Ambulatory electrocardiography monitoring

Background

Ambulatory electrocardiography monitoring, also known as Holter monitoring, is a subdivision of electrocardiography. The procedure refers to physician interpretations of electrocardiograms (ECG), or maps of the heart’s electrical activity, recorded by a small, portable device that is worn by patients during normal activity. The device consists of an electrocardiograph and a recording system capable of storing hours of an individual’s ambulatory electrocardiograms (AECG).

It is important for physicians to be able to review AECGs taken over long periods of time because cardiac abnormalities may occur only rarely, such as during sleep or with mental, emotional, or exercise-induced changes in cardiac oxygenation. Thus, the portability of AECG monitoring allows physicians to identify arrhythmias, or irregularities of the heartbeat, that would not be discovered by ECG records of only a few minutes in duration.

There are two categories of AECG examination: continuous recordings (typically used for 24 to 48 hours) and intermittent recordings that may be made over long periods of time to provide brief recordings. Some intermittent event recorders incorporate a memory loop that permits capture of fleeting symptoms, tachycardia onset, and in some cases, syncope of infrequent occurrence.

There are many types of AECG systems, and most require a certain amount of technological expertise to filter out invalid data. Physicians who interpret AECGs should be familiar with the systems used in their laboratories. In addition, although physicians rarely collect or process ECG data and commonly use commercial reading services for those tasks, it should be the interpreting physician, rather than the physician who ordered the AECG, who is ultimately responsible for the data’s validity.

Ambulatory monitoring by either continuous or intermittent recorders is safe. However, if the use of ambulatory monitoring results in a delay in hospitalization or treatment, the procedure is contraindicated. This could include those cases in which patients’ symptoms of altered consciousness or palpitations have an etiology identified by history, physical examination, or laboratory tests.

Use of ambulatory monitoring for the assessment of patients with potential ischemia as the initial screening tool is not ideal for those who are able to undergo exercise testing or for the screening of asymptomatic patients. Use in these circumstances could lead to potentially serious consequences brought on by a delay in diagnosis.
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Involved specialties
Cardiologists and some internists

Positions of societies and academies

The American College of Cardiology (ACC)/American Heart Association (AHA)/American College of Physicians–American Society of Internal Medicine (ACP-ASIM) Task Force on Clinical Competence developed the document *ACC/AHA Clinical Competence Statement on Electrocardiography and Ambulatory Electrocardiography*. In the document, the task force states that competence in interpreting standard 12-lead ECG is a prerequisite to minimum competence in AECG. The task force further states that the following recommendations address the special educational and cognitive skills needed to assess heart rate variability, cardiac pacemakers, and implantable cardioverter defibrillators (ICD) by AECG.

**Minimum training necessary for competence in interpreting AECGs**
There may be several ways to achieve these skills. It is essential that the number of AECG interpretations made under the review and guidance of experienced faculty be sufficient to expose the trainee to most of the technical and physiological phenomena that tend to confound accurate interpretation. Many physicians acquire the knowledge required for AECG interpretation in a training program during a residency or fellowship, and supervised interpretation of 150 AECGs is the norm.

This task force recommends that supervised interpretation of a minimum of 150 AECGs be considered necessary for minimum competence. At the discretion of the program director, this experience may be gained in part from a teaching set of AECGs. Educational training should include a wide range of typical and atypical AECG records that exemplify common and uncommon problems.

Firsthand interaction with an operator of Holter instrumentation would enable a trainee to appreciate the recording and analysis of artifacts and errors. This experience in AECG interpretation under the guidance of an authoritative faculty reviewer should be documented in a permanent logbook of the training program within that institution.

A physician may become competent in interpreting AECGs by attending well-designed courses conducted by an expert in AECG, coupled with studies of teaching sets comprising repre-
sentative recording and subsequent interpretations of these recordings. All of the requirements listed in the previous paragraph must be met.

*Cognitive skills needed to interpret AECGs competently*

- Knowledge of the appropriate indications for AECG
- Knowledge of cardiac arrhythmias, their diagnosis, and significance in normal subjects and in patients with heart disease
- Appreciation of the wide range of variability in arrhythmia occurrence in the ambulatory patient throughout a diurnal cycle and the influence of the autonomic nervous system on the rhythm of the heart
- Knowledge of changes in the ECG that may result from exercise, hyperventilation, conduction disorders, electrolyte shifts, drugs, meals, temperature, Valsalva maneuvers, ischemia, and transient repolarization phenomena related to a variety of cardiac diseases
- Knowledge of cardiac drugs and how they may affect conduction and repolarization on the ECG, particularly for suspected proarrhythmic phenomena
- Knowledge of the sensitivity, specificity, and diagnostic accuracy of ambulatory electrocardiography in various age groups and populations, particularly with respect to ST segment changes and the application of Bayes’ theorem
- Knowledge of the most widely accepted criteria for ischemic ST segment changes
- Knowledge of AECG evidence of failure to capture, failure to sense, or failure to pace for cardiac pacemakers and ICDs
- Knowledge of AECG evidence of appropriate and inappropriate antitachycardia pacing or defibrillation in the ICD patient
- A basic understanding of the advantages and disadvantages of the instrumentation used in continuous and intermittent AECG from the recorder and the possible causes for false-positive or false-negative test results that are due to inherent instrumentation or signal processing limitations
- Knowledge of the particular characteristics of the AECG instrumentation used to process the recordings for which the electrocardiographer is responsible
- Appreciation of the skills required by the technologist to interact with the AECG instrumentation in editing the computer output and the need to be assured of the competence of the technologist
Maintaining competence in the interpretation of AECGs

Maintaining competence in AECG requires a continual updating of technological knowledge and an ongoing accrual of experience in the interpretation of AECGs. If interpretations are made only occasionally, arrhythmia may be missed or inappropriately diagnosed, particularly when there is a change in the recording system, analysis system, or technical personnel in the laboratory performing the AECG.

The task force recommends a minimum of 25 interpretations per year to maintain competence. Currently, there are no formal data to document a correlation between the frequency of AECG interpretation and practitioner competence. Continuing competence as a part of quality assurance programs may be assessed by reviewing a random sample of AECG interpretations performed by the physician requesting continuing privileges.

This sample should be examined by an acknowledged expert in AECG or one who is currently training physicians in the interpretation of the AECG. If no one within an individual institution is qualified to review a candidate’s experience and cognitive skills, a qualified outside expert should be consulted.

In addition to the primary certificate in internal medicine, the American Board of Internal Medicine (ABIM) offers a subspecialty certificate in cardiovascular disease. To become certified in the subspecialty, physicians must satisfy the following requirements:

- Been previously certified in internal medicine by the ABIM
- Completed subspecialty training that required 36 months of cardiovascular disease training, of which a minimum of 24 months is clinical training in the diagnosis and management of a broad spectrum of cardiovascular diseases
- Met the following procedural requirements:
  - Advanced cardiac life support, including cardioversion
  - ECG, including ambulatory monitoring and exercise testing
  - Echocardiography
  - Arterial catheter insertion
  - Right-heart catheterization, including insertion and management of temporary pacemakers
  - Documented competence in the following:
    - Patient care, including medical interviewing, physical examination, and procedural skills
    - Medical knowledge

Positions of other interested parties

ABIM
– Practice-based learning and improvement
– Interpersonal and communication skills
– Professionalism
– Systems-based practice

- Verified clinical competence from both the training program director and the chair of the department of medicine
- Received a satisfactory rating of overall clinical competence, humanistic qualities, and moral and ethical behavior in each of the required years of training
- Proved possession of a valid, unrestricted license to practice medicine in a state, territory, commonwealth, province, or possession of the United States or Canada
- Passed the secure exam for the subspecialty of cardiovascular disease

AOA
The American Osteopathic Association (AOA) grants certification in the subspecialty of cardiology through the American Osteopathic Board of Internal Medicine (AOBIM). Candidates must meet the following minimum requirements to receive certification:
- Be a diplomate of the AOBIM in internal medicine
- Have completed three years of AOA-approved subspecialty training in cardiology
- Have an unrestricted, unchallenged, valid license to practice in the state where their practice is conducted
- Be a member in good standing of the AOA for a continuous period of at least two years immediately prior to the date of certification
- Be able to show evidence or conformity to the standards set in the AOA Code of Ethics if requested
- Demonstrate clinical competence in the practice of cardiology, which is documented by the program director of the subspecialty training program
- Pass a one-day written examination in the subspecialty of cardiology

CRC draft criteria
Minimum threshold criteria for requesting AECG interpretation privileges

The following draft criteria are intended to serve solely as a starting point for the development of an institution’s policy regarding this procedure.

Basic education: MD or DO
Minimum formal training: Successful completion of an Accreditation Council for Graduate Medical Education (ACGME)/AOA-accredited residency or fellowship program
that included training in AECG interpretation. Applicants may also become competent in AECG interpretation by attending well-designed courses conducted by a physician who is experienced in AECG.

**Required previous experience:** Applicants must be able to demonstrate for minimum competence that they have successfully performed at least 150 AECG interpretations. At the discretion of the program director, this experience may be gained in part from teaching sets of AECGs.

**References**

A letter of reference should come from the director of the applicant’s AECG-interpretation training program. Alternatively, a letter of reference regarding competence should come from the chief of electrocardiography at the institution where the applicant most recently practiced.

**Reappointment**

Reappointment should be based on unbiased, objective results of care, according to the organization’s existing quality assurance mechanisms.

Applicants must be able to demonstrate that they have maintained competence by showing evidence that they have successfully performed at least 25 AECG interpretations annually over the reappointment cycle.

In addition, continuing education related to ECG and AECG interpretation should be required.

**For more information**

For more information regarding privileging this procedure, contact:

American Board of Internal Medicine
510 Walnut Street, Suite 1700
Philadelphia, PA 19106-3699
Telephone: 215/446-3500
Fax: 215/446-3633
Web site: www.abim.org

American Osteopathic Association
142 East Ontario Street
Chicago, IL 60611
Telephone: 312/202-8000
Fax: 312/202-8200
Web site: www.aoa-net.org
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American College of Cardiology
Heart House
9111 Old Georgetown Road
Bethesda, MD 20814-1699
Telephone: 301/897-5400
Fax: 301/897-9745
Web site: www.acc.org

American College of Physicians
190 North Independence Mall
West Philadelphia, PA 19106-1572
Telephone: 215/351-2600
Fax: 215/351-2799
Web site: www.acponline.org

American Heart Association National Headquarters
7272 Greenville Avenue
Dallas, TX 75231
Telephone: 214/373-6300
Fax: 214/706-1341
Web site: www.americanheart.org

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Privilege request form
Ambulatory electrocardiography monitoring

To be eligible to request clinical privileges in AECG monitoring, an applicant must meet the following minimum threshold criteria:

- Education: MD or DO

- Minimum formal training: Successful completion of an ACGME/AOA-accredited residency or fellowship program that included training in AECG interpretation. Applicants may also become competent in AECG interpretation by attending well-designed courses conducted by a physician who is experienced in AECG.

- Required previous experience: Applicants must be able to demonstrate for minimum competence that they have successfully performed at least 150 AECG interpretations. At the discretion of the program director, this experience may be gained in part from teaching sets of AECGs.

- References: A letter of reference should come from the director of the applicant’s AECG interpretation training program. Alternatively, a letter of reference regarding competence should come from the chief of electrocardiography at the institution where the applicant most recently practiced.

- Reappointment: Reappointment should be based on unbiased, objective results of care, according to the organization’s existing quality assurance mechanisms.

Applicants must be able to demonstrate that they have maintained competence by showing evidence that they have successfully performed at least 25 AECG interpretations annually over the reappointment cycle.

In addition, continuing education related to ECG and AECG interpretation should be required.

I understand that by making this request, I am bound by the applicable bylaws or policies of the hospital and hereby stipulate that I meet the minimum threshold criteria for this request.

Physician’s signature: _________________________________________________

Typed or printed name: _______________________________________________

Date: _______________________________________________________________