Automated Versus Manual Blood Pressure Monitoring for Hypertension in the Community Setting: Comparative Clinical and Cost-Effectiveness and Guidelines
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Acknowledgments:

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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.
Research Questions
1. What is the comparative clinical effectiveness of automated versus manual blood pressure monitoring in patients with hypertension or suspected hypertension in the community setting?

2. What is the cost-effectiveness of automated versus manual blood pressure monitoring in patients with hypertension or suspected hypertension in the community setting?

3. What are the evidence-based guidelines associated with the use of automated compared with manual blood pressure monitoring in patients with hypertension or suspected hypertension in the community setting?

Key Findings
One systematic review, three randomized controlled trials, four non-randomized studies, and four evidence-based guidelines were identified comparing the use of automated versus manual blood pressure monitoring in patients with hypertension or suspected hypertension in the community setting.

Methods
A limited literature search was conducted 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. Methodological filters were applied to limit retrieval to health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, economic studies, and guidelines. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2012 and February 5, 2017. 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

<table>
<thead>
<tr>
<th>Population</th>
<th>Individuals with hypertension or suspected hypertension in the community setting (e.g., clinics, other outpatients settings)</th>
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<tbody>
<tr>
<td>Intervention</td>
<td>Automated (oscillometric) blood pressure monitoring</td>
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<tr>
<td>Comparator</td>
<td>Manual (auscultatory) blood pressure monitoring</td>
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<tr>
<td>Outcomes</td>
<td>Q1: Clinical effectiveness (e.g., relative effectiveness, accuracy, reliability, etc.)</td>
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<td></td>
<td>Q2: Cost-effectiveness (e.g., cost per health benefit)</td>
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<td>Q3: Guidelines</td>
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<tr>
<td>Study Designs</td>
<td>Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, economic evaluations, evidence-based guidelines</td>
</tr>
</tbody>
</table>
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, three randomized controlled trials, four non-randomized studies, and four evidence-based guidelines were identified comparing the use of automated versus manual blood pressure monitoring in patients with hypertension or suspected hypertension in the community setting. No relevant economic evaluations were identified.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

One systematic review examined screening for high blood pressure in non-pregnant adults identified few studies that compared the accuracy of manual and automated blood pressure measurement. In these studies, automated blood pressure measurements had a range of sensitivity values for detecting elevated blood pressure (BP) and more consistent specificity and positive predictive value when compared with manual mercury sphygmomanometry.

A threshold for in-office diagnosis of hypertension in adults with automated office blood pressure measurement was assessed in one randomized controlled trial (RCT). The authors sought to determine which automated measurement was equivalent to the established threshold of 140/90 mmHg for hypertension diagnosis for manual office BP. Systolic and diastolic BP measurements were higher with the manual measurement. The authors concluded that an automated measurement of 131/85 mmHg was equivalent to a manual measurement of 140/90 mmHg. In another RCT, manual and automated BP measurement were each compared with awake ambulatory BP (AABP). The mean decrease in systolic BP after enrollment was significantly greater in the automated BP group both at the first visit and after two years. A greater difference was observed between the manual BP measurements and AABP than between automated BP measurements and AABP.

One non-randomized study (NRS) compared in-office automated and manual BP measurements in stable hypertensive patients. Mean manual BP measurements were higher (146.9/85.8 mm Hg) than automated BP measurements (131.2/77.8 mmHg). In order to determine whether the presence of a doctor or nurse impacted BP, one NRS compared manual and automated BP results without a doctor or nurse present. Mean automated and manual BP results were closely correlated. A third NRS compared manual and automated BP by assessing patients with both methods at the same time. The mean, systolic, and diastolic BP measurements were all similar between the two devices.

One RCT compared automated and manual BP measurements for hypertensive pregnant women. Hypertension was diagnosed using manual BP then women were randomized to be followed using either manual or automated BP measurement for the
rest of their pregnancy. Severe hypertension was detected in more women in the automated group; however, maternal and fetal outcomes were similar between groups. A NRS conducted in a similar population found that systolic BP was higher with the automated BP device and diastolic BP was higher with the manual BP device. Overall, the authors concluded that there was adequate agreement between the two measurement methods for pregnant women with hyperension.

Four guidelines were identified. Hypertension Canada's 2016 guidelines for the measurement, diagnosis, and assessment of risk of pediatric hypertension recommends that pediatric BP be measured using “a mercury sphygmomanometer, aneroid sphygmomanometer, or oscillometric device” (page 592). The group's 2016 guideline for adult patients recommends “automated office blood pressure, taken without patient-health provider interaction” as the standard method of in-office assessment. A 2016 guideline from the National Institute for Health and Care Excellence recommends manual BP measurement when pulse irregularity is detected. If pulse is normal, BP can be measured with a properly validated and calibrated automated BP device. The 2013 guidelines from the European Society of Hypertension and the European Society of Cardiology recommend that in-office BP be measured using validated and calibrated auscultatory or oscillometric semiautomatic sphygmomanometers.

References Summarized

Health Technology Assessments
No literature identified.

Systematic Reviews and Meta-analyses

Randomized Controlled Trials


Non-Randomized Studies


Economic Evaluations
No literature identified.

Guidelines and Recommendations


See: Blood Pressure Measurement
Appendix — Further Information

Review Articles


Additional References

