3. What are the evidence-based guidelines regarding screening of vancomycin-resistant enterococci in patients admitted to hospital?

Key Findings

One health technology assessment, two non-randomized studies, and one economic evaluation were identified regarding the selective screening versus universal screening or no screening of vancomycin-resistant enterococci in patients admitted to hospital. In addition, two evidence-based guidelines were identified regarding the screening of vancomycin-resistant enterococci in patients admitted to hospital. No systematic reviews, meta-analyses, or randomized controlled trials were identified.

Methods

A limited literature search was conducted by an information specialist on key resources including PubMed, the Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were vancomycin-resistant enterococci and screening. No search filters were applied to limit retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2013 and July 9, 2019. Internet links were provided, where available.

Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Q1 & Q2: Patients in intensive care, oncology, and transplant units Q3: Any patient admitted to hospital
Intervention	Q1 & Q2: Selective screening (i.e., screening in ICU, oncology, or transplant patients) Q3: Screening patients with suspected VRE infection or colonization
Comparator	Q1 & Q2: Universal screening (i.e., screening any patient admitted to hospital); no screening Q3: No comparator
Outcomes	Q1: Clinical effectiveness (transmission of VRE, mortality, morbidity) Q2: Cost-effectiveness Q3: Evidence-based guidelines
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, economic evaluations, evidence-based guidelines

ICU = intensive care unit; VRE = vancomycin-resistant enterococci

Results

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines.

One health technology assessment, two non-randomized studies, and one economic evaluation were identified regarding the selective screening versus universal screening or no screening of vancomycin-resistant enterococci (VRE) in patients admitted to hospital. In addition, two evidence-based guidelines were identified regarding the screening of VRE in patients admitted to hospital. No relevant systematic reviews, meta-analyses, or randomized controlled trials were identified.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

One health technology assessment,[1] two non-randomized studies,[2,3] and one economic evaluation[4] were identified regarding the selective screening versus universal screening or no screening of VRE in patients admitted to hospital. Detailed study characteristics are provided in Table 2.

The authors of the identified health technology assessment aimed to compare the clinical effects of universal, targeted, and no screening for several antibiotic-resistant organisms, including VRE.[1] They found four systematic reviews and clinical practice guidelines that demonstrated better clinical outcomes in hospitals with a screening program and recommended admission screening for high-risk patients.[1]

The authors of one non-randomized study found no significant difference in the incidence of VRE bacteremia following the discontinuation of VRE surveillance and contact precautions.[2] Similarly, the authors of another non-randomized study found no increase in VRE bacteremia and a reduced number of patients requiring VRE isolation following the shift from routine screening to selective screening.[3]

The authors of the identified economic evaluation found that significant increases in attributable hospitalization cost and length of stay when comparing patients with VRE colonization or infection to patients without VRE.[4] They concluded that these factors should be considered before de-escalation of screening programs.[4] In addition, Public Health Ontario concluded in its guidelines evidence assessment that admission screening is cost-effective in large acute care hospitals.[5]

Two evidence-based guidelines were identified regarding the screening of VRE in patients admitted to hospital.[5,6] Public Health Ontario recommends risk-factor-based screening at the time of admission.[5] Kidney Health Australia recommends against routine screening in hemodialysis units.[6]

Table 2: Characteristics of Included Literature

First Author, Year	Study Characteristics	Interventions and Comparators	Outcomes	Conclusions
Health Technology Assessments				
Bond, 2014[1]	• Systematic literature search regarding clinical effects of screening strategies for several AROs in hospital setting • Two systematic reviews and two CPGs were relevant to VRE screening	• Universal screening • Selective screening • No screening	Several outcomes, including incidence of VRE bacteremia	• Surveillance culture can be effective in decreasing colonization or infection rates • Higher incidence of VRE bacteremia in hospital without active screening versus hospital with screening • Current guidelines recommend admission screening of high-risk patients
Non-Randomized Studies				
Almyroudis, 2016[2]	• Hematology-oncology unit inpatients • Prospective cohort study • Two three-year time periods	• Active surveillance and contact precautions • Discontinuation of systematic surveillance	Several outcomes, including incidence of VRE bacteremia	No significant difference in VRE bacteremia following discontinuation of surveillance
Bryce, 2015[3]	• Hospital inpatients • Prospective study	• Routine screening • Selective screening of intensive care, burns-trauma, solid organ transplant, and bone marrow transplant units	Several outcomes, including: • Incidence of VRE bacteremia • Number of patients requiring VRE isolation	• No increase in VRE bacteremia after discontinuation of routine screening • Reduced number of patients requiring VRE isolation in all areas of hospital after discontinuation of routine screening

First Author, Year	Study Characteristics	Interventions and Comparators	Outcomes	Conclusions
Economic Evaluations				
Lloyd-Smith, 2013[4]	• N = 1292 • Acute care hospital inpatients	• Patients with VRE colonization or infection • Patients without VRE	• Attributable hospitalization cost of VRE case per patient • Attributable LOS of VRE case	Significant increases due to presence of VRE, which should be considered before de-escalation of hospital VRE control program

ARO = antibiotic resistant organism; CPG = clinical practice guideline; LOS = length of stay; VRE = vancomycin-resistant enterococci

References Summarized

Health Technology Assessments

1. Bond K, Tjosvold L, Harstall C. Effectiveness of screening for endemic antibiotic resistant organisms (AROs) in hospital settings: summary of systematic reviews, primary studies, and evidence-based guidelines. Canadian Consensus Development Conference on Surveillance and Screening for AROs. Edmonton (AB): Institute of Health Economics (IHE); 2014: https://www.ihe.ca/advanced-search/effectiveness-of-screening-for-endemic-antibiotic-resistant-organisms-aros-in-hospital-settings. Accessed 2019 Jul 16.

Systematic Reviews and Meta-analyses

No literature identified.

Randomized Controlled Trials

No literature identified.

Non-Randomized Studies

2. Almyroudis NG, Osawa R, Samonis G, et al. Discontinuation of systematic surveillance and contact precautions for vancomycin-resistant enterococcus (VRE) and its impact on the incidence of VRE faecium bacteremia in patients with hematologic malignancies. *Infect Control Hosp Epidemiol*. 2016 Apr;37(4):398-403. PubMed: PM26750087

3. Bryce E, Grant J, Scharf S, et al. Horizontal infection prevention measures and a risk-managed approach to vancomycin-resistant enterococci: an evaluation. *Am J Infect Control*. 2015 Nov;43(11):1238-1243. PubMed: PM26190379

Economic Evaluations

4. Lloyd-Smith P, Younger J, Lloyd-Smith E, Green H, Leung V, Romney MG. Economic analysis of vancomycin-resistant enterococci at a Canadian hospital: assessing attributable cost and length of stay. *J Hosp Infect*. 2013 Sep;85(1):54-59. PubMed: PM23920443

Guidelines and Recommendations

5. Ontario Agency for Health Protection and Promotion (Public Health Ontario), Provincial Infectious Diseases Advisory Committee. Evidence review and revised recommendations for the control of vancomycin-resistant enterococci in all Ontario health care facilities. Toronto (ON): Queen's Printer for Ontario; 2019: https://www.publichealthontario.ca/-/media/documents/recommendations-vre.pdf?la=en. Accessed 2019 Jul 16.
See: Sections 1.10 and 4.4

6. Kidney Health Australia. Infection control for haemodialysis units. (*CARI Guidelines*). KHA-CARI Guidelines Office, Centre for Kidney Research, Kids Research Institute Children's Hospital at Westmead: Westmead (AU); 2017 Nov: http://www.cari.org.au/Dialysis/dialysis%20infection%20control/Harmonised%20ID%20Guideline_FINAL_short.pdf. Accessed 2019 Jul 16.
See: Recommendation 2I

Appendix — Further Information

Previous CADTH Reports

7. Universal screening for antibiotic-resistant organisms: a review of the clinical and cost-effectiveness. (*Rapid response report: summary with critical appraisal*). Ottawa (ON): CADTH; 2015 Oct. https://www.cadth.ca/sites/default/files/pdf/htis/oct-2015/RC0709%20Universal%20Screening%20Strategy%20for%20AROs%20Final.pdf Accessed 2019 Jul 16.

8. Vancomycin-resistant enterococci isolation and screening strategies: clinical evidence and cost-effectiveness. (*Rapid response report: reference list*). Ottawa (ON): CADTH; 2014 Mar: https://www.cadth.ca/media/pdf/htis/mar-2014/RA0662%20VRE%20Screening%20final.pdf. Accessed 2019 Jul 16.

9. Ho C, Lau A, Cimon K, Farrah K, Gardam M. Screening, isolation, and decolonization strategies for vancomycin-resistant enterococci or extended spectrum beta-lactamase-producing organisms: a systematic review of the clinical evidence and health services impact. (*Rapid response report: systematic review*). Ottawa (ON): CADTH; 2012 Sep: https://www.cadth.ca/sites/default/files/pdf/htis/sept-2012/RE0028_VREReport_e.pdf. Accessed 2019 Jul 16.

Randomized Controlled Trials – Alternative Comparators

10. Derde LPG, Cooper BS, Goossens H, et al. Interventions to reduce colonisation and transmission of antimicrobial-resistant bacteria in intensive care units: an interrupted time series study and cluster randomised trial. *Lancet Infect Dis*. 2014 Jan;14(1):31-39.
PubMed: PM24161233

Non-Randomized Studies

Alternative Comparators

11. Linfield RY, Campeau S, Injean P, et al. Practical methods for effective vancomycin-resistant enterococci (VRE) surveillance: experience in a liver transplant surgical intensive care unit. *Infect Control Hosp Epidemiol*. 2018 Oct;39(10):1178-1182.
PubMed: PM30178725

12. Kampmeier S, Knaack D, Kossow A, et al. Weekly screening supports terminating nosocomial transmissions of vancomycin-resistant enterococci on an oncologic ward - a retrospective analysis. *Antimicrob Resist Infect Control*. 2017;6:48.
PubMed: PM28515904

Alternative Populations

13. Munigala S, McMullen KM, Russo AJ, et al. Reinstatement of reflex testing of stool samples for vancomycin-resistant enterococci (VRE) resulted in decreased incidence of hospital-associated VRE. *Infect Control Hosp Epidemiol*. 2017 May;38(5):619-621. PubMed: PM28219459

14. Popiel KY, Miller MA. Evaluation of vancomycin-resistant enterococci (VRE)-associated morbidity following relaxation of VRE screening and isolation precautions in a tertiary care hospital. *Infect Control Hosp Epidemiol*. 2014 Jul;35(7):818-825. PubMed: PM24915209

Economic Evaluations – Population Unclear

15. Ulu-Kilic A, Ozhan E, Altun D, Percin D, Gunes T, Alp E. Is it worth screening for vancomycin-resistant Enterococcus faecium colonization?: Financial burden of screening in a developing country. *Am J Infect Control*. 2016 Apr 1;44(4):e45-49. PubMed: PM26775930

16. Bodily M, McMullen KM, Russo AJ, Kittur ND, Hoppe-Bauer J, Warren DK. Discontinuation of reflex testing of stool samples for vancomycin-resistant enterococci resulted in increased prevalence. *Infect Control Hosp Epidemiol*. 2013 Aug;34(8):838-840.
PubMed: PM23838226

Guidelines and Recommendations

17. Department of Health and Community Services, Disease Control Division. Guidelines for management of antimicrobial resistant organisms across the continuum of care. St. John's (NL): Government of Newfoundland and Labrador; 2019 Jun: https://www.health.gov.nl.ca/health/publichealth/cdc/infectioncontrol/aro_policy_2019.pdf. Accessed 2019 Jul 16.
See: Screening, page 7

18. Winnipeg Regional Health Authority. Vancomycin resistant enterococci (VRE). VRE disease specific protocol. Infection prevention and control manual. Winnipeg (MB): WRHA; 2018 Mar: http://www.wrha.mb.ca/extranet/ipc/files/VancomycinResistantEnterococci-VRE.pdf. Accessed 2019 Jul 16.

19. Infection Control Service, Communicable Disease Control Branch. Clinical guideline for the management of patients with vancomycin-resistant enterococci (VRE). Adelaide (AU): Department for Health and Ageing, Government of South Australia; 2017 Mar: https://www.sahealth.sa.gov.au/wps/wcm/connect/e7b306004023a72496fcbfd30eb2c8cd/Management+of+patients+with+Vancomycin-resistant+Enterococci+%28VRE%29+Clinical+Guideline_10.05.2017.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-e7b306004023a72496fcbfd30eb2c8cd-mHVeAz8. Accessed 2019 Jul 16.
See: Appendix 1

20. Dunn H, Hartley J, Brekle B. Microbiological screening of patients on admission (including MRSA). London (GB): Great Ormond Street Hospital for Children; 2014 Dec: https://www.gosh.nhs.uk/health-professionals/clinical-guidelines/microbiological-screening-patients-admission-including-mrsa. Accessed 2019 Jul 16.

21. Winnipeg Regional Health Authority. WRHA Infection Prevention and Control Program. Admission screening for antibiotic resistant organisms (AROs): methicillin resistant staphylococcus aureus (MRSA) and vancomycin resistant enterococci (VRE). Acute care infection prevention and control manual. Winnipeg (MB): WRHA; 2014 Jul: http://www.wrha.mb.ca/extranet/ipc/files/manuals/acutecare/files/3.AdmissionsScreeningforMRSAandVREODFinal.pdf. Accessed 2019 Jul 16.

Review Articles

22. Humphreys H. Controlling the spread of vancomycin-resistant enterococci. Is active screening worthwhile? *J Hosp Infect*. 2014 Dec;88(4):191-198. PubMed: PM25310998

Additional References

23. Escaut L, Bouam S, Frank-Soltysiak M, et al. Eradication of an outbreak of vancomycin-resistant enterococcus (VRE): the cost of a failure in the systematic screening. *Antimicrob Resist Infect Control.* 2013 Jun 6;2(1):18. PubMed: PM23738672