Title: Telemetry and Holter Monitoring: Guidelines and Comparative Effectiveness

Date: 11 July 2008

Research questions:

1. What is the comparative effectiveness of telemetry and holter monitoring for identification of cardiovascular conditions?

2. Are there guidelines for which patient populations should use telemetry over holter monitoring for identification of cardiovascular conditions?

Methods:

A limited literature search was conducted on key health technology assessment resources, including PubMed, the Cochrane Library (Issue 2, 2008), University of York Centre for Reviews and Dissemination (CRD) databases, ECRI, EuroScan, international HTA agencies, and a focused Internet search. Results include articles published between 2003 and June 2008, and are limited to English language publications only. No filters were applied to limit the retrieval by study type. Internet links are provided, where available.

The summary of findings was prepared from the abstracts of the relevant information.

Results:

HTIS 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, observational studies and evidence-based guidelines.

The literature search identified one randomized controlled trial (RCT), two observational studies, and six guidelines/recommendations. No health technology assessments, systematic reviews, or meta-analyses were identified. Additional references of potential interest are included in the Appendix.

Disclaimer: The Health Technology Inquiry Service (HTIS) is an information service for those involved in planning and providing health care in Canada. HTIS responses are based on a limited literature search and are not comprehensive, systematic reviews. The intent is to provide a list of sources of the best evidence on the topic that CADTH could identify using all reasonable efforts within the time allowed. HTIS 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.

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Overall summary of findings:

One RCT was identified. Scalvini et al. (2005)\textsuperscript{1} published results of a RCT comparing transtelephonic event monitors with Holter monitors in 310 patients with symptoms of palpitation, in order to confirm or rule out cardiac arrhythmia. Nurses in the telemedicine call centre responded to the event monitor transmissions. The authors stated that more patients received a faster, clearer diagnosis with the event monitors than with Holter monitoring. They concluded that event monitors were preferable to Holter monitors for patients experiencing palpitations.

Two observational studies were identified. Saarel et al. (2008)\textsuperscript{2} report the results of a study evaluating children and adolescents with suspected cardiac arrhythmia. Fifty-nine patients were monitored using a mobile cardiac outpatient telemetry (MCOT) system. The monitors stored, analyzed, and transmitted electrocardiograms through cellular and land telephone networks to a central, remote station, on a continual basis. The study yielded a diagnosis in 61% of the patients, which the authors stated was superior to expected results using event monitors or Holter monitors in this population. It should be noted that no actual comparison between monitors was performed during the study. The authors concluded that MCOT was safe and useful for children and adolescents with suspected arrhythmia.

The study by Piorkowski et al. (2005)\textsuperscript{3} compared transtelephonic ECG every two days for half a year with serial seven-day Holter monitoring (preablation, postablation, at 3 months, and 6 months), for follow-up after atrial fibrillation catheter ablation, in order to judge ablation success. Thirty patients were followed. Freedom from atrial fibrillation was diagnosed in 70% of patients, based on symptoms only. Holter monitoring provided a diagnosis of successful ablation in 50% of patients and transtelephonic monitoring provided this diagnosis in 45% of patients. The authors concluded that, in asymptomatic patients, these two monitoring systems were equally effective for objectively determining long-term success.

Six guidelines or recommendations were identified and are briefly summarized in Table 1. Links to the full text of the guidelines are provided in the reference list.

Table 1: Guidelines and Recommendations for use of telemetry or holter monitors

<table>
<thead>
<tr>
<th>Author, year published/updated</th>
<th>Technology and/or Condition</th>
<th>Guidelines/Recommendations</th>
</tr>
</thead>
</table>
| Aetna, 1995/2008\textsuperscript{4} | Mobile cardiovascular telemetry [e.g., CardioNet mobile Cardiac Outpatient Telemetry (MCOT) Service; Cardiac Telecom] | Considered medically necessary for diagnostic evaluation of recurrent unexplained episodes of:  
  - presyncope  
  - syncope  
  - palpitations  
  - dizziness  
  when cardiac arrhythmia is expected to be the cause and there is a nondiagnostic Holter monitor or the condition is unlikely to be diagnosed by Holter monitoring |
| Aetna, 1995/2008\textsuperscript{5} | Holter monitors | Considered medically necessary for diagnostic evaluation of any of the following:  
  - frequent palpitation, syncope, unexplained dizziness, or frequent arrhythmias  
  - autonomic cardiac neuropathy with diabetes mellitus  
  - idiopathic hypertrophic or dilated cardiomyopathy  
  - post myocardial infarction with left ventricular dysfunction |
### United Healthcare and Oxford Benefit Management, 2008

<table>
<thead>
<tr>
<th>Area</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessing treatment effectiveness for baseline high frequency, reproducible, sustained, symptomatic premature ventricular complexes, supraventricular arrhythmias or ventricular tachycardia</td>
<td></td>
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<tr>
<td>Assessing paroxysmal symptoms, myopotential inhibition, pacemaker medicated tachycardia, antitachycardia pacing device functioning, or rate-responsive physiologic pacing function in individuals with pacemakers</td>
<td></td>
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<tr>
<td>Pain suggestive of Prinzmetal’s angina</td>
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</tbody>
</table>

May be indicated when the following requirements are met:

- Low likelihood of a potentially life-threatening cardiac event
- Other testing/monitoring is non-diagnostic or inappropriate
- Results of this monitoring should provide diagnostic and treatment information

in the following outpatients with a demonstrated need for cardiac monitoring:

- Known, non life-threatening arrhythmias such as paroxysmal atrial fibrillation, other paroxysmal supraventricular arrhythmias, evaluation of bradyarrhythmias and intermittent bundle branch block
- Recovery from cardiac surgery, with documented atrial arrhythmias
- Symptomatic underlying structural disease
- No structural heart disease but recurrent severe symptoms, when all testing is negative and an implantable event recorder is contemplated
- Uncontrolled atrial fibrillation post-pneumonectomy

### Institute for Clinical Systems Improvement, 2007

<table>
<thead>
<tr>
<th>Area</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real-time outpatient cardiac surveillance (CardioNet, HEARTLink II™, Cardiac Telecom or Telemetry at Home)</td>
<td></td>
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</tbody>
</table>

May be indicated when the following requirements are met:

- Telemetry monitoring required for at least 4 hours (or longer if QT remains prolonged) during the administration of antiarrhythmics
- Holter monitors and event monitors may be useful for recurrence of atrial fibrillation in selected patients

### McKeown and Gutterman (American College of Chest Physicians), 2005

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<thead>
<tr>
<th>Area</th>
<th>Indicators</th>
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<tbody>
<tr>
<td>Telemetry, holter monitors, and event monitors for atrial fibrillation</td>
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</table>

Close monitoring by continuous telemetry when therapy with antiarrhythmic drugs is started during atrial fibrillation

### Drew et al. (American Heart Association), 2004

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<tr>
<td>Real-time electrocardiographic monitoring (telemetry) in hospital settings</td>
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</table>

Cardiac monitoring (real-time electrocardiographic monitoring) is recommended for most, if not all, patients in the following groups:

- Resuscitated from cardiac arrest
- Early phase acute coronary syndromes and all patients receiving early reperfusion therapy
- Unstable coronary syndromes and newly diagnosed high-risk coronary lesions
- Following uncomplicated cardiac surgery (adults and children)
- Non-urgent percutaneous coronary intervention with complications
- Implantation of an automatic defibrillator lead or pacemaker lead and considered dependent
- Temporary pacemaker or transcutaneous pacing pads
- AV block
<table>
<thead>
<tr>
<th>Conditions</th>
<th>Indications for Intensive Care or Diagnostic/Therapeutic Procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrhythmias complicating Wolff-Parkinson-White Syndrome with rapid anterograde conduction over an accessory pathway</td>
<td>Major trauma, acute respiratory failure, sepsis, shock, acute pulmonary embolus, major noncardiac surgery</td>
</tr>
<tr>
<td>Long-QT syndrome and associated ventricular arrhythmias</td>
<td>Requires conscious sedation or anesthesia</td>
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<tr>
<td>Intraaortic balloon counterpulsation</td>
<td>Any other hemodynamically unstable arrhythmia</td>
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<tr>
<td>Acute heart failure/pulmonary edema</td>
<td></td>
</tr>
<tr>
<td>Indications for intensive care (e.g., major trauma, acute respiratory failure, sepsis, shock, acute pulmonary embolus, major noncardiac surgery)</td>
<td></td>
</tr>
<tr>
<td>Diagnostic/therapeutic procedures requiring conscious sedation or anesthesia</td>
<td></td>
</tr>
<tr>
<td>Any other hemodynamically unstable arrhythmia</td>
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</table>

Cardiac monitoring (real-time electrocardiographic monitoring) may be beneficial for, but is not considered essential for patients in the following groups:
- Post-acute MI
- Administration of an antiarrhythmic drug or requiring adjustment of drugs for rate control with chronic atrial tachyarrhythmias
- Pacemaker lead implantation, but not pacemaker dependent
- Uncomplicated ablation of an arrhythmia
- Routine coronary angiography
- Subacute heart failure
- Syncope
- Do-not-resuscitate orders with arrhythmias that cause discomfort

Overall, telemetry and holter monitoring both appear to be useful for the detection of cardiovascular conditions, although telemetry may provide the benefit of immediate feedback, which would be necessary for rapid decision making and treatment of many cardiovascular conditions.
References summarized:

**Health technology assessments**
No literature identified

**Systematic reviews and meta-analyses**
No literature identified

**Randomized controlled trials**

**Observational studies**


**Guidelines and recommendations**


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Appendix – Further information

Systematic reviews

Structured abstract available: http://www.crd.york.ac.uk/CRDWeb/ShowRecord.asp?View=Full&ID=32005000063

Observational studies


Review articles


Additional references