CASE REPORT

Consumer Wearable Device Leads to Expedited Diagnosis and Treatment of Paroxysmal Atrial Fibrillation

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KEYWORDS

Paroxysmal atrial fibrillation

Device

Wearable

Accessibility

Cost-effective

ABSTRACT

Paroxysmal atrial fibrillation (AF) is typically characterized by intermittent episodes of disorganized electrical activity that frequently go undetected due to their brief duration and sporadic nature. Conventional diagnostic methods often fail to identify these episodes, especially when asymptomatic and infrequent, contributing to delayed diagnosis and increased stroke risk. The emergence of consumer-wearable devices has enabled continuous real-time monitoring and self-recording of arrhythmic events, helping to bridge gaps between symptom onset, clinical diagnosis, and management. This case report describes a 59-year-old male who used his consumer-wearable device to document symptomatic episodes of paroxysmal AF, which led to expedited diagnosis and management, including pulmonary vein isolation ablation. Increased recognition of the transformative potential of wearable monitors may optimize patient-centered outcomes in AF diagnosis and management by enhancing both patient autonomy and accessibility in cardiovascular care.

INTRODUCTION

Atrial fibrillation (AF) is the most common arrhythmia encountered in clinical practice and is projected to affect 6 to 12 million Americans by 2050.[1] More than 37 million people worldwide currently have AF, and its prevalence is expected to double within the next 30 years.[2] AF is defined by its paroxysmal nature as patients may experience episodes of disorganized atrial electrical activity that begin and end spontaneously, often lasting less than 48 hours but sometimes persisting for up to 7 days.[3] These intermittent and unpredictable episodes can manifest with symptoms such as palpitations, irregular heartbeats, fatigue, or lightheadedness. However, episodes can go undetected in individuals who do not experience symptoms.[3] The sporadic presentation of AF poses significant diagnostic challenges for both patients and clinicians, as the arrhythmic events may be infrequent and asymptomatic. Paroxysmal AF affects a broad spectrum of patients, presenting as recurrent self-terminating episodes that may occur multiple times per week or per year, with some cases progressing to persistent forms over time.[4] Because conventional short-term diagnostic tests often fail to capture the arrhythmia, especially in patients with infrequent or silent episodes, long-term monitoring becomes essential.[5] The economic and clinical burden of AF is substantial, with annual costs in the United States (US) alone reaching up to $26 billion (US).[6] Estimated prevalence in the US is approximately 4.48%, though this almost certainly underestimates the actual disease prevalence due to difficulties in detecting paroxysmal and asymptomatic cases.[7]

Diagnosis of paroxysmal AF conventionally relies on capturing the temporal pattern of the arrhythmia episode, which is identified by irregularly irregular RR intervals and absent P waves on a 12-lead electrocardiogram (ECG) or rhythm strip.[8] Conventional modalities such as short-duration ECGs and Holter monitoring frequently fail to detect paroxysmal or asymptomatic AF, especially in those with infrequent symptoms.[6] Although devices such as an implantable loop recorder (ILR) can provide greater sensitivity, their use is limited by high cost, invasiveness of the procedure, and the fact that it is often restricted to individuals at the highest risk for adverse events.[9]

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 Print 1877-573X; Electronic ISSN 1877-5748 doi: 10.33181/18308

The authors have no financial support or conflicts to disclose.

Emergence of mobile and consumer-wearable-driven technology has dramatically expanded the landscape of arrhythmia detection. Devices such as smartwatches and smartphone-enabled ECG platforms allow individuals to record their own rhythm in real-time and employ automated algorithms for arrhythmia analysis.[10] The Apple Heart Study, which included over 400,000 participants, found that 34% of those who received an irregular pulse notification were confirmed to have AF via ECG patch monitoring, and the algorithm demonstrated a positive predictive value of 84% for concurrent AF.[11] The Fitbit Heart Study enrolled more than 450,000 participants and reported that approximately 1% experienced irregular heart-rhythm detections.[12] With about one-third of those participants having confirmed AF using an ECG patch, this led to a positive predictive value of approximately 98% for irregular rhythm notifications.[12] Another study of 346 participants using various consumer-wearable algorithms reported detection sensitivities for simulated AF burden of 64.4% for Fitbit and up to 82.2% for the Apple Watch.[13] These values outperformed conventional Holter and patch monitors when users ensured sustained device wear.[13] The clinical impact is substantial, as real-time notifications can help improve patient adherence to monitoring, expedite confirmation, and facilitate earlier evidence-based arrhythmia management.

Long-term accessible monitoring provided by these devices expands arrhythmia surveillance, increasing detection of asymptomatic or intermittent AF in community and primary care settings, and reduces AF morbidity through timely intervention. Management of paroxysmal AF focuses on stroke prevention, symptom control through medication or ablation therapy, and modification of risk factors such as hypertension, obesity, sleep apnea, diabetes, and alcohol use.[1,7] Integrating wearable device data into electronic health records and care workflows creates new opportunities for remote and hybrid management, further supporting expedited clinical decision-making.

CASE PRESENTATION

A 59-year-old male presented with a 2-year history of recurrent episodes characterized by increased heart rate, palpitations, fatigue, and occasional shortness of breath. These episodes occurred once or twice weekly and gradually increased in both duration and severity, with some lasting up to 24 hours. He reported that his symptoms began insidiously and were not associated with any specific exertion or time of day, despite a regular exercise routine involving running. The patient documented several episodes through his smartphone using a consumer-wearable device, which were subsequently determined to be paroxysmal AF by a cardiologist friend outside the clinical setting. Despite the persistence of his symptoms, he had not previously sought a formal cardiology evaluation.

The patient's past medical history was notable for atopic rhinitis, actinic keratosis, longstanding left ear fullness and tinnitus, and asymmetrical sensorineural hearing loss. His surgical history included a hernia repair. The patient denied tobacco or vaping product use and reported moderate alcohol consumption consisting of approximately eight standard drinks per week. There was no history of illicit drug use. Family history revealed lung cancer, hypertension, and kidney failure.

On presentation at the family medicine clinic, his vital signs were stable with blood pressure of 132/80 mmHg and a resting rate of 50 beats per minute. Physical examination demonstrated a normal cardiac rate and regular rhythm with intact heart sounds (S1, S2), normal peripheral pulses, and normal respiratory effort with clear breath sounds. Review of systems was significant for malaise, fatigue, palpitations, and intermittent numbness/weakness. Initial laboratory evaluation was overall within normal range, with a blood urea nitrogen of 16 mg/dL, creatinine 0.92 mg/dL, potassium level 5.0 mmol/L, hemoglobin 14.7 g/dL, total cholesterol 200 mg/dL, LDL 130 mg/dL, HDL 44 mg/dL, triglycerides 146 mg/dL, and HbA1c 5.5%.

Initial management focused on ambulatory rhythm monitoring using a consumer-wearable device for patient convenience to differentiate AF from premature beats. A confirmed episode of AF lasting several hours prompted a comprehensive laboratory workup, including thyroid function testing, and referral to cardiology. Transthoracic echocardiography revealed a dilated aortic root and ascending aorta, each measuring 4.1 cm, with mildly increased left atrial volume. Left ventricular size, wall thickness, and systolic function (ejection fraction 60%) were normal.

Given continued symptomatic episodes, it was recommended that the patient undergo continued cardiac monitoring for 30 days to attempt to document the arrhythmia. However, given the patient had documented paroxysmal AF from the rhythm strips produced by his consumer-wearable device, his care was able to be expedited straight to discussing treatment options. These included pharmacologic therapy with flecainide or a more definitive catheter-based ablation procedure. The patient decided to undergo the pulmonary vein isolation ablation procedure. Postablation, the patient reported a dramatic improvement in symptoms. He had one rare recurrence during skiing that quickly responded to flecainide.

At follow-up, the patient remained asymptomatic and free from AF without ongoing antiarrhythmic therapy. Serial home blood pressure monitoring demonstrated well-controlled systolic pressures (<130 mmHg). Although his

TABLE 1: A clinician's ABCD guide to wearable device use in clinical practice.

Letter	Component	Practical Considerations for Clinicians Using Wearables in Cardiovascular Care	Reference
A	Assess	Assess the clinical need and appropriateness for wearable use (e.g., arrhythmia detection, risk stratification). Evaluate device accuracy, regulatory status, and patient characteristics.	[14]
B	Be aware	Be aware of device limitations, potential sources of error (motion artifacts, skin tone, comorbidities), and data privacy concerns. Stay updated on device validation studies and regulatory changes.	[14]
C	Communicate	Communicate clearly with patients about device capabilities, limitations, and expectations. Educate on proper use, data interpretation, and when to seek medical attention.	[14]
D	Document/decide	Document device findings in the medical record. Decide on clinical action based on wearable data, integrating with standard diagnostic pathways, and confirming findings with gold-standard tests as needed.	[14]

CHA_2DS_2-VASc score was 1, the patient preferred to remain off anticoagulation after a thorough discussion of risks and benefits. Ongoing surveillance was recommended due to his aortic root dilation, with repeat imaging scheduled. The patient's counseling emphasized that the pulmonary vein isolation is not curative, and there is still a risk of recurrent symptoms in the years following the procedure. The patient expressed understanding of his condition and agreed to continue symptom monitoring, promptly report any changes, and follow up as directed in the clinic.

DISCUSSION

This case raises important considerations regarding the expanding and transformative role of consumer-wearable devices in diagnosing and managing paroxysmal AF, particularly for individuals in low-resource and medically underserved settings. Wearable devices uniquely bridge the gap between symptom onset and clinical confirmation by enabling continuous real-time monitoring and rhythm strip capture during symptomatic episodes without the need for scheduled clinic visits or invasive device placement.

Increasing availability of wearable technology reflects a broader shift toward enhanced patient autonomy in cardiac arrhythmia monitoring. This case is notable for the patient's use of a personal smartphone-linked wearable device to document symptomatic arrhythmia episodes outside of the clinical setting. As a result, the patient was able to bypass delays and logistical obstacles associated with traditional ambulatory monitoring and go directly to treatment. Upon presentation, this patient was able to forego repeat 30-day ambulatory monitoring and instead immediately proceed to a management strategy discussion and timely referral for pulmonary vein isolation ablation. This expedited approach minimized the burden and costs of redundant diagnostic processes, reduced time to definitive therapy, and potentially lowered the patient's risk of arrhythmia-related complications. Furthermore, this case demonstrates how wearable technology can empower patients to independently bridge critical diagnostic gaps, providing longitudinal data that support early diagnosis and accelerate access to definitive care in settings where formal cardiology evaluation and resources may be limited.

From a systems perspective, this case highlights how the surge in wearable-device adoption has pushed the cardiovascular management field toward a more decentralized and personalized care model. This may allow clinicians to offer wearable devices to patients in rural and low-resource settings to facilitate arrhythmia diagnosis. Guidelines such as the practical "ABCD" guide for clinicians, corroborated by Elshazly and colleagues (Table 1), could be further investigated to help evaluate a device's accuracy, clinical utility, cost, and alignment with established best-practice guidelines.[14]

Table 1 provides clinicians with a practical framework to integrate wearable devices into cardiovascular care by emphasizing the need to assess clinical appropriateness of wearable devices on an individualized basis.[14]

Although wearable technologies may expand arrhythmia surveillance and improve detection sensitivity, they unfortunately can pose risks and barriers to patients. Many wearable devices exhibit high sensitivity but lower specificity, which can lead to false positives, especially among younger healthier users.[15] This can contribute to potential overdiagnosis of arrhythmic episodes and unnecessary patient anxiety.[15] Conversely, older and high-risk populations, who may have the most benefit from consumer-wearable devices, may be less likely to use them. Additionally, potential barriers such as the need for electronic-device skills, software familiarity, and adequate financial support could exacerbate existing health disparities. A cost analysis of current arrhythmia-monitoring options is provided in Table 2.[14]

For osteopathic physicians and other healthcare clinicians, the implementation of wearable devices for AF monitoring aligns closely with the tenets of osteopathy and reinforces the importance of a holistic multidisciplinary approach to patient care. Wearable technologies enable patients to take an active role in their health management and allow clinicians to develop individualized care plans that consider both physiologic and psychosocial factors. This approach facilitates the integration of wearable data

TABLE 2: Cost analysis of current arrhythmia monitoring options.

Device Type	Monitoring Modality	Upfront/Per-Use Cost (USD)	Replacement Interval	FDA Clearance for AF Detection	Key Limitations/Notes	Reference
Smartwatch	Photoplethysmography ± single-lead ECG	$250-$400	~5 years	Yes (irregular pulse only)	Requires confirmatory ECG for diagnosis; sensitivity lower in some populations	[14]
Handheld ECG	Single-lead ECG	$99-$149	~5 years	Yes	User-activated; 2%-15% tracings uninterpretable; accuracy improved with clinician read	[14]
Ambulatory ECG patch	Continuous multiday ECG	$300-$400	Single use	Yes	Prescription only; highest sensitivity; higher per-episode cost	[14]

into comprehensive preventive care strategies, while maintaining awareness of barriers such as health literacy and equitable access. By adopting these technologies, physicians can reinforce therapeutic partnerships focused on education and patient autonomy, ultimately advancing whole-person health and optimizing cardiovascular outcomes.

This case underscores the clinical significance of consumer-wearable devices in expediting the diagnosis and management of paroxysmal AF. Future research should focus on defining optimal monitoring durations, establishing thresholds of clinical significance for device-detected AF, and evaluating the cost-effectiveness of consumer wearable-driven screening and management strategies.

CONCLUSION

This case demonstrates the transformative potential of consumer-wearable-driven technology in the early detection and management of paroxysmal AF. It emphasizes the value of integrating patient-driven monitoring with clinical care to bridge diagnostic gaps, particularly in settings with limited access to specialized cardiology resources. Consumer-wearable devices can facilitate timely diagnosis, support personalized treatment plans, and reduce the burden of prolonged or redundant monitoring. Additionally, the shift towards continuous real-time arrhythmia surveillance aligns with holistic care principles by promoting patient autonomy and supporting shared decision-making.

REFERENCES

1. Patel D, Tarakji KG. Smartwatch diagnosis of atrial fibrillation in patient with embolic stroke of unknown source: a case report. *Cardiovascular Digital Health Journal*. 2021;2(1):84-87. doi:10.1016/j.cvdhj.2021.01.001
2. Prasitlumkum N, Cheungpasitporn W, Chokesuwattanaskul A, et al. Diagnostic accuracy of Smart Gadgets/wearable devices in detecting atrial fibrillation: a systematic review and meta-analysis. *Arch Cardiovasc Dis*. 2021;114(1):4-16. doi:10.1016/j.acvd.2020.05.015
3. Ko D, Chung MK, Evans PT, Benjamin EJ, Helm RH. Atrial fibrillation: a review. JAMA. 2025;333(4):329-342. doi: 10.1001/jama.2024.22451
4. Primo J, Gonçalves H, Macedo A, et al. Prevalence of paroxysmal atrial fibrillation in a population assessed by continuous 24-hour monitoring. *Revista Portuguesa de Cardiologia (English Edition)*. 2017;36(7-8):535-546. doi: 10.1016/j.repce.2016.11.013
5. Cheung CC, Krahn AD, Andrade JG. The emerging role of wearable technologies in detection of arrhythmia. *Can J Cardiol*. 2018;34(8):1083-1087. doi: 10.1016/j.cjca.2018.05.003
6. Abdelrazik A, Eldesouky M, Antoun I, et al. Wearable devices for arrhythmia detection: advancements and clinical implications. *Sensors (Basel)*. 2025;25(9):2848. doi: 10.3390/s25092848
7. Noubiap JJ, Tang JJ, Teraoka JT, Dewland TA, Marcus GM. Minimum national prevalence of diagnosed atrial fibrillation inferred from California acute care facilities. *J Amer Coll Cardiol*. 2024;84(16):1501-1508. doi: 10.1016/j.jacc.2024.07.014
8. Joglar JA, Chung MK, Armbruster AL, et al. 2023 ACC/AHA/ACCP/HRS guideline for the diagnosis and management of atrial fibrillation: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*. 2024;149(1):e1-e156. doi: 10.1161/CIR.0000000000001193
9. Baman JR, Mathew DT, Jiang M, Passman RS. Mobile health for arrhythmia diagnosis and management. J *Gen Intern Med*. 2021;37(1):188-197. doi: 10.1007/s11606-021-07007-w
10. Babar F, Cheema AM, Ahmad Z, et al. Sensitivity and specificity of wearables for atrial fibrillation in elderly populations: a systematic review. *Curr Cardiol Rep*. 2023;25(7):761-779. doi: 10.1007/s11886-023-01898-3
11. Perez MV, Mahaffey KW, Hedlin H, et al. Large-scale assessment of a smartwatch to identify atrial fibrillation. *N Engl J Med*. 2019;381(20):1909-1917. doi: 10.1056/nejmoa1901183
12. Lubitz SA, Faranesh AZ, Selvaggi C, et al. Detection of atrial fibrillation in a large population using wearable devices: the Fitbit Heart Study. *Circulation*. 2022;146(19):1415-1424. doi: 10.1161/CIRCULATIONAHA.122.060291
13. Aguilar M, Macle L, Chamieh R, et al. Wearable smartwatches for atrial fibrillation detection and burden estimation after ablation: comparison with continuous monitoring. *Europace*. 2025 Nov 10;euaf280. doi: 10.1093/europace/euaf280
14. Bayoumy K, Gaber M, Elshafeey A, et al. Smart wearable devices in cardiovascular care: where we are and how to move forward. *Nat Rev Cardiol*. 2021;18(8):581-599. doi: 10.1038/s41569-021-00522-7
15. Ioannidis DC, Kapasouri EM, Vassiliou VS. Wearable devices: monitoring the future? *Oxf Med Case Reports*. 2019;2019(12):492-494. doi: 10.1093/omcr/omz143