Optimal duration of event recording for diagnosis of arrhythmias in patients with palpitations and light-headedness in the general practice

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\textbf{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.

\textbf{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.

\textbf{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 2 weeks, 75% of all diagnoses and 83.3% of all clinically relevant diagnoses could be established.

\textbf{Conclusion.} The yield of event recording in general practice diminishes with recording time. A minimum recording time of 2 weeks seems necessary.

\textbf{Keywords.} Atrial fibrillation, cardiology, diagnostic tests, duration, telemedicine.

\section*{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 1 or 2 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{1–3} The optimal duration of event recording was found to be 2–6 weeks in selected populations.\textsuperscript{13,4} 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.

\section*{Methods}

\textbf{Patients}

The methodology of this study has been described in more detail previously.\textsuperscript{2} In summary, GPs 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.

\textbf{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 centre.
Endpoints 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 rhythms between 60 and 100 beats per minute.\(^5\) 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, supra-ventricular 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 during at least one symptomatic episode a normal sinus rhythm was recorded (without any other rhythm abnormality) after 30 days. The outcome was inconclusive if patients did not have complaints during the 30 days of 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 1 week to 3 months (35%), 3 months to 1 year (27%) and longer than 1 year (38%). In the last month prior to enrolment, patients reported between one and >30 episodes. A typical episode lasted from less than 1 minute (19%), 1–5 minutes (21%), 6 minutes to 1 hour (21%) and longer than 1 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 3 weeks of 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 enrolment 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 arrhythmias 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, diagnoses 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 3 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.

Declaration

Conflicts of interest: None.

References

1 Kinlay S, Leitch JW, Neil A, Chapman BL, Hardy DB, Fletcher PJ. Cardiac event recorders yield more diagnoses and are more cost-effective than 48-hour Holter monitoring in patients with palpitations. A controlled clinical trial. Ann Intern Med 1996; 124(Pt 1): 16–20.
2 Zwietering PJ, Knottnerus A, Gorgels T, Rinkens P. Occurrence of arrhythmias in general practice. Scand J Prim Health Care 1996; 14: 244–250.
3 Hoefman E, van Weert HC, Reitsma JB, Koster RW, Bindels PJ. Diagnostic yield of patient-activated loop recorders for detecting heart rhythm abnormalities in general practice: a randomised clinical trial. Fam Pract 2005; 22: 478–484.
4 Reiffel JA, Schulhof E, Joseph B, Severance E, Wyndus P, McNamara A. Optimum duration of transtelephonic ECG monitoring when used for transient symptomatic event detection. J Electrocardiol 1991; 24: 165–168.
5 Zimetbaum PJ, Kim KY, Josephson ME, Goldberger AL, Cohen DJ. Diagnostic yield and optimal duration of continuous-loop event monitoring for the diagnosis of palpitations. A cost-effectiveness analysis. Ann Intern Med 1998; 128: 890–895.