TITLE: Blood Pressure Monitoring Chairs to Identify Hypertension: A Review of the Clinical Effectiveness and Guidelines

DATE: 26 May 2011

CONTEXT AND POLICY ISSUES

In Canada between 2006-2007, there were approximately 450,000 newly diagnosed cases of hypertension, contributing to a prevalence of 5.9 million adults. Further, all-cause mortality was greater for all adults (20 years of age and older) with hypertension, as compared to those without, and by 2011-2012 it is forecasted that the number of Canadian adults diagnosed with hypertension will increase by 25.5% to 7.3 million. Accordingly, accurate blood pressure monitoring (BPM) for the diagnosis of hypertension ranks amongst the most frequent and important measurements taken in clinical practice.

The gold standard for BPM has long been considered a trained nurse or physician using the auscultatory method with a mercury sphygmomanometer. However, environmental concerns about the presence of mercury in the clinic have increasingly positioned modern alternatives as more attractive. Aneroid sphygmomanometers register pressure through a mechanical system, but are inherently sensitive to trauma, require frequent calibration, and are generally considered less accurate than their mercury counterparts. Newer automated BPM devices rely on the oscillometric technique. The oscillometric method is employed in a commercially available BPM chair, the VitaStat 90550. In light of this ever expanding pool of marketed automated BPM devices, criteria have evolved for their validation against auscultatory methods, including the British Hypertension Society (BHS) Protocol, the Association for the Advancement of Medical Instrumentation (AAMI) standard, and the European Society of Hypertension International (ESH) Protocol.

Beyond eliminating some of the measurement error associated with mercury sphygmomanometry, this trend towards increased out-of-office BPM is partially reflective of an effort to dampen the prevalence of the so-called ‘white-coat effect’, a phenomenon in which some patients display temporarily elevated blood pressure in the clinic setting, thereby complicating the accurate diagnosis of hypertension. BPM chairs, typically regarded as a community-based method for BPM due to their frequent utilization in public areas (i.e.

Disclaimer: The Rapid Response Service is an information service for those involved in planning and providing health care in Canada. Rapid responses are based on a limited literature search and are not comprehensive, systematic reviews. The intent is to provide a list of sources and a summary of the best evidence on the topic that CADTH could identify using all reasonable efforts within the time allowed. Rapid responses should be considered along with other types of information and health care considerations. The information included in this response is not intended to replace professional medical advice, nor should it be construed as a recommendation for or against the use of a particular health technology. Readers are also cautioned that a lack of good quality evidence does not necessarily mean a lack of effectiveness particularly in the case of new and emerging health technologies, for which little information can be found, but which may in future prove to be effective. While CADTH has taken care in the preparation of the report to ensure that its contents are accurate, complete and up to date, CADTH does not make any guarantee to that effect. CADTH is not liable for any loss or damages resulting from use of the information in the report.

Copyright: This report contains CADTH copyright material. It may be copied and used for non-commercial purposes, provided that attribution is given to CADTH.

Links: This report may contain links to other information available on the websites of third parties on the Internet. CADTH does not have control over the content of such sites. Use of third party sites is governed by the owners’ own terms and conditions.
pharmacies, grocery stores), may provide another important means of assessing blood pressure outside of the office-based setting.

This report is intended to review and critically appraise the quality of health technology assessments, systematic reviews, meta-analyses, and randomized clinical trials evaluating the clinical effectiveness of BPM chairs, relative to auscultatory and automated methods. Additionally, the quality of evidence-based clinical practice guidelines for BPM in the identification of hypertension, with an emphasis on those which discuss BPM chairs, will be assessed. This information will be utilized to inform the purchasing of a BPM chair at a federal institution.

**RESEARCH QUESTIONS**

1. What is the comparative clinical effectiveness of blood pressure monitoring chairs versus standard testing for identifying hypertension?

2. What are the evidence-based guidelines regarding blood pressure monitoring to identify hypertension?

**KEY MESSAGE**

Insufficient research has been conducted to validate the clinical effectiveness of BPM chairs for reliably identifying hypertensive patients. Evidence-based clinical guidelines do not incorporate BPM chairs into algorithms for the diagnosis of hypertension, and acknowledge the lack of research towards their validation.

**METHODS**

A limited literature search was conducted on key resources including PubMed, The Cochrane Library (2011, Issue 4), 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 and guidelines. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2006 and April 26, 2011.

The AGREE instrument (Appraisal of Guidelines Research and Evaluation) was utilized to assess six domains related to the quality of relevant evidence-based clinical practice guidelines, identified through the literature search. Domains include scope and purpose, stakeholder involvement, rigor of development, clarity and presentation, applicability, and editorial independence.

**SUMMARY OF FINDINGS**

No relevant health technology assessments, systematic reviews, meta-analyses or randomized controlled trials were identified in the literature search. One evidence-based North American guideline discussing a role for BPM chairs in the identification of hypertension was identified. Additional articles of potential interest, related to the clinical effectiveness of the VitaStat 90550 BPM chair and previous iterations of this device, but published prior to January 1, 2006, as well
as one evidence-based clinical guideline published prior to January 1, 2006 that references BPM chairs, have been included in Appendix 1.

Guidelines and recommendations

The Nursing Management of Hypertension Revision was published in 2009, as a supplemental add on to the original version, published in 2005. The AGREE instrument is applied to both the original version and the revision concurrently for the purposes of this critical appraisal, as the 2009 revision only identified evidence to further support the approach for hypertension detection and diagnosis outlined in 2005 (minor revisions were made to some pharmacological treatment strategies). The Nursing Management of Hypertension recommendations are best practice guidelines with the defined objective of providing “nurses with recommendations, based on the best available evidence, related to nursing interventions for high blood pressure detection, client assessment and development of a collaborative treatment plan, promotion of adherence and ongoing follow-up”. There is a particular emphasis placed on assisting those nurses working towards the management of hypertension for some patients, within the context of a broader clinical setting. The specific clinical questions to be addressed are unambiguously described (1. “How can nurses accurately detect symptoms of hypertension in the adult population? 2. What effective treatment interventions can nurses utilize in practice to decrease blood pressure?). The target patient population is clearly delineated, and specifically adults over 18 years of age without hypertension related to pregnancy or secondary causes, such as renal disease, and not suffering from transient, pulmonary or endocrine hypertension. The guideline refers to the assembly of a panel of nurses, with expert level skills in various aspects of hypertension management, who were divided into specialized sub-groups for the purposes of drafting recommendations (2005) and considering revisions (2009). There seems to have been some effort to include patient input into the guideline development process, as so-called “clients and families” were given specific questions for comment, and opportunities to provide feedback on their impressions of the recommendations as they evolved. There is no documented validation process or piloting of the recommendations in small-scale clinical practice. The details of the search strategy are explained for recommendation development, including databases (MEDLINE, Embase, CINAHL) and websites utilized, search terms, and the period from which guidelines and literature were drawn from. The criteria for inclusion/exclusion of relevant literature abstracts are not identified in 2005 or 2009, whereas clinical practice guidelines considered for inclusion needed to be published in English, in or later than 1999, solely focused on hypertension, evidence-based, and retrievable in order to be eligible for inclusion in recommendation development in 2005. The 2009 revision is less clear about the methods for identifying guidelines published since 2004 for consideration. Eligible guidelines were then assessed for quality using the AGREE instrument, yielding 3 guidelines for consideration in both the 2005 original publication, as well as the 2009 revision. The original 2005 guidelines generally describe an approval process for recommendations among the aforementioned panel members, whereby draft recommendations were reviewed, gaps identified and consensus sought prior to finalization. The 2009 revision provides a similar level of detail on the consensus process, stating that panel members were provided comprehensive data tables from the approved reference list and mandated to review the 2005 guidelines for validity, safety and appropriateness. The recommendations are explicitly linked to supporting literature and guidelines, and there is specific mention of external stakeholder review and endorsement, including the Canadian Hypertension Education Program (CHEP) Executive Committee. A defined procedure for commencing a formal update of the recommendations every 3 years is defined in 2005, and delivered upon in 2009. Further, the RNAO committed to regularly monitoring systematic reviews and randomized clinical trials in the intervening
periods, as well as the CHEP recommendations for hypertension management on an annual basis, for evidence necessitating more frequent updated supplements. The recommendations themselves are slightly ambiguous, however, sufficient detail for their execution is provided in the subsequent “Discussion of Evidence” which accompanies each recommendation. Recommendations are provided for multiple BPM modalities, including community-based self-monitoring devices such as BPM chairs. Key recommendations are reiterated and presented in an easily identifiable manner throughout the guideline. Some suggestions are provided for effective implementation of the guidelines within healthcare organizations, and a Toolkit resource is offered through the RNAO website to facilitate this process. The Nursing Management of Hypertension guidelines provide consideration of the organizational barriers to their application, offering insights on multiple theoretical models for behavioral change and their relationship to the guidelines. Cost implications for the application of the recommendations are also discussed (i.e. typical cost of self/home BPM cited as $80-140). The aforementioned Toolkit also provides healthcare organizations with a framework and specific indicators for monitoring and evaluating the impact of implementing these recommendations. The 2005 recommendations indicate that potential conflicts of interest were declared by panel members, although there is no such statement in the 2009 revision and no formal process for addressing their implications are addressed. Editorial independence from the Government of Ontario is explicitly indicated.

A summary of the recommendations from the identified guideline, focusing specifically on the accurate BPM, and any role for BPM chairs in the clinical algorithm for the identification of hypertension, is presented in Table 1.

Table 1. Recommendations for the Accurate Assessment of Blood Pressure for the Identification of Hypertension

<table>
<thead>
<tr>
<th>Title, Group, Year of Guidelines Publication</th>
<th>Recommendations Identified in the Guidelines</th>
</tr>
</thead>
</table>
| Nursing Management of Hypertension, Heart & Stroke Foundation of Ontario (HSFO) and Registered Nurses Association of Ontario (RNAO), 2009¹¹ | For recommendations, the level of evidence identified by the RNAO to support their respective inclusion is provided. The specific grading criteria are described elsewhere.¹¹  
“1.2 Nurses will utilize correct technique, appropriate cuff size and properly maintained/calibrated equipment when assessing clients’ blood pressure. [Level IV]” (pp.28) ¹¹  
“1.4 Nurses will educate clients about self/home blood pressure monitoring techniques and appropriate equipment to assist in potential diagnosis and the monitoring of hypertension. [Level IV]” (pp.35) ¹¹  

Community-based Self Monitoring Devices  
“Community-based self monitoring devices are available in many public locations, including grocery chains and pharmacies. Clients may ask nurses and other health professionals if these devices can be used for self measurement of blood pressure.” (pp.35) ¹¹ |
**Title, Group, Year of Guidelines Publication**

**Recommendations Identified in the Guidelines**

<table>
<thead>
<tr>
<th>Recommendations Identified in the Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Community-based automated devices are not recognized in the current diagnostic algorithm for hypertension nor are they included in the recommendations for self blood pressure monitoring.” (pp.35)</td>
</tr>
<tr>
<td>“Further research is needed to validate these devices before they will be endorsed for diagnosis and monitoring of blood pressure in routine practice.” (pp.35)</td>
</tr>
</tbody>
</table>

**Limitations**

There were no meta-analyses, systematic reviews, or randomized clinical trials evaluating the clinical effectiveness of BPM chairs identified in the last five years. This gap in the research provides very little basis for the consideration of the accuracy and reliability of BPM chairs in the clinical setting.

A review of North American evidence-based clinical guidelines for BPM in the identification of hypertension revealed only one, the Nursing Management of Hypertension from the RNAO, which specifically addresses BPM chairs. The RNAO guidelines are a rigorously developed platform, with delineated objectives, involving expert-level professionals in their development, clearly described systematic review processes, external stakeholder consideration and endorsement, thoughtful and informative presentation, implementation strategies and mandated review processes. Noted limitations of the Nursing Management of Hypertension guidelines included a vague account of the inclusion/exclusion criteria applied to literature and international guidelines utilized in the recommendation development process, as well as the absence of a description of the recommendation approval process.

**CONCLUSIONS AND IMPLICATIONS FOR DECISION OR POLICY MAKING:**

A review of the literature as well as North American evidence-based clinical guidelines, revealed very little data to support the inclusion of BPM chair readings in the algorithm for diagnosing hypertension in adults. Community-based approaches, such as BPM chairs, are considered too variable and insufficiently researched by the RNAO for incorporation into the Nursing Management of Hypertension guidelines for the identification of hypertension.

**PREPARED BY:**
Canadian Agency for Drugs and Technologies in Health
Tel: 1-866-898-8439
www.cadth.ca
REFERENCES:


APPENDIX 1:

RELATED TO VITASTAT 90550 VALIDATION AND CLINICAL EFFECTIVENESS


EVIDENCE-BASED CLINICAL GUIDELINES WITH REFERENCE TO BPM CHAIRS PUBLISHED PRIOR TO 2006