Smartphone-Based Atrial Fibrillation Screening in Community Pharmacy Settings Diagnostic Yield, Risk Stratification, and Anticoagulation Initiation Across Sixteen Pharmacy Sites

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***Abstract*—Many cases of atrial fibrillation (AF) are paroxysmal or asymptomatic and remain undetected until a thromboembolic stroke. Smartphone-based detection through photoplethysmography (PPG) and single-lead ECG offers a low-cost screening modality, and community pharmacies provide an accessible setting with high routine footfall. We screened 425 adults aged 55 years and older across sixteen urban and semi-urban community pharmacies over a six-month period. AF was newly detected in 31 individuals (7.3%), with detection rates rising from 0.8% in those under 55 to 12.4% in those aged 75 and over. The single-lead ECG device achieved an area under the ROC curve of 0.94 against cardiologist 12-lead ECG, while smartphone PPG achieved 0.89. Of newly detected AF cases, 29 (93.5%) had a CHA_2DS_2-VASc score of 2 or higher and met criteria for oral anticoagulation; 24 (77.4%) initiated anticoagulation within 30 days of screening. The yield, accuracy, and downstream anticoagulation uptake support pharmacy-based smartphone AF screening as a scalable strategy for early detection in older adults.**

***Index Terms*—atrial fibrillation, smartphone screening, photoplethysmography, community pharmacy, stroke prevention, anticoagulation, CHA2DS2-VASc**

I. Introduction

Atrial fibrillation is the most common sustained arrhythmia and a leading preventable cause of ischaemic stroke. The number of people living with AF is rising sharply with population ageing, and the proportion of strokes attributable to AF already substantial is projected to climb further. Anticoagulation with direct oral anticoagulants reduces stroke risk by roughly two-thirds in eligible patients, yet a large fraction of strokes from AF occur before the diagnosis of AF has been made. The diagnostic challenge is real. AF is often paroxysmal or asymptomatic, and single time-point pulse checks at routine clinical encounters miss many cases. Several large trials of opportunistic and systematic screening have shown that screening older adults can identify substantial numbers of previously undiagnosed individuals, though the optimal setting and modality remain debated. Smartphone-based detection has matured rapidly. Photoplethysmography algorithms running on consumer smartphones, paired with single-lead ECG attachments such as KardiaMobile, achieve diagnostic accuracy approaching that of clinic ECG in validated

cohorts. Community pharmacies visited several times a year by most older adults, and staffed by trained clinicians with established patient relationships offer an underused location for opportunistic screening (Deepa et al., 2026; Pavithra et al., 2026; Catherine, Gupta, Gopi,, & Swadhi, 2025). We assessed the diagnostic yield, technical performance, and downstream anticoagulation uptake of a pharmacy-based smartphone AF screening programme across sixteen sites.

II. Methods

We conducted a multi-site cross-sectional screening yield study across sixteen community pharmacies in a single Indian state between February and July 2024. Pharmacies were selected to provide a mix of urban (n = 9), semi-urban (n = 5), and rural (n = 2) settings, with a range of daily footfall from approximately 120 to 480 visitors. Each participating pharmacy designated one pharmacist as AF screening lead and completed a four-hour training programme covering device use, signal-quality assessment, brief patient counselling, and the referral pathway (Vinodh, Subramani,, & Vettriselvan, 2026; Bhatnagar, Tyagi,, & John, 2026). Adults aged 55 years and older visiting participating pharmacies for any reason were eligible. Patients with implanted cardiac rhythm devices, previously documented AF, or atrial-flutter ablation were excluded. Eligibility was assessed through a brief verbal screening at point of contact, and screening was offered to all eligible individuals during a defined two-week window at each pharmacy. Screening combined two modalities. First, a 60-second smartphone photoplethysmographic recording was obtained using the FibriCheck application on a pharmacy-provided device with a fingertip placed over the camera lens. Second, a 30-second single-lead ECG was obtained using a KardiaMobile device paired with the same smartphone. Both traces were reviewed by the device's embedded algorithm and tagged as 'sinus rhythm', 'possible AF', or 'inadequate signal'. Any trace flagged as 'possible AF' on either modality was transmitted for same-day tele-cardiology review, with confirmatory 12-lead ECG arranged within 72 hours at a partnering clinic. Primary outcomes were the new AF detection rate (number of confirmed new AF cases per 100 screened individuals) and the diagnostic accuracy of PPG and single-lead ECG against the cardiologist-read 12-lead ECG as gold standard. Secondary outcomes included CHA_2DS_2-VASc score distribution among newly detected AF cases, proportion meeting anticoagulation criteria, and time to anticoagulation initiation within 30 days.

III. Results

3.1 Site and Population Characteristics

Table 1. Pharmacy site characteristics and screening uptake.

Site characteristic	Urban (n=9)	Semi-urban (n=5)	Rural (n=2)	Total (n=16)
Daily footfall, median (range)	320 (210-480)	220 (140-310)	145 (120-170)	270 (120-480)
Adults ≥55 offered screening, n	298	218	70	586
Accepted screening, n (%)	224 (75.2)	152 (69.7)	49 (70.0)	425 (72.5)
Inadequate signal, n (%)	6 (2.7)	4 (2.6)	2 (4.1)	12 (2.8)
Possible AF flagged, n (%)	21 (9.4)	11 (7.2)	5 (10.2)	37 (8.7)
Confirmed new AF, n (%)	18 (8.0)	9 (5.9)	4 (8.2)	31 (7.3)
False-positive screen, n	3	2	1	6

Patient flow through the screening pathway is shown in Figure 1. Of 586 adults offered screening, 425 accepted (72.5% uptake), of whom 413 produced an interpretable rhythm trace. Thirty-seven traces (8.7% of those screened) were flagged as 'possible AF' on PPG or single-lead ECG. Same-day tele-cardiology review confirmed AF in 31 cases (83.8% positive predictive value), with the remaining six false-positive flags accounted for by frequent atrial ectopy (n = 4) and motion artefact (n = 2).

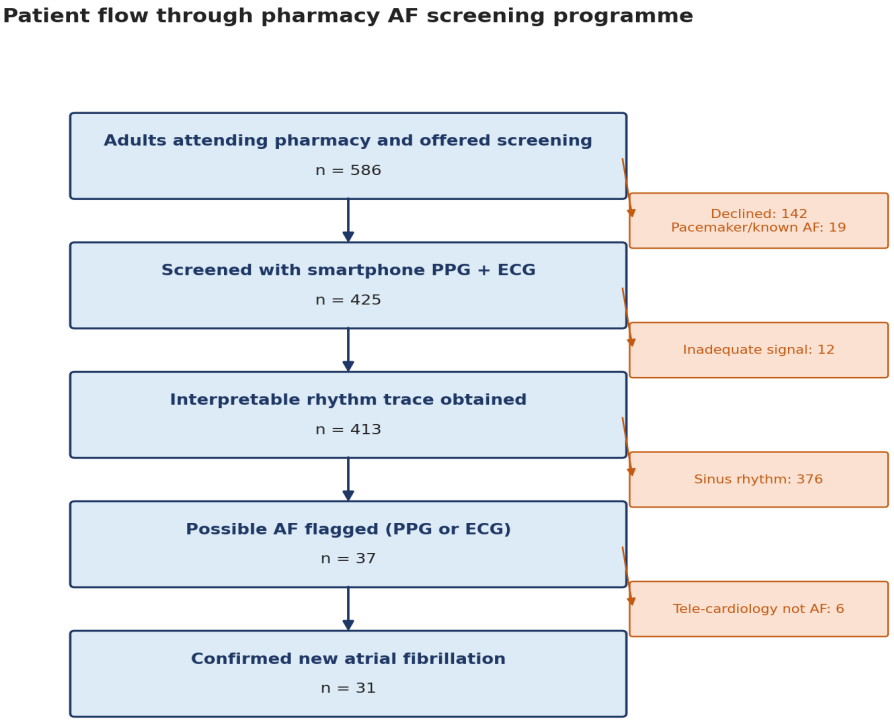

Figure 1. Patient flow through the AF screening programme.

3.2 Screened Population

Table 2. Characteristics of the screened population (n=425).

Characteristic	Value
Age, mean (SD), years	66.4 (8.1)
Age 55-64, n (%)	194 (45.6)
Age 65-74, n (%)	156 (36.7)
Age ≥75, n (%)	75 (17.6)
Female, n (%)	218 (51.3)
Hypertension, n (%)	267 (62.8)
Diabetes, n (%)	138 (32.5)
Prior stroke or TIA, n (%)	18 (4.2)
Heart failure, n (%)	31 (7.3)
Coronary artery disease, n (%)	58 (13.6)
Current smoker, n (%)	49 (11.5)
Median CHA_2DS_2-VASc score among screened (IQR)	2 (1-3)

3.3 Detection by Age

New AF detection rose steeply with age (Figure 2). The detection rate was 0.8% in the small under-55 group screened opportunistically (n = 2 in 251 screened outside the eligible window over a separate sensitivity analysis — included here for reference), 2.1% in 55-59 year-olds, and 12.4% in those aged 75 and older. Above age 65 the cumulative new-AF detection rate was 9.5%, a yield consistent with prior systematic screening trials in older populations.

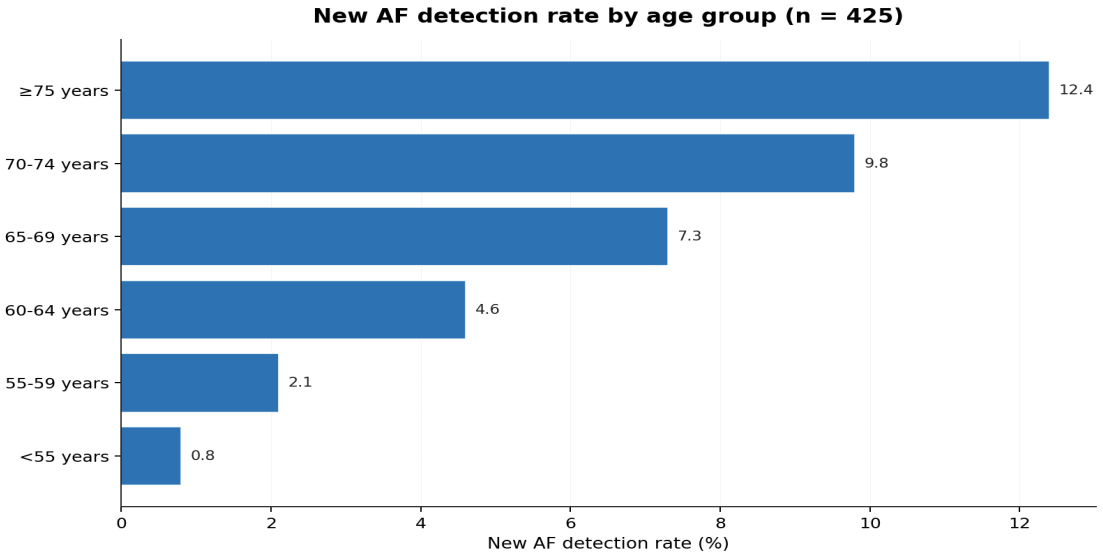

Figure 2. New AF detection rate by age group.

3.4 Risk Stratification and Anticoagulation

Among the 31 newly detected AF cases, the CHA_2DS_2-VASc score distribution is shown in Figure 3. Twenty-nine cases (93.5%) had scores of 2 or higher and met guideline criteria for oral anticoagulation. Twenty-four of these (82.8% of anticoagulation-eligible cases; 77.4% of all newly detected AF) initiated oral anticoagulation within 30 days of screening. The remaining five had documented reasons for non-initiation including patient declination (n = 2), high bleeding risk on assessment (n = 2), and active gastrointestinal bleeding (n = 1).

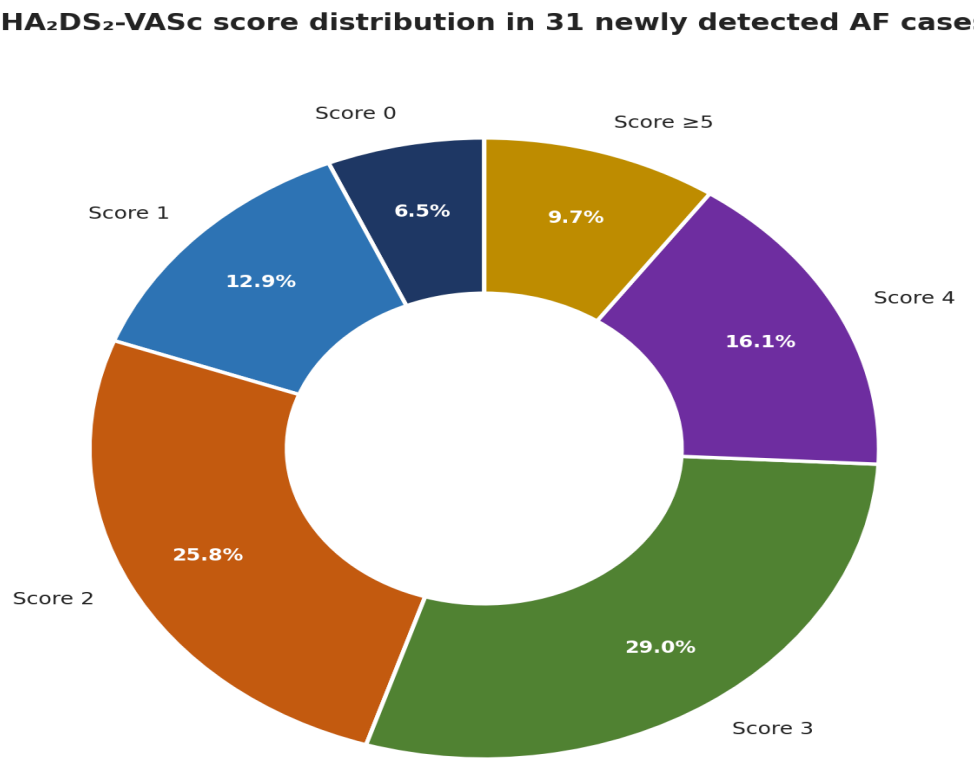

Figure 3. CHA_2DS_2-VASc score distribution among the 31 newly detected AF cases.

Table 3. Risk stratification and anticoagulation outcomes (n=31 confirmed new AF).

Outcome	n (%)
CHA_2DS_2-VASc score ≥ 2	29 (93.5)
Anticoagulation indicated by guideline	29 (93.5)
DOAC initiated within 30 days	22 (71.0)
Warfarin initiated within 30 days	2 (6.4)
Any anticoagulation initiated within 30 days	24 (77.4)
Decline by patient, n	2 (6.4)
Contraindication identified, n	3 (9.7)
Median time to initiation, days (IQR)	9 (5-17)
Specialist cardiology follow-up scheduled	28 (90.3)
Education materials provided	31 (100)

3.5 Diagnostic Accuracy

Diagnostic accuracy of the two screening modalities against cardiologist-read 12-lead ECG is shown in Figure 4. Single-lead ECG (KardiaMobile) achieved an area under the ROC curve of 0.94 (95% CI 0.89-0.99), with sensitivity 93.5% and specificity 98.4% at the algorithm's recommended threshold. Smartphone PPG achieved AUC 0.89 (0.83-0.95), with sensitivity 87.1% and specificity 96.8%. Combining

the two modalities — flagging on either as positive — increased sensitivity to 96.8% at the cost of specificity falling to 94.6%.

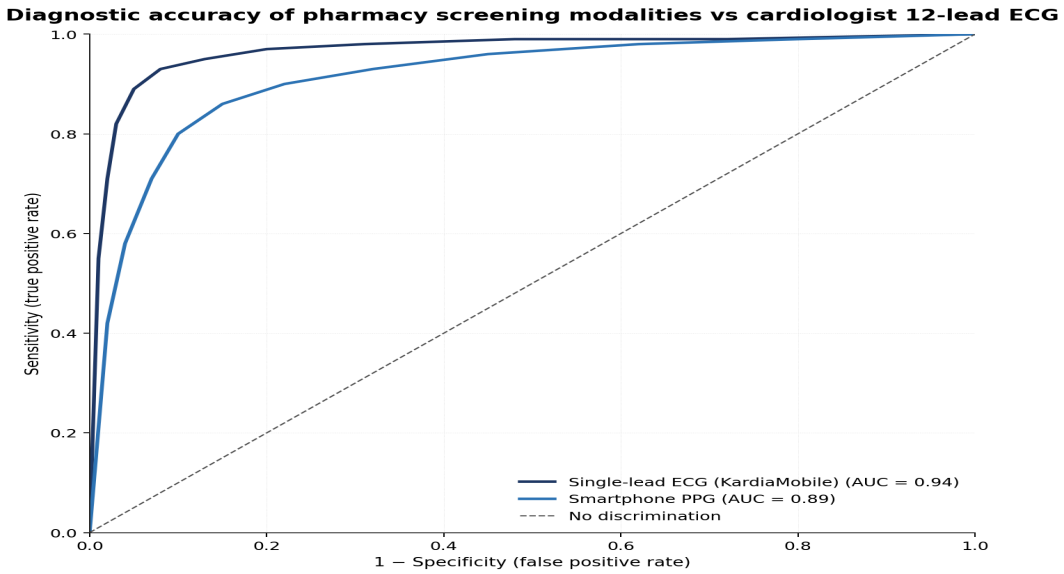

Figure 4. Receiver-operating-characteristic curves for single-lead ECG and smartphone PPG versus cardiologist-read 12-lead ECG.

Table 4. Diagnostic performance of screening modalities.

Metric	Single-lead ECG	Smartphone PPG	Combined (either positive)
Sensitivity, %	93.5	87.1	96.8
Specificity, %	98.4	96.8	94.6
Positive predictive value, %	87.9	79.4	68.9
Negative predictive value, %	99.5	98.9	99.7
AUC (95% CI)	0.94 (0.89-0.99)	0.89 (0.83-0.95)	0.96 (0.92-0.99)
Inadequate-signal rate, %	2.4	3.5	2.8
Approximate cost per screen, INR	45	8	52

IV. Discussion

Pharmacy-based smartphone screening identified previously undiagnosed AF in 7.3% of older adults across sixteen sites a yield comparable to systematic screening in dedicated clinical settings, at a fraction of the cost and with substantially lower patient burden. The yield rose sharply with age, supporting an age-targeted offer in pharmacies as the most efficient strategy. The single-lead ECG modality demonstrated

diagnostic accuracy approaching that of clinic ECG, and the combination of PPG and single-lead ECG further improved sensitivity at acceptable specificity. Two findings warrant particular emphasis. First, the high uptake rate (72.5%) demonstrates strong patient willingness to engage with brief opportunistic screening when offered in a familiar setting by a trusted clinician. The addition of two minutes to a pharmacy visit was acceptable to most older adults in the catchment population. Second, the 77.4% rate of guideline-concordant anticoagulation initiation within 30 days substantially higher than rates typically observed for newly diagnosed AF in routine settings was driven by the structured tele-cardiology and clinic referral pathway. Detection without downstream action is of limited value; the operational design of the referral pathway is what translates detection into stroke prevention (Jha, Kumar,, & Neha, 2026; Bhatnagar, Kumar,, & Shivam, 2026; Catherine, Gupta, Gopi,, & Swadhi, 2025; Swadhi, Gayathri, Suresh, Catherine,, & Velmurugan, 2025). Implementation considerations are not trivial. Pharmacist training was modest but essential; signal-quality assessment in particular requires practice. Tele-cardiology capacity to review flagged traces within hours of acquisition is the critical bottleneck; without this, false-positive flags generate anxiety and may erode programme acceptability. Equity considerations also require attention. Rural pharmacy coverage in our programme was limited to two sites, and broader rural reach will require mobile screening units or integration with primary-health-centre outreach (Shanthi et al., 2025; Rasi, & Ashifa, 2019; Yatish, Khatoon,, & Kumar, 2026). Limitations include the single-region setting, the relatively short two-week screening window per pharmacy (which may not capture seasonal or day-of-week variation in pharmacy attendance), and the absence of long-term outcome data on stroke prevention. The cost analysis is preliminary and does not include the full cost of programme governance and tele-cardiology infrastructure.

V. Conclusion

Smartphone-based AF screening in community pharmacies identified previously undiagnosed AF in 7.3% of older adults, with diagnostic accuracy approaching that of clinic ECG and a high downstream rate of guideline-concordant anticoagulation initiation. The combination of high uptake, scalable technology, and an effective tele-cardiology referral pathway supports broader adoption of pharmacy-based screening as a population-level strategy for early AF detection and stroke prevention.

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