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CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Natriuretic Peptide Testing for Perioperative Risk Assessment: 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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Research Questions

1. What is the clinical utility of natriuretic peptide testing for perioperative cardiac risk assessment?
2. What is the cost-effectiveness of natriuretic peptide testing for perioperative cardiac risk assessment?
3. What are the guidelines for natriuretic peptide testing for perioperative cardiac risk assessment?

Key Findings

One systematic review (with meta-analysis), one non-randomized study and one evidence-based guideline were found regarding natriuretic peptide testing for perioperative cardiac risk assessment.

Methods

A limited literature search was conducted by an information specialist on key resources including PubMed, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of 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 natriuretic peptide testing and perioperative cardiac risk. For a narrow search, no filters were applied to limit the retrieval by study type. For a broad search, search filters were applied to limit retrieval to health technology assessments, systematic reviews, meta-analyses, or network meta-analyses, randomized controlled trials or controlled clinical trials, economic studies and guidelines. The search was also limited to English language documents published between January 1, 2014 and July 17, 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	Patients of all ages in need of perioperative risk assessment
Intervention	Natriuretic peptide testing (BNP/NT-proBNP blood tests) with/without additional diagnostic test(s)
Comparator	Q1 & 2: No natriuretic peptide testing; Other prognostic testing (cardiac troponin T test, echocardiography); Natriuretic peptide testing in addition to another diagnostic test Q3: Not applicable
Outcomes	Q1: Clinical utility (e.g., changes to therapy) Q2: Cost-effectiveness Q3: Guidelines
Study Designs	Health technology assessments, systematic reviews, randomized-controlled trials, non-randomized studies, economic evaluations and evidence-based guidelines

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 systematic review (with meta-analysis)[1], one non-randomized study[2] and one evidence-based guideline[3] were identified regarding natriuretic peptide testing for perioperative cardiac risk assessment. No relevant health technology assessments, systematic reviews, meta-analyses and randomized controlled trials and economic evaluations were identified in the search.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

One systematic review (SR) (with meta-analysis)[1], one non-randomized study (NRS)[2] and one evidence-based guideline[3] were identified regarding natriuretic peptide (NP) testing for perioperative cardiac risk assessment.

The identified SR[1] evaluated whether perioperative NP testing would predict post-operative major adverse cardiac events. The SR included 24 eligible articles and concluded that perioperative NP testing had reasonable accuracy and could be useful in perioperative risk stratification and predicting post-operative major adverse cardiac events.[1]

Secondly, the NRS[2] examined whether plasma brain NP levels and early morbidity were associated with patients undergoing coronary artery bypass. Twenty-two patients undergoing coronary artery bypass surgery were included in the study with pre-operative plasma brain NP levels compared to postoperative morbidity findings. Overall, the researchers concluded that preoperative plasma brain NP levels level were a reliable indicator for early postoperative morbidity in patients undergoing coronary artery bypass.

Finally, the identified guideline[3] by the American College of Cardiology/American Health Association Task Force states that biomarkers may be a helpful tool to predict post-operative morbidity although data is limited as to whether targeting these biomarkers for treatment will reduce post-operative risk.

References Summarized

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

1. Young YR, Sheu BF, Li WC, et al. Predictive value of plasma brain natriuretic peptide for postoperative cardiac complications--a systemic review and meta-analysis. *J Crit Care*. 2014 Aug;29(4):696.e691-610. PubMed: PM24793659

Randomized Controlled Trials

No literature identified.

Non-Randomized Studies

2. Avsar MK, Yaliniz H. Preoperative Serum NT-proBNP levels; Can it be a Clue About Postoperative Clinical Outcome of Patients Undergoing to Coronary Artery Bypass Surgery? *J Cardiol & Cardiovasc Ther* 2016; 1(5)1-6. https://pdfs.semanticscholar.org/e4f3/cb7e1106876de3ef7ad8d5b0a6eb40c0a9f0.pdf

Economic Evaluations

No literature identified.

Guidelines and Recommendations

3. Fleisher LA, Fleischmann KE, Auerbach AD, et al. 2014 ACC/AHA guideline on perioperative cardiovascular evaluation and management of patients undergoing noncardiac surgery: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. *Circulation*. 2014 Dec 9;130(24):e278-333. https://www.ahajournals.org/doi/10.1161/CIR.0000000000000106

   See: Section 2: Clinical Risk Factors

Appendix — Further Information

Health Technology Assessments

Perioperative Setting Not Specified

4. Pufulete M, Maishman R, Dabner L, et al. Effectiveness and cost-effectiveness of serum B-type natriuretic peptide testing and monitoring in patients with heart failure in primary and secondary care: an evidence synthesis, cohort study and cost-effectiveness model. *Health Technol Assess* 2017;21(40); https://www.journalslibrary.nihr.ac.uk/hta/hta21400/#/abstract

Non-Randomized Studies

Perioperative Setting Not Specified

5. Youssef H, Collantes E, Hunter J, et al. Preoperative and Postoperative N-terminal Pro B-type Natriuretic Peptide Levels Predict Cardiac Morbidity and Mortality in Patients Undergoing Colorectal Cancer Resection. *J Colon Rectal Cancer*. 2019;1(3):1-9. https://openaccesspub.org/jcrc/article/948

Evidence-Based Guidelines

Perioperative Setting Not Specified

6. National Institute in Health and Care Excellence. Chronic heart failure in adults: diagnosis and management*. (NICE guideline NG106);* 2018: https://www.nice.org.uk/guidance/ng106/resources/chronic-heart-failure-in-adults-diagnosis-and-management-pdf-66141541311685 Accessed 2019 Jul 29

7. Ezekowitz JA. O'Meara E, McDonald MA, et al. 2017 Comprehensive Update of the Canadian Cardiovascular Society Guidelines for the Management of Heart Failure. *Can J Cardiol*. 2017 Nov;33(11):1342-1433. https://www.onlinecjc.ca/article/S0828-282X(17)30973-X/pdf

8. Scottish Intercollegiate Guidelines Network. Management of chronic heart failure: a national clinical guideline. *(SIGN 147);* 2016; https://www.sign.ac.uk/assets/sign147.pdf Accessed 2019 Jul 29

9. Moe GW, Ezekowitz JA, O'Meara E, et al. The 2014 Canadian Cardiovascular Society Heart Failure Management Guidelines Focus Update: Anemia, Biomarkers, and Recent Therapeutic Trial Implications. *Can J Cardiol*. 2015 Jan;31:3-16. https://www.onlinecjc.ca/article/S0828-282X(14)01492-5/pdf

10. National Institute in Health and Care Excellence. Acute heart failure: diagnosis and management. *(NICE Clinical guideline CG187).* 2014; https://www.nice.org.uk/guidance/cg187/resources/acute-heart-failure-diagnosis-and-management-pdf-35109817738693 Accessed 2019 Jul 29

11. Klings ES, Machado RF, Barst RJ, et al. An Official American Thoracic Society Clinical Practice Guideline: Diagnosis, Risk Stratification, and Management of Pulmonary Hypertension of Sickle Cell Disease. *Am J Respir Crit Care Med*. 2014 Mar 15;189(6):727-40; http://www.thoracic.org/statements/resources/pvd/sickle-cell-disease.pdf

Clinical Practice Guidelines – Methodology Not Specified

12. Guidelines & Protocols Advisory Committee. Chronic heart failure – diagnosis and management. Victoria (BC): BCGuidelines.ca; 2015; https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/bc-guidelines/heart-failure-chronic Accessed 2019 Jul 29

Review Articles

13. Soussi S, Chatti K, Mebazaa A. Management of perioperative heart failure. *Curr Opin Anesthesiol.* 2014, 27:140–145. https://sfai.se/wp-content/uploads/2018/05/Management_of_perioperative_heart_failure.5.pdf

Additional References

14. Cantinotti M, Walters HL, Crocetti M, Marotta M, Murzi B, Clerico A. BNP in children with congenital cardiac disease: is there now sufficient evidence for its routine use? *Cardiol Young*. 2015 Mar;25(3):424-437. PubMed: PM25601330

15. Ma J, Xin Q, Wang X, Gao M, Wang Y, Liu J. Prediction of Perioperative Cardiac Events through Preoperative NT-pro-BNP and cTnI after Emergent Non-Cardiac Surgery in Elderly Patients. *PLoS ONE. 2015;*10(3): e0121306 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0121306

16. Shang C. B-type natriuretic peptide-guided therapy for perioperative medicine? *Open heart*. 2014;1(1):e000105. PubMed: PM25332815

17. Wayne Causey M, Singh N. Clinical implications of B-type natriuretic peptide and N-terminal pro--B-type natriuretic peptide in the care of the vascular surgery patient. *Semin Vasc Surg*. 2014 Dec;27(3-4):143-147. PubMed: PM26073822