Diagnosing arrhythmias in general practice: the BEAT study
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Chapter 3

Optimal duration of event recording for diagnosis of arrhythmias in patients with palpitations and lightheadedness in general practice

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ABSTRACT

Background
Patient-activated continuous-loop event recorders (CER) are useful as a diagnostic tool in new episodes of palpitations and/or dizziness. So far no analysis of optimal duration for monitoring in unselected patients has been published.

Methods
During a period of 30 days we prospectively evaluated the time until diagnosis using CER in patients with symptoms of palpitations and/or dizziness in general practice.

Results
In total, 127 patients received an event recorder for a maximum duration of 30 days. Events were recorded by 104 patients (82 %), of whom 83 (78%) showed an arrhythmia. After two weeks, 75% of all diagnoses and 83.3% of all clinically relevant diagnoses could be established.

Conclusion
The yield of event recording in general practice diminishes with recording time. A minimum recording time of two weeks seems necessary.

Keywords
Atrial fibrillation, cardiology, diagnostic tests, duration, telemedicine.
INTRODUCTION

Electrocardiogram (ECG) recording during complaints is the reference standard for establishing or excluding a cardiac diagnosis in patients with palpitations. Due to the paroxysmal nature of symptoms, a conventional ECG during complaints can only be made in about one-third of patients.\textsuperscript{1} When symptoms occur frequently, Holter monitoring for one or two days might provide a diagnosis. In case of sporadic symptoms, patient-activated continuous-loop event recorders (CER) allow for a longer observation period and have proven to be more efficacious than Holter monitoring.\textsuperscript{1-4} The optimal duration of event recording was found to be two to six weeks in selected populations.\textsuperscript{3-5} So far, no analysis of optimal monitoring duration in unselected patients with new episodes of palpitations or light-headedness has been published. The aim of this study was to evaluate prospectively the optimal duration of CER monitoring to establish any diagnosis and to establish the time needed to diagnose relevant cardiac arrhythmias.

METHODS

Patients

The methodology of this study has been described in more detail previously.\textsuperscript{2} In summary, GP’s included consecutive adult patients with palpitations or dizziness and provided baseline data on a standard research form. Palpitations were defined as any feeling of abnormal heartbeat or rhythm. Dizziness was defined as a feeling of light-headedness, faintness or near-collapse. When a standard 12-lead ECG did not explain the patient’s complaints a CER was provided for a maximum period of 30 days.

Event Recorder

All patients received a loop recorder CG-6106 (Card Guard, Schaffhausen, Switzerland). It was programmed to store 30 seconds before and 2 minutes after activation by patient. Every time patients experienced the predefined complaints, an ECG-registration was made by the patient and sent by phone to the research center. End points were a conclusive abnormal ECG, or three normal ECGs during symptoms. An experienced cardiologist, who was informed about the patients’ complaints, reviewed all the recordings. If the cardiologist judged the ECG conclusive the patient was instructed to stop recording.

ECG findings

Arrhythmias were defined as all rhythms that were not normal sinus rhythm between 60-100 beats per minute.\textsuperscript{6} Arrhythmias for which medical intervention or referral to a
cardiologist was needed were considered relevant [i.e., paroxysmal atrial fibrillation (AF), atrial flutter, atrial tachycardia, supraventricular tachycardia not specified and ventricular tachycardia]. Less relevant arrhythmias included ventricular or atrial premature beats, sinus tachycardia or bradycardia. Normal sinus rhythm was diagnosed when a patient recorded three symptomatic episodes with no ECG abnormalities, or when at least during one symptomatic episode a normal sinus rhythm was recorded (without any other rhythm abnormality) after thirty days. The outcome was inconclusive if patients did not have complaints during the 30 days monitoring and if they were not able to record during complaints, or when registrations were of poor quality.

**RESULTS**

In total, 127 patients were enrolled. The average age was 50 (range 18-85) years; 94 patients (74%) were women. Time between onset of palpitations and study enrolment varied from one week to 3 months (35%), 3 months to 1 year (27%) and longer then one year (38%). In the last month prior to enrolment, patients reported between one and >30 episodes. A typical episode lasted from less than one minute (19%), 1-5 minutes (21%), 6 minutes to 1 hour (21%) and longer than one hour (19%). Twenty-five patients (20%) were on cardiac medication (beta-blockers, Ca-antagonists and/or digoxin). Two patients were not able to make a registration. A symptomatic episode was recorded in 104 patients (82%); 83 patients (65%) recorded an arrhythmia, of which 24 (29%) proved clinically relevant. In total, 13 relevant arrhythmias (54%) were recorded during the first week, and six (25%) during the second week. Fifty-nine patients (71%) registered a less relevant arrhythmia, of whom 30 (51%) during the first week of registration and 13 (22%) during the second week. At three weeks CER monitoring, 23 (96%) of the relevant, and 50 (85%) of the less relevant arrhythmias were diagnosed (fig 1). The number of episodes during the month prior to enrollment showed a small increase in the likelihood to obtain an early diagnosis (Hazard ratio 1.09, 95% confidence interval 1.024-1.162).

**DISCUSSION**

This study prospectively evaluated the time needed to establish a diagnosis using a CER in patients with palpitations. During 30 days, 104 patients (82%) were able to document a symptomatic episode. Of those 104 patients, 24 (23%) had a relevant arrhythmia and 80 patients (77%) showed less relevant arrhythmia’s or sinus tachycardia. The chance of
finding a relevant arrhythmia diminished over time. In the last 15 days, during which 59 patients carried a CER, four relevant arrhythmias were detected, and in the last 10 days just one. This phenomenon of decreasing diagnostic yield has been described previously in patients referred to a cardiology department. The clinical relevance of the arrhythmia proved to be the most predictive factor for early diagnosis.

The duration of monitoring in this study was limited to 30 days. If a patient registered a clinically less relevant arrhythmia that could explain his/her complaints, the registration was ended. During a follow-up period of 6 months, relevant arrhythmias (AF) were diagnosed in two patients who had been referred by the GP to the cardiologist. Both patients registered a less relevant arrhythmia during the registration period in this study. Thus, diagnosis of additional relevant arrhythmias with other methodologies or longer observation periods are possible. From this relatively small study, one can conclude that the diagnostic yield rapidly diminishes after three weeks (79% of relevant arrhythmias in 2 weeks and 96% in 3 weeks). For longer periods of monitoring, the treating physician has to weigh the decreasing yield of diagnosis against the burden and costs of carrying a CER.

**Figure 1.** The cumulative number and type of diagnosis diagnosed per day of CER monitoring; patients with no diagnosis have been removed from this figure.
REFERENCES


