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Review Article

ambulatory ECG monitoring in the Management of atrial fibrillation among post-myocardial infarction patients

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Abstract

Background: Atrial fibrillation (AF) complicates a substantial proportion of myocardial infarction (MI) admissions and is independently associated with higher mortality, yet much post-MI AF is paroxysmal and escapes brief inpatient telemetry or standard Holter recording.

Objective: This review synthesizes evidence on ambulatory ECG monitoring for detecting and managing AF after myocardial infarction, and how findings should translate into anticoagulation and rhythm-control decisions.

Methods: We reviewed cohort data on post-MI AF epidemiology, comparative studies of Holter, patch, and loop-recorder monitoring, plus randomized evidence on AF duration, stroke risk, and guideline recommendations.

Findings: Diagnostic yield for AF rises with monitoring duration and repetition, from Holter recording through multi-year loop-recorder surveillance; stroke risk from device-detected AF scales with episode duration and vascular risk, and post-MI patients typically already carry an elevated CHA2DS2-VASc score that makes detected AF more actionable than in lower-risk screening.

Conclusions: A structured, risk-stratified ambulatory monitoring pathway after myocardial infarction, matching intensity and duration to stroke risk and interpreting AF burden jointly with overall risk, offers a practical route to meaningful stroke prevention.

Keywords: atrial fibrillation; ambulatory ECG monitoring; myocardial infarction; stroke prevention; implantable loop recorder

1. Introduction

Atrial fibrillation (AF) complicates roughly 6-21% of hospitalizations for acute myocardial infarction (MI), ranging from a brief self-terminating episode noted only on the telemetry strip to a sustained arrhythmia persisting beyond discharge [1]. AF arising around MI is not a benign bystander: registry data from GISSI-3 showed new-onset AF independently predicted higher in-hospital and 6-month mortality, and elderly patients with AF complicating MI had substantially worse survival than those remaining in sinus rhythm [2,3]. A pooled analysis confirmed this excess mortality persists after adjustment for infarct size and left ventricular function [4], and in the OPTIMAAL population, concomitant left ventricular dysfunction carried an especially steep hazard for subsequent stroke and death [5]. A systematic review spanning several decades confirmed the consistency of this association while noting how heterogeneous reported AF incidence has been depending on monitoring intensity [6].

That heterogeneity is the starting premise of this review: much of the variability in reported post-MI AF incidence, and much of the missed opportunity to intervene, traces back to monitoring intensity rather than any real difference in underlying burden. AF is an established independent risk factor for ischemic stroke, first demonstrated in the Framingham cohort and confirmed in subsequent prevalence studies, so a missed diagnosis after MI is a missed opportunity for stroke-preventive anticoagulation in a population already at elevated vascular risk [7,8]. This review synthesizes the evidence on ambulatory ECG monitoring, from Holter recording through adhesive patches, external loop recorders, wearables, and implantable loop recorders, for detecting and managing AF after MI.

2. Epidemiology and prognostic significance

Reported AF incidence after MI depends heavily on surveillance intensity and case-mix, but clusters at

roughly 6-20% across large registries, with higher rates in older patients, larger infarcts, and reduced ejection fraction [1,6]. New-onset AF appears to carry prognostic weight distinct from pre-existing AF, with several cohorts reporting a steeper mortality gradient for the new-onset group, consistent with acute atrial stretch creating a substrate that is both arrhythmogenic and a marker of hemodynamic compromise [3,2]. The OPTIMAAL experience showed AF's incremental hazard is not simply explained by ejection fraction alone [5].

Because much of this literature relies on in-hospital telemetry or a single admission ECG, it systematically underestimates paroxysmal AF that recurs, or first appears, after discharge. This is precisely where ambulatory monitoring has the greatest potential to change practice: patients who never manifest AF on inpatient telemetry often have paroxysmal episodes detectable only with prolonged outpatient recording, a pattern well documented in cryptogenic stroke survivors, a population with comparable vascular risk [9,10]. Pooled evidence from AF detection after stroke and TIA found diagnostic yield rose steadily with duration and number of monitoring episodes, a dose-response relationship directly relevant to post-MI surveillance design [11].

3. Rationale for ambulatory monitoring in this population

Post-MI patients make a particularly strong case for prolonged ambulatory monitoring for three reasons. First, the atrial substrate created by ischemia, stretch, and neurohormonal activation persists well beyond the acute admission, so the arrhythmogenic risk period outlasts inpatient telemetry. Second, post-MI patients already meet or exceed the vascular risk thresholds, hypertension, diabetes, prior vascular disease, advancing age, that define a high CHA2DS2-VASc score, so AF detected in this group typically crosses the threshold for anticoagulation [12]. Third, the population is already engaged with structured cardiology follow-up, a natural point of contact

for prescribing ambulatory monitoring that general screening populations lack.

Table 1: Comparative characteristics of ambulatory ECG monitoring modalities used in post-myocardial infarction atrial fibrillation surveillance [16,17,18,20].

Modality	Typical duration	Invasiveness	Relative diagnostic yield
24-48 h Holter monitor	1-2 days	Noninvasive	Lowest; misses infrequent paroxysmal AF
Adhesive patch monitor	7-14 days	Noninvasive	Moderate-high; outperforms standard Holter
External/mobile loop recorder	Up to 30 days	Noninvasive	Moderate-high; real-time transmission
Implantable loop recorder	Up to 3 years	Minor implant procedure	Highest cumulative yield
Consumer wearable (PPG/ECG)	Continuous, patient-worn	Noninvasive	High reach; requires ECG confirmation

The broader screening literature supports extending monitoring beyond inpatient windows in exactly this kind of elevated-risk population. The AF-SCREEN international collaboration concluded that patients with an already elevated stroke risk profile, which describes most post-MI survivors, stand to gain the most from detection [13]. STROKESTOP demonstrated that intermittent handheld ECG recording meaningfully increases AF detection in an elderly at-risk population, while mSToPS showed a wearable adhesive patch roughly triples new AF diagnosis compared with usual care over a year [14,15]. Neither trial enrolled post-MI patients specifically, but their diagnostic-yield findings translate directly, since the underlying detection problem is the same.

4. Monitoring modalities: from Holter to implantable devices

Ambulatory ECG monitoring spans a spectrum of duration, invasiveness, and yield, and no single modality suits every post-MI patient. The 24-48 hour Holter monitor remains the most available option and is adequate for frequent, near-daily symptoms, but its brief

window is poorly suited to paroxysmal AF recurring only every few weeks. A direct comparison of 24-hour Holter monitoring against a 14-day continuous adhesive patch found the patch detected arrhythmia events, including AF, at a substantially higher rate simply because of its longer window [16], underlying the general shift toward longer-wear devices for genuinely paroxysmal arrhythmias.

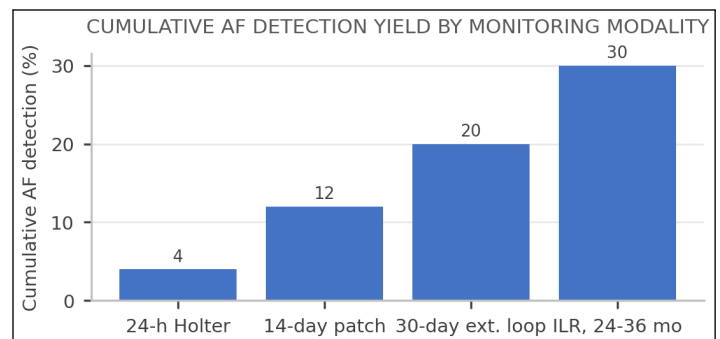


Figure 1: Approximate cumulative atrial fibrillation detection yield by ambulatory monitoring modality and duration, rising from roughly 4% with a single 24-hour Holter recording to approximately 30% with implantable loop recorder (ILR) surveillance sustained over 24-36 months [16,9,18].

External loop recorders and mobile telemetry extend observation further, in some configurations to 30 days or more, with real-time transmission flagging actionable episodes without waiting for device retrieval, useful for titrating therapy against longitudinal rhythm data rather than a single monitoring snapshot [17].

Implantable loop recorders (ILRs) offer continuous surveillance for up to three years and the highest cumulative yield of any modality. CRYSTAL-AF, in cryptogenic stroke patients, found ILR monitoring detected AF in roughly 30% of patients by three years, far more than any short-duration external monitor in the comparator arm [9]. REVEAL AF extended this to a broader high-risk population without prior stroke and found a similarly high cumulative detection rate over 18-30 months [18]. The LOOP study tested this strategy at scale, randomizing older adults with vascular risk factors to ILR versus usual care, and confirmed markedly higher detection in the monitored arm, though detection alone

did not proportionally reduce stroke events [19].

Consumer wearables offer a complementary, lower-cost option for extended surveillance outside the clinic. The Apple Heart Study showed a smartwatch-based irregular pulse notification algorithm could flag AF in a very large unselected population, with a meaningful proportion of notified participants confirmed on patch monitoring [20], and photoplethysmography-based smartphone screening achieved high sensitivity and specificity against ECG confirmation [21]. The Fitbit Heart Study replicated these findings at comparable scale [22]. None enrolled a dedicated post-MI cohort, but their feasibility positions wearables as a plausible adjunct for lower-risk patients for whom a prescription-grade patch or ILR may not be justified.

5. Diagnostic yield, AF burden and anticoagulation decisions

Across modalities, diagnostic yield for AF rises consistently with observation duration and the number of discrete monitoring episodes, a dose-response relationship demonstrated most clearly in post-stroke AF detection but directly applicable to post-MI surveillance [11]. No strategy has perfect sensitivity: a 14-day patch outperforms a 24-hour Holter but still misses episodes recurring at longer intervals; an ILR outperforms external monitors of any duration but requires an implant procedure; wearables offer very long observation windows at low cost but at the price of false positives requiring confirmatory ECG [16,20,19]. Matching monitoring intensity to individual post-MI stroke risk, rather than a single default strategy, follows directly from this trade-off.

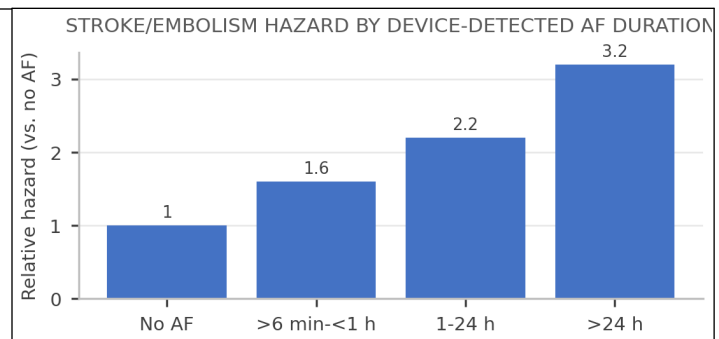


Figure 2: Relative hazard of stroke or systemic embolism by device-detected atrial fibrillation duration category, showing a graded rise from brief subclinical episodes exceeding six minutes through sustained episodes beyond 24 hours [23,24,25].

A detected AF episode is not by itself sufficient for an anticoagulation decision; episode duration and overall stroke risk jointly determine whether detection should translate into therapy. ASSERT, using continuous atrial high-rate episode logging from implanted devices, established that even subclinical episodes lasting more than six minutes were associated with a significantly increased risk of subsequent stroke or systemic embolism, though at lower magnitude than clinical AF [23]. A subsequent analysis of the same cohort found stroke risk rose with maximum daily AF duration, with episodes exceeding roughly 24 hours conferring a substantially higher hazard, establishing a duration gradient rather than a binary threshold [24]. A pooled analysis of more than 10,000 device patients from the SOS AF project corroborated this relationship and helped establish the thresholds that continue to inform guidance around device-detected AF [25].

Kaplan and colleagues showed stroke risk from device-detected AF scales jointly with episode duration and CHA2DS2-VASc score, so a given burden confers markedly different absolute risk depending on the surrounding risk profile, directly relevant to post-MI patients who already carry an elevated vascular risk score [12]. This argues against a single duration threshold applied uniformly; a patient with additional risk factors may warrant anticoagulation at a shorter detected duration. Randomized-trial evidence for stroke

prevention, across dabigatran, rivaroxaban, and apixaban against warfarin, provides the therapeutic backbone that makes ambulatory AF detection clinically consequential [26,27,28].

6. Guideline recommendations and a practical pathway

Contemporary society guidelines have progressively formalized ambulatory monitoring's role. The 2020 ESC guidelines recommend opportunistic screening in patients over 65 and note the added yield of prolonged monitoring in elevated-risk presentations overlapping substantially with post-MI patients [29]. The preceding 2016 update had already incorporated ASSERT and SOS AF evidence into its discussion of device-detected subclinical AF, cautioning that management required individualized risk-benefit assessment [30]. The 2019 AHA/ACC/HRS focused update similarly reinforced ambulatory monitoring's role in high embolic-risk populations while emphasizing that anticoagulation decisions should weigh duration, cumulative burden, and risk factors jointly [31]. EAST-AFNET 4's demonstration that early, systematic rhythm-control therapy improved cardiovascular outcomes in recently diagnosed AF has further sharpened the stakes of timely detection [32].

In practice, monitoring intensity should match individual stroke risk: an extended-wear patch of 14 days or more is a reasonable first-line strategy for post-MI patients with an elevated CHA2DS2-VASc score [16], escalation to an ILR is warranted when initial monitoring is negative but suspicion remains high [9,18], and wearables serve as a scalable adjunct for lower-risk patients provided positive notifications are confirmed with ECG-grade recording [20,22]. Any detected episode should be interpreted jointly with CHA2DS2-VASc profile and duration, following the risk-stratified framework from ASSERT, SOS AF, and Kaplan and colleagues [23,25,12].

7. Conclusion

AF complicating or following MI carries substantial

prognostic weight, yet a meaningful proportion, particularly paroxysmal episodes recurring after discharge, escapes detection by brief inpatient telemetry or standard Holter monitoring alone [1,6,4]. Evidence from extended patch monitors, telemetry, implantable loop recorders, and wearables consistently shows diagnostic yield rising with monitoring duration and repetition, translating directly to the post-MI setting [16,9,11]. Because post-MI patients typically already carry an elevated CHA2DS2-VASc score, AF detected through ambulatory monitoring is more often actionable than in a lower-risk screening population, strengthening the case for structured, risk-stratified surveillance after MI [12,13]. A pragmatic pathway matching monitoring intensity to stroke risk, confirming wearable-flagged episodes with ECG-grade recording, and interpreting detected burden jointly with overall risk offers the most direct route to converting these advances into meaningful stroke prevention [29,31,32].

Table 2: Summary of society guideline positions on ambulatory and device-detected atrial fibrillation monitoring relevant to post-myocardial infarction risk stratification [29,30,31,32].

Guideline	Year	Key recommendation on ambulatory/device-detected AF
[30]	2016	Individualized risk-benefit assessment for device-detected subclinical AF
[29]	2020/2021	Opportunistic screening age >65; prolonged monitoring in elevated-risk presentations
[31]	2019	Ambulatory monitoring endorsed for high embolic-risk populations, duration/burden considered
[32]	2020	Early rhythm-control therapy supported once AF is diagnosed in at-risk patients

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