

CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Automated versus Manual Blood Pressure and Cardiac Monitors in Prehospital Settings: Clinical Effectiveness and Guidelines

Service Line: Rapid Response Service
Version: 1.0
Publication Date: October 14, 2020
Report Length: 8 Pages

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Cite As: *Automated versus Manual Blood Pressure and Cardiac Monitors in Prehospital Settings: Clinical Effectiveness and Guidelines*. Ottawa: CADTH; 2020 Oct. (CADTH rapid response report: summary of abstracts).

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Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

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Research Questions

1. What is the comparative clinical effectiveness of automated blood pressure monitoring versus manual blood pressure monitoring in patients in pre-hospital settings?
2. What is the comparative clinical effectiveness of automated cardiac monitoring versus manual cardiac monitoring in patients in pre-hospital settings?
3. What are the evidence-based guidelines regarding the use of automated or manual blood pressure monitoring and automated or manual cardiac monitoring in patients in pre-hospital settings?

Key Findings

Two evidence-based guidelines were identified regarding the use of automated or manual cardiac monitoring in patients in pre-hospital settings. No relevant literature was identified regarding the use of automated or manual blood pressure monitoring, or the comparative clinical effectiveness of automated versus manual monitoring for either cardiac symptoms or blood pressure in patients in pre-hospital settings.

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, 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 automated blood pressure, cardiac monitoring and prehospital settings. Search filters were applied to limit retrieval for a subset of results to guidelines. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2015 and September 29, 2020. Internet links were provided, where available.

Selection Criteria and Summary Methods

One reviewer screened literature search results (titles and abstracts) and selected publications according to the inclusion criteria presented in Table 1. Full texts of study publications were not reviewed. The Overall Summary of Findings was based on information available in the abstracts of selected publications. Open access full-text versions of evidence-based guidelines were reviewed when abstracts were not available, and relevant recommendations were summarized.

Table 1: Selection Criteria

Population	Patients in a pre-hospital setting (e.g., ambulance, patient transfer)
Intervention	Q1: Automated (oscillometric) blood pressure monitoring Q2: Automated cardiac (electrocardiographic) monitoring Q3: Automated or manual blood pressure or cardiac monitoring

Comparator	Q1: Manual (auscultatory) blood pressure monitoring Q2: Manual cardiac monitoring (e.g., manual heart rate monitoring) Q3: Not applicable
Outcomes	Q1-2: Clinical effectiveness (e.g., relative effectiveness, accuracy, reliability) Q2: Recommendations regarding the use of automated blood pressure or cardiac monitoring, recommendations regarding the use of manual blood pressure or cardiac monitoring, recommendations regarding when to use automated or manual blood pressure or cardiac monitoring, recommendations regarding best practices
Study Designs	Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, evidence-based guidelines

Results

Two evidence-based guidelines¹⁻² were identified regarding the use of automated or manual cardiac monitoring in patients in pre-hospital settings. No relevant health technology assessments, systematic reviews, randomized controlled trials, or non-randomized studies were identified regarding the use of automated or manual blood pressure monitoring, or the comparative clinical effectiveness of automated versus manual monitoring for either blood pressure or cardiac symptoms in patients in pre-hospital settings.

Additional references of potential interest that did not meet the inclusion criteria are provided in the appendix.

Overall Summary of Findings

The two evidence-based guidelines¹⁻² recommend that an automatic cardiac monitoring system, specifically an electrocardiogram, be present in the prehospital setting for emergency medical service personnel to identify heart conditions and disorders such as ST-elevation myocardial infarctions. No evidence-based guidelines were identified regarding the use of automated or manual blood pressure monitoring in patients in pre-hospital settings; therefore, no summary can be provided.

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

No literature identified.

Guidelines and Recommendations

Cardiac Monitoring

1. Wong GC, Welsford M, Ainsworth C, et al. 2019 Canadian Cardiovascular Society/Canadian Association of Interventional Cardiology Guidelines on the Acute Management of ST-Elevation Myocardial Infarction: Focused Update on Regionalization and Reperfusion. *Can J Cardiol.* 2019;35(2):107-132.
[PubMed: PM30760415](#)
See: *Recommendation 8, p.112*
2. Ibanez B, James S, Agewall S, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *Eur Heart J.* 2018;39(2):119-177.
[PubMed: PM28886621](#)
See: Section 4.4.2 Emergency medical system, p.130

Appendix — Further Information

Previous CADTH Report

- Automated Versus Manual Blood Pressure Monitoring in the Emergency Department: Comparative Clinical Effectiveness and Guidelines. (*CADTH rapid response report: summary of abstracts*). Ottawa (ON): CADTH; 2020:
<https://www.cadth.ca/sites/default/files/pdf/htis/2020/RB1441%20Automated%20BP%20in%20ER%20Final.pdf>. Accessed 2020 Oct 13.

Systematic Reviews and Meta-Analyses – Alternative Setting

- Munro SF, Cooke D, Kiln-Barfoot V, Quinn T. The use and impact of 12-lead electrocardiograms in acute stroke patients: A systematic review. *Eur Heart J Acute Cardiovasc Care*. 2018;7(3):257-263.
[PubMed: PM26637212](#)

Non-Randomized Studies

Cardiac Monitoring

No Comparator

- Cloutier JM, Hayes C, Ducas J, Allen DW. Reducing Delay to Treatment of ST-Elevation Myocardial Infarction with Software Electrocardiographic Interpretation and Transmission (SCINET). *CJC Open*. 2020;2(3):111-117.
[PubMed: PM32462124](#)
- Tanguay A, Brassard E, Lebon J, Begin F, Hebert D, Paradis J-M. Effectiveness of a Prehospital Wireless 12-Lead Electrocardiogram and Cardiac Catheterization Laboratory Activation for ST-Elevation Myocardial Infarction. *Am J Cardiol*. 2017;119(4):553-559.
[PubMed: PM27939226](#)

Alternative Comparator

- Al-Zaiti S, Besomi L, Bouzid Z, et al. Machine learning-based prediction of acute coronary syndrome using only the pre-hospital 12-lead electrocardiogram. *Nat Commun*. 2020;11(1):3966.
[PubMed:PM32769990](#)
- Ter Haar CC, Peters RJG, Bosch J, et al. An initial exploration of subtraction electrocardiography to detect myocardial ischemia in the prehospital setting. *Ann Noninvasive Electrocardiol*. 2020;25(3):e12722.
[PubMed: PM31707764](#)

Alternative Setting

- Castelletti S, Dagradi F, Goulene K, et al. A wearable remote monitoring system for the identification of subjects with a prolonged QT interval or at risk for drug-induced long QT syndrome. *Int J Cardiol*. 2018;266:89-94.
[PubMed: PM29887480](#)

Blood Pressure Monitoring

No Comparator

10. Hansen LH, Ettrup-Christensen A, Bulow K. Feasibility of continuous noninvasive arterial pressure monitoring in a prehospital setting, measurements during emergency transfer. *Eur J Emerg Med.* 2019;26(5):334-339.
[PubMed: PM30045102](#)

Alternative Setting

11. Meidert AS, Dolch ME, Muhlbauer K, et al. Oscillometric versus invasive blood pressure measurement in patients with shock: a prospective observational study in the emergency department. *J Clin Monit Comput.* 2020.
[PubMed: PM32056094](#)
12. Rebesco MR, Pinkston MC, Smyrniotis NA, Weisberg SN. A Comparison of Non-Invasive Blood Pressure Measurement Strategies with Intra-Arterial Measurement. *Prehosp Disaster Med.* 2020;35(5):516-523.
[PubMed: PM32690122](#)
13. Garbern SC, Mbanjumucyo G, Umuhoza C, et al. Validation of a wearable biosensor device for vital sign monitoring in septic emergency department patients in Rwanda. *Digit Health.* 2019;5:2055207619879349.
[PubMed: PM31632685](#)
14. Mirdamadi A, Etebari M. Comparison of manual versus automated blood pressure measurement in intensive care unit, coronary care unit, and emergency room. *ARYA Atheroscler.* 2017;13(1):29-34.
[PubMed: PM5515188](#)

Alternative Outcomes

15. Mort AJ, Fitzpatrick D, Wilson PMJ, Mellish C, Schneider A. Lightweight physiologic sensor performance during pre-hospital care delivered by ambulance clinicians. *J Clin Monit Comput.* 2016;30(1):23-32.
[PubMed: PM25804608](#)

Guidelines and Recommendations

Unclear Methodology

16. Clinical practice procedure: cardiac/cardiac monitoring. Brisbane (AU): State of Queensland (Queensland Ambulance Service); 2019:
https://www.ambulance.qld.gov.au/docs/clinical/cpp/PPP_Cardiac%20monitoring.pdf. Accessed 2020 Oct 13.
17. Peberdy MA, Gluck JA, Ornato JP, et al. Cardiopulmonary Resuscitation in Adults and Children With Mechanical Circulatory Support: A Scientific Statement From the American Heart Association. *Circulation.* 2017;135(24):e1115-e1134
[PubMed:PM28533303](#)
See: Assessment of Flow and Perfusion in Patients with an LVAD, Echocardiography in the Evaluation of an Acutely Ill Patient with and LVAD

18. Acute coronary syndrome: a national clinical guideline. (*SIGN publication no. 148*). Edinburgh (GB): Scottish Intercollegiate Guidelines Network (SIGN); 2016: <https://www.sign.ac.uk/media/1084/sign148.pdf>. Accessed 2020 Oct 13.
See: Section 3.1 Clinical Presentation and Immediate Assessment

Alternative Setting

19. National Institute for Health Care Excellence. Hypertension in adults: diagnosis and management. (*NICE guideline NG136*) 2019; <https://www.nice.org.uk/guidance/ng136>. Accessed 2020 Oct 13.
See: Section 1.1 Measuring blood pressure
20. National Institute for Health Care Excellence. Peripheral arterial disease: diagnosis and management. (*Clinical guideline CG147*) 2018; <https://www.nice.org.uk/guidance/cg147>. Accessed 2020 Oct 13.
See: Section 1.3 Diagnosis
21. Al-Khatib SM, Stevenson WG, Ackerman MJ, et al. 2017 AHA/ACC/HRS Guideline for Management of Patients With Ventricular Arrhythmias and the Prevention of Sudden Cardiac Death: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Rhythm Society. *Circulation*. 2018;138(13):e272-e391.
[PubMed: PM29084731](https://pubmed.ncbi.nlm.nih.gov/35084731/)
See: Section 4.2.2. Ambulatory Electrocardiography
22. National Institute for Health Care Excellence. Recent-onset chest pain of suspected cardiac origin: assessment and diagnosis. (*Clinical guideline CG95*) 2016; <https://www.nice.org.uk/guidance/cg95>. Accessed 2020 Oct 13.
See: Section 1.2.2 Resting 12-lead ECG

Recommendations not Specified

23. Guber NK, Sporer KA, Guluma KZ, et al. Acute Stroke: Current Evidence-based Recommendations for Prehospital Care. *West J Emerg Med*. 2016;17(2):104-128.
[PubMed: PM26973735](https://pubmed.ncbi.nlm.nih.gov/26973735/)