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CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Natriuretic Peptide testing for Monitoring of Oncology Therapy: Clinical Utility, 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 monitoring of cardiotoxicity of oncology therapy?
2. What is the cost-effectiveness of natriuretic peptide testing for monitoring cardiotoxicity of oncology therapy?
3. What are the guidelines for natriuretic peptide testing for monitoring cardiotoxicity of oncology therapy?

Key Findings

Nine non-randomized studies were identified regarding the clinical utility of natriuretic peptide testing for monitoring of cardiotoxicity of oncology therapy. In addition, two evidence-based guidelines were identified regarding natriuretic peptide testing for monitoring cardiotoxicity of oncology therapy. No relevant economic evaluations were identified.

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, cardiotoxicology and oncology treatments. No filters were applied to limit the retrieval by study type. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between Jan 1, 2014 and July 25, 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 monitoring of cardiotoxicity of oncology therapy
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) Q3: No comparators
Outcomes	Q1: Clinical utility (e.g., changes to therapy) 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

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.

Nine non-randomized studies[1-9] were identified regarding the clinical utility of natriuretic peptide testing for monitoring of cardiotoxicity of oncology therapy. In addition, two evidence-based guidelines[10-11] were identified regarding natriuretic peptide testing for monitoring cardiotoxicity of oncology therapy. No relevant health technology assessments, systematic reviews, meta-analyses, or economic evaluations were identified.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

Nine non-randomized studies[1-9] were identified regarding the clinical utility of natriuretic peptide testing for monitoring of cardiotoxicity of oncology therapy. Authors of four non-randomized-studies[1,3,4,9] found that natriuretic peptide (B-type natriuretic peptide [BNP] or N-terminal pro b-type natriuretic peptide [NT-proBNP]) testing was useful in predicting the development of anthracycline-induced cardiotoxicity or cardiomyopathy. The authors of two of the studies[3,9] also found that natriuretic peptide testing had significant correlation in predicting chemotherapy-related mortality.[3,9] Authors of two non-randomized studies observed that abnormal or elevated natriuretic peptide levels were associated with chemotherapy-induced cardiotoxicity, and made note of its potential use as an additional tool for early detection of cardiotoxicity risk in cancer patients.[7,8] However, authors of three non-randomized studies[2,5,6] found that normal or elevated levels of natriuretic peptide may not be reliable as early predictors of chemotherapy-induced cardiotoxicity.

Guidelines from the American Society of Clinical Oncology recommend screening for serum cardiac biomarkers such as natriuretic peptide during and after chemotherapy treatment in patients at risk for cardiac dysfunction.[10] Guidelines from the Canadian Cardiovascular Society recommend the serial use of cardiac biomarkers such as BNP for the early detection of cardiotoxicity in cancer patients receiving cardiotoxic chemotherapy implicated in left ventricular dysfunction.[11]

References Summarized

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

No literature identified.

Randomized Controlled Trials

No literature identified.

Non-Randomized Studies

1. Bisoc A, Ciurescu D, Radoi M, et al. Elevations in High-Sensitive Cardiac Troponin T and N-Terminal Prohormone Brain Natriuretic Peptide Levels in the Serum Can Predict the Development of Anthracycline-Induced Cardiomyopathy. *Am J Ther*. 2019 Jan 3.
PubMed: PM30648987

2. Ponde N, Bradbury I, Lambertini M, et al. Cardiac biomarkers for early detection and prediction of trastuzumab and/or lapatinib-induced cardiotoxicity in patients with HER2-positive early-stage breast cancer: a NeoALTTO sub-study (BIG 1-06). *Breast Cancer Res Treat*. 2018 Apr;168(3):631-638.
PubMed: PM29280043

3. De Iuliis F, Salerno G, Taglieri L, et al. Serum biomarkers evaluation to predict chemotherapy-induced cardiotoxicity in breast cancer patients. *Tumour Biol*. 2016 Mar;37(3):3379-3387.
PubMed: PM26449821

4. Lenihan DJ, Stevens PL, Massey M, et al. The Utility of Point-of-Care Biomarkers to Detect Cardiotoxicity During Anthracycline Chemotherapy: A Feasibility Study. *J Card Fail*. 2016 Jun;22(6):433-438.
PubMed: PM27079675

5. Malik A, Jeyaraj PA, Calton R, et al. Are Biomarkers Predictive of Anthracycline-Induced Cardiac Dysfunction? *Asian Pac J Cancer Prev*. 2016;17(4):2301-2305.
PubMed: PM27221934

6. Matos E, Jug B, Blagus R, Zakotnik B. A Prospective Cohort Study on Cardiotoxicity of Adjuvant Trastuzumab Therapy in Breast Cancer Patients. *Arq Bras Cardiol*. 2016 Jul;107(1):40-47.
PubMed: PM27305108

7. Urun Y, Utkan G, Yalcin B, et al. The role of cardiac biomarkers as predictors of trastuzumab cardiotoxicity in patients with breast cancer. *Exp Oncol*. 2015 Mar;37(1):53-57.
PubMed: PM25804233

8. Zidan A, Sherief LM, El-sheikh A, et al. NT-proBNP as early marker of subclinical late cardiotoxicity after doxorubicin therapy and mediastinal irradiation in childhood cancer survivors. *Dis Markers*. 2015;2015:513219.
PubMed: PM25960594

9. Skovgaard D, Hasbak P, Kjaer A. BNP predicts chemotherapy-related cardiotoxicity and death: comparison with gated equilibrium radionuclide ventriculography. *PLoS One*. 2014;9(5):e96736.
PubMed: PM24800827

Economic Evaluations

No literature identified.

Guidelines and Recommendations

10. Armenian SH, Lacchetti C, Barac A, et al. Prevention and Monitoring of Cardiac Dysfunction in Survivors of Adult Cancers: American Society of Clinical Oncology Clinical Practice Guideline. *J Clin Oncol.* 2017;35(8):893-911 https://ascopubs.org/doi/pdfdirect/10.1200/JCO.2016.70.5400
See: Recommendation 4.2 & 5.1.1, bullet 3 , pages 895 to 896.

11. 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
See: Recommendation 154, page 1408.

Appendix — Further Information

Previous CADTH Reports

12. Recent series of reports on Natriuretic Peptide Testing (in progress)
https://www.cadth.ca/search?keywords=natriuretic+AND+peptide+AND+testing

Non-Randomized Studies

Alternative Population

13. Podlecka-Pietowska A, Kochanowski J, Zakrzewska-Pniewska B, Opolski G, Kwiecinski H, Kaminska AM. The N-terminal pro-brain natriuretic peptide as a marker of mitoxantrone-induced cardiotoxicity in multiple sclerosis patients. *Neurol Neurochir Pol*. 2014;48(2):111-115.
PubMed: PM24821636

Alternative Outcome

14. Bando S, Soeki T, Matsuura T, et al. Plasma brain natriuretic peptide levels are elevated in patients with cancer. *PLoS One*. 2017;12(6):e0178607.
PubMed: PM28570595

Outcome Unspecified

15. Royal Prince Alfred Hospital, Sydney, Australia. NCT00858039 Prediction of Cardiotoxicity Using Serum N-terminal Pro-B-type Natriuretic Peptide in Breast Cancer Patients Receiving Adjuvant Trastuzumab. *ClinicalTrials.gov*. Bethesda (MD): U.S. National Library of Medicine; 2014; https://ichgcp.net/clinical-trials-registry/NCT00858039

Review Articles

16. Riddell E, Lenihan D. The role of cardiac biomarkers in cardio-oncology. *Curr Probl Cancer*. 2018 Jul;42(4):375-385.
PubMed: PM30126650

17. Tan LL, Lyon AR. Role of Biomarkers in Prediction of Cardiotoxicity During Cancer Treatment. *Curr Treat Options Cardiovasc Med*. 2018 Jun 19;20(7):55.
PubMed: PM29923056

18. Vohra A, Asnani A. Biomarker Discovery in Cardio-Oncology. *Curr Cardiol Rep*. 2018 May 25;20(7):52.
PubMed: PM29802472

19. Cao L, Zhu W, Wagar EA, Meng QH. Biomarkers for monitoring chemotherapy-induced cardiotoxicity. *Crit Rev Clin Lab Sci*. 2017 Mar;54(2):87-101.
PubMed: PM28013560

20. Shah KS, Yang EH, Maisel AS, Fonarow GC. The Role of Biomarkers in Detection of Cardio-toxicity. *Curr Oncol Rep*. 2017 Jun;19(6):42.
PubMed: PM28421484

21. Srikanthan K, Klug R, Tirona M, et al. Creating a Biomarker Panel for Early Detection of Chemotherapy Related Cardiac Dysfunction in Breast Cancer Patients. *J Clin Exp Cardiolog*. 2017 Mar;8(3).
PubMed: PM28642833

22. Novo G, Cadeddu C, Sucato V, et al. Role of biomarkers in monitoring antiblastic cardiotoxicity. *J Cardiovasc Med (Hagerstown)*. 2016 May;17 Suppl 1:S27-34.
PubMed: PM27183522

23. Henri C, Heinonen T, Tardif JC. The Role of Biomarkers in Decreasing Risk of Cardiac Toxicity after Cancer therapy. *Biomark Cancer*. 2016;8(Suppl 2):39-45.
PubMed: PM27257396

24. Witteles RM. Biomarkers as Predictors of Cardiac Toxicity From Targeted Cancer Therapies. *J Card Fail*. 2016 Jun;22(6):459-464.
PubMed: PM27038641

25. Horacek JM, Vasatova M, Pudil R, et al. Biomarkers for the early detection of anthracycline-induced cardiotoxicity: current status. *Biomed Pap Med Fac Univ Palacky Olomouc Czech Repub*. 2014 Dec;158(4):511-517.
PubMed: PM24457832

26. Tian S, Hirshfield KM, Jabbour SK, et al. Serum biomarkers for the detection of cardiac toxicity after chemotherapy and radiation therapy in breast cancer patients. *Front Oncol*. 2014;4:277.
PubMed: PM25346912