

# Use of event recorders and loop recorders in clinical practice: results of the European Heart Rhythm Association Survey

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Several kinds of electrocardiogram monitoring systems are now available in the clinical practice. The aim of this European Heart Rhythm Association (EHRA) survey was to assess the use of different monitoring techniques in the evaluation of patients with unexplained syncope, palpitations, and in those with established diagnosis of atrial fibrillation. Forty-five centres in Europe answered the questionnaire and the majority (78%) were university hospitals. The answers showed a discrepancy between the recommended use of implantable loop recorders (ILRs) in patients with unexplained syncope and the use of this device in clinical practice. In most of the cases only a minority of patients (<20%) seemed to actually receive an ILR as a part of the diagnostic process in accordance to the current guidelines. Holter monitoring systems and external loop recorders seemed to be the preferred monitoring techniques both in patients with recurrent palpitations and in those with established diagnosis of atrial fibrillation.

**Keywords** Electrocardiogram monitoring system • Loop recorder • Syncope • EHRA survey • EP wire

## Introduction

Syncope and recurrent palpitations are frequent causes of hospitalization and often a diagnostic challenge for the physician.

Current guidelines for the management of patients with syncope,<sup>1,2</sup> palpitations,<sup>3</sup> and atrial fibrillation (AF)<sup>4</sup> recommend the use of prolonged electrocardiogram (ECG) monitoring techniques to better establish the correlation between the symptoms and a specific ECG finding.

The choice of monitoring technique in different clinical situations should be driven by the predicted recurrence rate of symptoms.

The purpose of this European Heart Rhythm Association (EHRA) EP wire survey was to evaluate the use of different event recorder systems in patients with unexplained syncope, palpitations, and in those with established diagnosis of AF.

## Methods and results

### Participating centres

This survey is based on a questionnaire sent via the Internet to the EHRA electrophysiology research network centres. Of 45 responding centres, 35 (78%) were university hospitals, 4 were private hospitals (9%), and the remaining 6 (13%) were other type of hospitals. Despite the relatively small sample size, there was a wide geographical distribution

among the centres including 17 different countries (6 centres in Italy; 5 in Denmark and Spain; 4 in UK, France, and Germany; 3 in Greece, Norway, and Sweden, and 1 centre in Austria, Belgium, Bulgaria, Estonia, Georgia Luxembourg, Romania, and Serbia, respectively).

Most of the centres were medium- (200–399, 36%) or high-volume (>400, 45%) pacemaker and implantable cardioverter-defibrillator implanting centres. The use of external loop recorder (ELR) and Holter monitoring in the responding centres is shown in *Table 1*. Most of the centres implanted a medium numbers of implantable loop recorders (ILRs) per year with 20 centres (45%) implanting between 1 and 19 devices and 12 (27%) implanting between 20 and 49 ILRs. Ten centres (23%) implanted >50 ILRs per year and two (5%) did not implant any.

### Evaluation of patients with syncope

Forty-two centres provided answers to the questions regarding the use of ILR in different clinical settings.

The complete set of data regarding the use of ILRs in patients with syncope is shown in *Figure 1*.

For recurrent syncope in patients with no structural heart disease, 21 centres (50%) used an ILR in <20% of the cases, 14 (33%) in 20–49% of the cases, and only 2 centres (5%) used an ILR in over 80% of the cases.

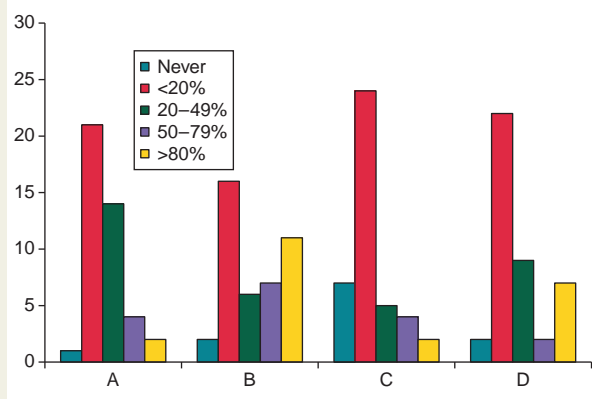
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**Table 1** Holter and ELR recordings per centre (N = 44)

Recordings numbers	0	1–99	100–199	200–399	>400
Holter	0	1	4	2	37
ELR	8	23	8	2	3

ELR, external loop recorder.



**Figure 1** Use of ILR in syncope. A, recurrent syncope with no structural heart disease; B, recurrent syncope in high-risk patients; C, bradycardia in neurally mediated syncope; D, possible arrhythmia in recurrent transient loss of consciousness.

In high-risk patients in whom a comprehensive evaluation could not clarify the cause of syncope, 16 centres (38%) used an ILR in <20% of the cases and only 11 centres (26%) used this device in over 80% of the cases.

In the case of neurally mediated syncope, most centres (57%) used an ILR in <20% of the cases to assess the role played by bradycardia. Only six centres (14%) used an ILR in >50% of the cases in this clinical scenario.

Similar results were observed for the use of ILRs to exclude arrhythmic mechanism in patients experiencing transient loss of consciousness on a monthly basis: 22 centres (52%) used the device in <20% of the cases, 9 (21%) in 20–49% of the cases, and only 7 centres (17%) used it in >80% of the cases.

Most of the centres (69%) only occasionally implemented an ILR to document arrhythmic causes of syncope in patients with inherited cardiomyopathies, while 21% of the responding centres often used ILR in this case. The remaining centres never used ILR in this kind of patients.

Regarding the ILR type, 57% of the centres used an insertable one (Medtronic Reveal LINQ®); 46% of those centres used it in all cases where an ILR was indicated, 15% used it more often than a traditional one, and 39% of the centres used it less often than a traditional ILR.

The reason for a more frequent use of the insertable ILR appeared to be related to its dimension that makes it more suitable for children and very slim patients, while the main reason for a more conservative use of this new device was its high price.

Patients who received ILRs were followed up with onsite visits every 3 or 6 months in most of the centres (62%), while in 26% of the centres the follow-up was performed using mainly a remote

**Table 2** Monitoring methods in patients with known AF (N = 42)

	Rate control	Rhythm control	Post-ablation
24–48 h Holter	29	27	24
7-day Holter	3	4	5
ELR	2	3	4
ILR	0	1	2
No monitoring	8	7	5

ELR, external loop recorder; ILR, implantable loop recorder.

monitoring systems combined with onsite visits at specific intervals and only 12% of the centres used exclusively remote monitoring systems follow-up.

Holter monitoring systems and ELRs were also commonly used to evaluate patients with syncope. In the majority of the centres (62%), either method was used in case of recurrent syncopal episodes, while in 29% of the centres these options were preferred after one isolated episode. In 9% of the centres, these monitoring options were never implemented to evaluate patients with syncope.

## Evaluation of patients with palpitations

Forty-two centres provided answers to the questions regarding the management of patients presenting with palpitations.

In case of palpitations occurring on a weekly basis or more often, the preferred monitoring method (64%) was 24 or 48 h Holter. An ELR was implemented as a primary choice in 17% of the centres, while in 17% of the centres an ELR was used only if the Holter monitoring had failed to document the cause of palpitations. In one centre (2%), neither Holter monitoring nor ELR was used.

In the case of palpitations occurring less often than once a week, the preferred monitoring method (40%) was ELR while 24 or 48 h Holter monitoring was the primary choice in 36% of the centres. In 22% of the centres, ELR was used only if Holter monitoring had failed to document the cause of palpitations. In one centre (2%), neither Holter monitoring nor ELR was used in this clinical scenario.

Only a minority of centres (5%) used ILR as primary choice in patients with undocumented palpitations, while in most centres (67%) this was considered an option only if both Holter and ELR had not yielded any diagnostic finding.

## Event recorders in the management of atrial fibrillation

Forty-two centres provided answers to the questions regarding the management of patients with AF.

The preferred monitoring method for patients with established diagnosis of AF was 24 or 48 h Holter monitoring which was implemented to evaluate adequate rate control in 69% of the centres, to assess the rhythm control during treatment with antiarrhythmic drugs (64% of the centres) and for detection of recurrence after AF ablation (60% of the centres). All the results regarding the choice of monitoring systems in AF patients are presented in Table 2.

Forty centres answered the question regarding how patients with CHA<sub>2</sub>DS<sub>2</sub>-VASc score 2 or higher were evaluated for asymptomatic AF; most centres (58%) used 24 or 48 h Holter monitoring while 7-day Holter (5%), ELR (5%), and ILR (2%) were more seldom used. In 30% of the responding centres, no monitoring system was used in this kind of patients.

## Discussion

The most interesting finding of this survey is the discrepancy between clinical practice and the current guidelines on the use of ILRs in patients with unexplained syncope.

With the exception of high-risk patients with recurrent syncope and a negative screening, whereby 43% of the centres would resort to ILR implantation in >50% of the cases, in all other instances the use of ILRs was limited to <20% of the cases in most of the centres.

This finding is however not unique; Vitale et al.<sup>5</sup> have also reported a large discrepancy between the use of ILRs in patients with unexplained syncope and indications according to the current guidelines with only one-fifth of the patients that qualified for an ILR being correctly treated. In the same study, the proportion of patients receiving an ILR was even lower (14% of the cases) in the case of concomitant heart disease and unexplained syncope.<sup>5</sup>

External loop recorders in unexplained syncope and pre-syncope are considered a Class IIA indication and their diagnostic yield is directly related to the probability of syncope recurrence. In this respect, new ELR devices with auto-trigger function and mobile cardiac outpatient telemetry have been showing promising results.<sup>6</sup> Recently, Locati et al.<sup>7</sup> have reported a diagnostic yield of 30% with new ELRs in patients with unexplained syncope which is comparable with the diagnostic yield of ILRs during a relatively short timeframe.

In patients with palpitations of unknown origins, the preferred monitoring technique in this survey seemed to be Holter monitoring. This method has a very high specificity in confirming a diagnosis of arrhythmic vs. non-arrhythmic palpitations but it has a rather low sensitivity value (30–35%).<sup>8</sup> In patients with quite frequent symptoms, ELRs and event recorders have shown a higher diagnostic value and therefore also a better cost-effectiveness ratio than Holter devices.<sup>9</sup>

The use of ILRs in undocumented palpitations is recommended in cases with severe infrequent symptoms when other monitoring systems have failed to clarify the underlying cause,<sup>2,3</sup> and in our survey this recommendation was followed in the majority of the cases.

In patients with diagnosed AF, monitoring with Holter recordings or ELR is recommended in the current guidelines<sup>4</sup> and the results of our survey show a good adherence to these recommendations particularly regarding the evaluation of rate and rhythm control. On the other hand, a majority of the centres relied on 24 or 48 h Holter monitoring also to assess the efficacy of treatment after AF ablation. It is well established, however, that relying on such a short duration of monitoring may overestimate the number of patients truly free from AF. Dagres et al.<sup>10</sup> demonstrated that a Holter duration of <4 days can miss a great proportion of arrhythmia recurrences and that a 24 h Holter would only detect 59% of recurrences.

In conclusion, the results of this survey show a poor adherence to the guidelines regarding the use of ILRs in unexplained syncope and better results in the use of ECG monitoring systems in patients with palpitations and AF. A possible explanation of these findings

could be that ILRs have traditionally been regarded as expensive and more invasive monitoring tools. The recent advent of a new insertable ILR might increase the number of patients monitored with ILRs and eventually help to establish a diagnosis in a larger number of patients.

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