

Frequency and Patterns of Electrocardiogram Testing among High-risk Elderly Individuals

Arthur Shiyovich MD^{1,7}, Gil Marcus MD^{1,2}, Rola Hamood PhD^{3,4}, Matanya Tirosh PharmD³, Jacob Goldstein MD⁵, Moshe Hoshen PhD⁶, Sivan Gazit MD⁶, and Sa'ar Minha MD^{1,2}

¹Gray Faculty of Medical and Health Sciences, Tel Aviv University, Tel Aviv, Israel

²Department of Cardiology, Shamir Medical Center (Assaf Harofeh), Zerifin, Israel

³Medical Affairs, Pfizer Pharmaceuticals Israel, Herzliya, Israel

⁴School of Public Health, Haifa University, Haifa, Israel

⁵Department of Cardiology, Carmel Medical Center, Haifa, Israel

⁶Maccabi Research and Innovation Center, Maccabi Healthcare Services, Tel Aviv, Israel

⁷Division of Cardiovascular Medicine, Department of Medicine, Brigham and Women's Hospital, Harvard Medical School, Boston, MA, USA

ABSTRACT **Background:** Electrocardiogram (ECG) may detect atrial fibrillation (AF), but the true rate of ECG performance is unknown. **Objectives:** To explore the performance rate of ECG testing in patient populations at high risk for AF in a real-world cohort and to explore the incidence of newly diagnosed AF. **Methods:** This retrospective observational cohort study included de-identified data of members of Maccabi Health Services older than 65 years, excluding patients with prior AF and other cardiac diseases. Patients were followed between 1 January 2016 and 30 September 2020. The number of ECGs performed in an outpatient setting for each patient was reported. **Results:** In total, 211,515 patients (59.8% female) were included. The mean age was 70.3 ± 6.6 years, with a mean CHA₂DS₂-VASc score of 2.6 ± 1.0 . During the study period, over half of the patients ($n=112,340$; 53.1%) did not undergo any ECG tests, 51,644 patients (24.4%) had one ECG, 24,914 patients (11.8%) had two, while 22,617 patients (10.7%) had more than three. Of the patients referred for an ECG, 67,433 (81.1%) underwent ECG testing within 2 months following the referral. The median time from ECG referral to ECG testing was 5 days. **Conclusions:** Most patients older than 65 years had no ECG tests within a 5-year period. However, when referred to an ECG test, most patients complied within a median of 5 days.

IMAJ 2026; 28: 426–432

KEY WORDS: atrial fibrillation (AF), electrocardiogram (ECG), oral anticoagulants (OAC), primary care, screening

patient population 65 years of age or older [3,4]. Diagnosis of AF is of paramount prognostic importance. Beyond symptom control, diagnosed patients undergo stroke risk stratification and are prescribed oral anti-coagulants (OAC) when indicated. This treatment is associated with improved outcomes [5]. AF diagnosis is based on rhythm documentation by an electrocardiogram showing typical arrhythmia for at least 30 seconds [6]. The European Society of Cardiology (ESC) recommends routine heart rhythm assessment (i.e., pulse palpation) in all individuals older than 65 years, and a population-based screening program with prolonged non-invasive electrocardiogram for patients older than 75 years, or those older than 65 years at high risk [7]. Electrocardiogram is a readily available test, ordered at the discretion of the healthcare provider (HCP), that may provide important cardiovascular data (e.g., cardiac ischemia, left ventricular hypertrophy, conduction abnormalities, and arrhythmias). Electrocardiogram referral, for any reason, can also be utilized to diagnose asymptomatic AF, but data regarding the real-world performance of electrocardiogram tests ordered by the HCP and the incidence of AF diagnosis by electrocardiogram are lacking.

The aim of this study was to report the performance rate of electrocardiogram testing in a high-risk cohort of patients at an outpatient setting of the second largest healthcare provider is Israel and to explore the incidence of newly diagnosed AF in this population. Secondary objectives included describing indices associated with electrocardiogram performance and analyzing the differences in electrocardiogram referral.

Atrial fibrillation (AF), the most prevalent cardiac arrhythmia [1], is considered a major risk factor for cardiovascular diseases and accounts for one in five ischemic strokes [2]. AF prevalence is age-dependent, with a reported prevalence of 9–19.2% in a

PATIENTS AND METHODS

STUDY DESIGN AND DATA SOURCE

In this observational cohort study, we evaluated the rate of outpatient electrocardiogram testing in the elderly population in Israel. For this purpose, the Maccabi Healthcare Services (MHS, the second largest healthcare provider in Israel) electronic medical database, containing longitudinal data on a population of more than 2.7 million people, was utilized. Collected de-identified data on each participant included demographic data, diagnoses coded by physician visits, full pharmacy prescriptions, and purchase data. The MHS database also organizes data in automatically formulated registries (e.g., ischemic heart disease, peripheral vascular disease, and arrhythmia registries). These registries undergo automated updates, employing stringent algorithms for data management and categorization. The algorithms systematically aggregate information from multiple sources, including diagnoses codes, prescription records, hospital discharge data, and billing data. Diagnoses codes are based on the International Classification of Diseases 9th Revision, Clinical Modification (ICD-9-CM) coding systems, as well as internal MHS codes that correlate with standard ontologies. Medications were coded according to the Israeli coding system, with translation to the Anatomical Therapeutic Chemical coding system wherever available [8].

STUDY POPULATION

Participants were eligible for enrollment if they had turned 65 years old between 1 January 2016 and 30 September 2020. Exclusion criteria included previous diagnosis of AF based on at least one of the following criteria: entry to MHS AF registry prior to enrollment, at least two outpatient physician visits documented with AF diagnosis, hospital discharge note with AF diagnosis based on ICD-9 code, OAC prescription (≥ 3 dispensed prescriptions per patient) in a patient without a history of venous thromboembolism at approved doses for stroke prevention in AF within 6 months prior to study enrollment, a history of cardiac disease or cardiac surgery, membership in MHS for a duration of less than 1 year prior to study enrollment to ensure complete medical record, less than 3 months of follow-up.

All eligible participants were categorized into two main groups by age (age 65–74 and age ≥ 75 years). The groups were then sub-divided into four subgroups by frequency of electrocardiogram testing performed during follow-up period: no electrocardiogram, one electrocardiogram, two electrocardiograms, and three or more electrocardiograms.

By the study entry date (the index date), all participants had to be 65 years of age, or they had to have reached this age during the study period. Based on this criterion, a participant could be counted in both age groups.

MAIN OUTCOME

The main outcome of this study was the number of electrocardiogram tests performed during follow-up. We utilized the available logs for electrocardiogram performance between the years 2016–2020 including electrocardiogram tests performed during HCP visits (both the primary care physician and cardiologists), MHS's emergency centers, and other MHS facilities. The number of electrocardiograms per participant was collected and the annual rate of electrocardiogram per patient year was calculated. All data electrocardiogram referrals were collected based on electronic referral order after the index date. The end of the follow-up period was determined as the earliest of 31 December 2020, occurrence of AF, cardiac disease diagnosis, death, or MHS disenrollment.

PATIENT BASELINE CHARACTERISTICS

Baseline characteristics included demographics (e.g., sex and age), socioeconomic status (SES), smoking status (i.e., ever/never), CHA₂DS₂-VASc, and body mass index (BMI). SES is classified by the Central Bureau of Statistics in Israel, using a scale ranging from 1 (indicating the lowest status) to 10. This index is derived from multiple factors, such as household income, educational attainment, levels of crowding within the household, and ownership of vehicles [9]. The CHA₂DS₂-VASc score, which includes congestive heart failure, hypertension, age > 75 years, diabetes mellitus, stroke, vascular disease, age 65–74 years, sex category (female), is a validated score for stroke risk assessment recommended by ESC guidelines for this purpose [9].

Chronic co-morbidities were collected from MHS registries and included hypertension, diabetes mellitus, peripheral vascular disease, chronic kidney disease [10], and chronic obstructive pulmonary disease (COPD). Medications purchased at least once within 6 months prior to study entry included beta blockers (excluding sotalol), angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, aldosterone antagonists (spironolactone and eplerenone), diuretics, statins, ezetimibe, aspirin, clopidogrel, and OACs (apixaban, dabigatran, rivaroxaban, and warfarin).

STATISTICAL ANALYSES

Descriptive statistics are presented as number and percent for categorical variables and mean $\pm$ standard deviation

for continuous variables. Comparisons of proportions and means across age groups or study groups were performed using chi-square test and Student's *t*-test or one-way ANOVA, respectively. A *P*-value < 0.05 was considered statistically significant. A multivariate logistic regression model was used to describe correlates of electrocardiogram testing. Age and sex were forced into the model and a backwards Wald method was used to explore the significance of all other covariates (*P*-value < 0.05 was used for inclusion and *P*-value < 0.1 for exclusion). Associations are expressed as odds ratios (ORs), with corresponding 95% confidence intervals (95%CI). The interquartile range (IQR) presents the first and third quartiles. Statistical analyses were performed using IBM Statistical Package for the Social Sciences statistics software, version 27 (SPSS, IBM Corp, Armonk, NY, USA).

ETHICS: APPROVAL AND DATA PROTECTION

The study was approved by MHS institutional review board (IRB number 0089-22-MHS). The study was performed in accordance with the Helsinki Declaration of 1964, and its later amendments. Due to its retrospective

and de-identified nature, informed consent was waived. Data collection and analysis were performed by MHS. Raw data, including de-identified patient-level data, were available for MHS research personnel only.

RESULTS

A total of 297,546 MHS members aged ≥ 65 years were screened for inclusion in this study. A flowchart of study population selection is presented in Figure 1. After exclusions, a total of 211,515 participants were included in this study. The study's main cohort was comprised of 59.8% females, with a mean age of 70.3 ± 6.6 years at the index date [Table 1]. Of the overall participants, 78.5% of participants were in the 65–74-year-old age group and 21.5% were in the ≥ 75 -year-old age group. The prespecified grouping by the number of electrocardiogram testing resulted in over half of the patients ($n=112,340$; 53.1%) not having any electrocardiogram test during the study period. In addition, 51,644 (24.4%) had one electrocardiogram; 24,914 (11.8%) had two electrocardiograms; while 22,617 (10.7%) had three or more electrocardiograms [Figure 2].

Figure 1. Flow chart: selection of the study population

AF = atrial fibrillation, CHF = chronic heart failure, CVD = cardiovascular disease, IHD = ischemic heart disease, OACs = oral anticoagulants, PVD = peripheral vascular disease, VTE = venous thromboembolism

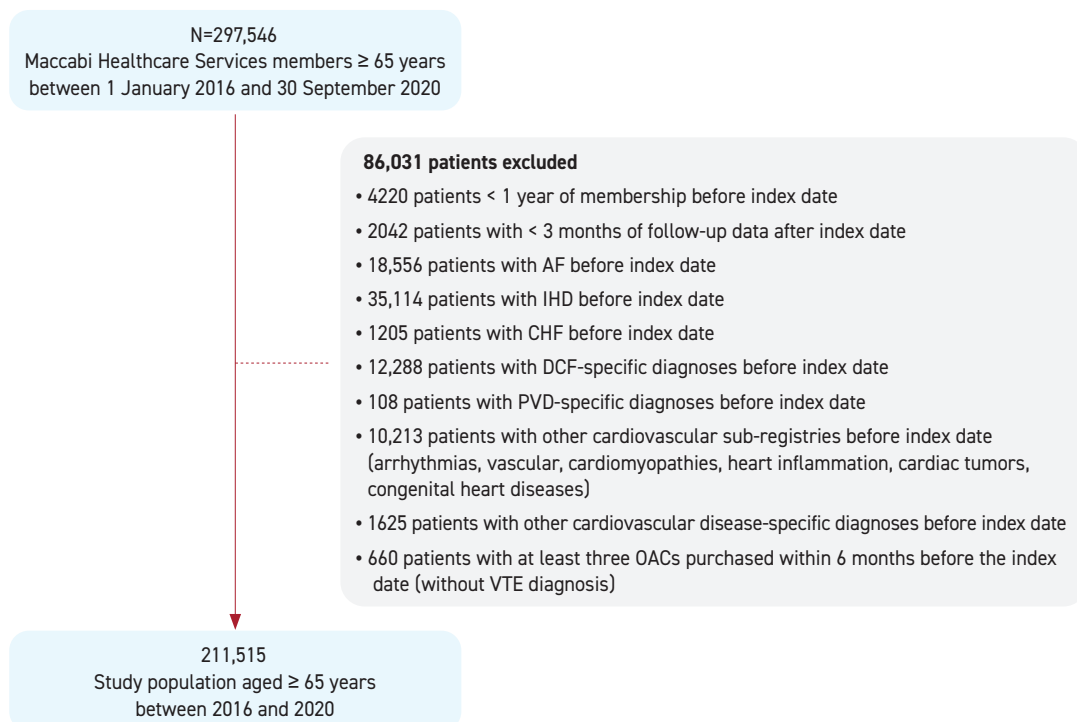


Table 1. Baseline characteristics of participants who underwent ECG testing versus participants without ECG testing during 2016–2020

	No ECG, n=112,340	1 ECG, n=51,644	2 ECGs, n=24,914	≥ 3 ECGs, n=22,617	All, n=211,515
Female n (%)	65,777 (58.6%)	30,674 (59.4%)	15,336 (61.6%)	14,623 (64.7%)	126,410 (59.8%)
Age at index date*, mean ± SD	70.0 ± 7.1	70.1 ± 6.0	70.7 ± 5.9	71.4 ± 5.8	70.3 ± 6.6
Age group at index*, n (%)					
65–74 years	88,940 (79.2%)	41,115 (79.6%)	19,309 (77.5%)	16,603 (73.4%)	165,967 (78.5%)
≥ 75 years	23,400 (20.8%)	10,529 (20.4%)	5605 (22.5%)	6014 (26.6%)	45,548 (21.5%)
Prior smoking history*, n (%)	12,383 (11.0%)	5364 (10.4%)	2337 (9.4%)	1980 (8.8%)	22,064 (10.4%)
Diabetes mellitus*, n (%)	24,299 (21.6%)	12,251 (23.7%)	6298 (25.3%)	6085 (26.9%)	48,933 (23.1%)
Hypertension*, n (%)	58,063 (51.7%)	29,712 (57.5%)	15,197 (61.0%)	15,294 (67.6%)	118,266 (55.9%)
COPD*, n (%)	5866 (5.2%)	3454 (6.7%)	1977 (7.9%)	2191 (9.7%)	13,488 (6.4%)
CKD*, n (%)	34,273 (30.5%)	17,508 (33.9%)	9273 (37.2%)	9406 (41.6%)	70,460 (33.3%)
Hyperlipidemia*,¥, n (%)	16,699 (14.9%)	9,205 (17.8%)	4903 (19.7%)	4922 (21.8%)	35,729 (16.9%)
Obstructive sleep apnea*,¥, n (%)	1220 (1.1%)	821 (1.6%)	432 (1.7%)	499 (2.2%)	2972 (1.4%)
Rheumatoid arthritis*,¥, n (%)	649 (0.6%)	349 (0.7%)	211 (0.8%)	213 (0.9%)	1422 (0.7%)
CHA ₂ DS ₂ -VASc score*, mean ± SD	2.5 ± 1.0	2.6 ± 1.0	2.7 ± 1.0	2.9 ± 1.0	2.6 ± 1.0
BMI* (kg/m ²), n (%)					
< 25	34,047 (30.3%)	14,326 (27.7%)	6416 (25.8%)	5458 (24.1%)	60,247 (28.5%)
25–29.9*	43,681 (38.9%)	21,375 (41.4%)	10,506 (42.2%)	9254 (40.9%)	84,816 (40.1%)
≥ 30	30,292 (27.0%)	15,713 (30.4%)	7961 (32.0%)	7895 (34.9%)	61,861 (29.2%)
Missing	4320 (3.8%)	230 (0.4%)	31 (0.1%)	10 (0.04%)	4591 (2.2%)
SES*, n (%)					
Low (1–4)	20,338 (18.1%)	8475 (16.4%)	4223 (17.0%)	4227 (18.7%)	37,263 (17.6%)
Medium (5–7)	57,854 (51.5%)	26,803 (51.9%)	13,331 (53.5%)	12,380 (54.7%)	110,368 (52.2%)
High (8–10)	33,922 (30.2%)	16,286 (31.5%)	7312 (29.3%)	5976 (26.4%)	63,496 (30.0%)
Chronic medication prescription					
Any OAC**,¥¥, n (%)	596 (0.5%)	294 (0.6%)	147 (0.6%)	166 (0.7%)	1203 (0.6%)
Beta blocker*, n (%)	19,860 (17.7%)	10,579 (20.5%)	5578 (22.4%)	6318 (27.9%)	42,335 (20.0%)
ACEi*, n (%)	19,090 (17.0%)	9895 (19.2%)	5069 (20.3%)	4943 (21.9%)	38,997 (18.4%)
ARB*, n (%)	19,177 (17.1%)	10,695 (20.7%)	5645 (22.7%)	6054 (26.8%)	41,571 (19.7%)
Diuretic*, n (%)	7421 (6.6%)	3725 (7.2%)	1938 (7.8%)	2107 (9.3%)	15,191 (7.2%)
Statin*, n (%)	42,668 (38.0%)	23,595 (45.7%)	12,175 (48.9%)	11,961 (52.9%)	90,399 (42.7%)
Ezetimibe*, n (%)	1615 (1.4%)	909 (1.8%)	439 (1.8%)	484 (2.1%)	3447 (1.6%)
Aspirin*, n (%)	21,415 (19.1%)	12,615 (24.4%)	6873 (27.6%)	7333 (32.4%)	48,236 (22.8%)
Clopidogrel*, n (%)	1512 (1.3%)	825 (1.6%)	440 (1.8%)	577 (2.6%)	3354 (1.6%)
Follow-up time (years), median [IQR]	5 [1.78–5]	5 [3.17–5]	5 [4.03–5]	5 [4.77–5]	5 [4.77–5]

ACEi = angiotensin-converting enzyme inhibitors; ARBs = angiotensin receptor blockers; BMI = body mass index; CHA₂DS₂-VASc = congestive heart failure, hypertension, age > 75 years, diabetes mellitus, stroke, vascular disease, age 65–74 years, sex category [female]; CKD = chronic kidney disease; COPD = chronic obstructive pulmonary disease; CVD = cardiovascular disease; ECG = electrocardiogram; IQR = interquartile range; OAC = oral anticoagulants; PVD = peripheral vascular disease; SD = standard deviation; SES = socioeconomic status

*Intergroup differences are statistically significant (*P*-value < 0.001)

**Intergroup differences are statistically significant (*P*-value = 0.003)

¥Within 1 year before index date

¥¥Within 6 months before index date

Patients in the three or more electrocardiogram group were older and had a higher prevalence of AF risk factors compared with the other groups.

Multivariate logistic regression analysis for indices as-

sociated with at least 1 electrocardiogram testing [Table 2] demonstrated that among other indices (e.g., age and female sex), obstructive sleep apnea, COPD, and hyperlipidemia had the strongest association with the odds of undergoing at least 1 electrocardiogram test.

To explore patient compliance with electrocardiogram referral, we evaluated the performance of electrocardiogram within 2 months of documented referral by HCP. Of all participants who had at least one documented electrocardiogram referral (n=83,137) within the study period, 67,433 (81.1%) had an electrocardiogram test within 2 months following the referral. The median time from electrocardiogram referral to testing was 5 days (IQR 1–15 days). Among participants in the 65–74-year-old age group (n=57,798), 46,571 (80.6%) had an electrocardiogram test within 2 months following the referral. In the ≥ 75-year-old age group (n=25,339), 20,862 (82.3%) had an electrocardiogram test within 2 months following the referral.

Figure 2. Frequency of ECG testing (all participants)

Each bar shows the percentage of participants who underwent ECG tests (out of overall participants) separated by the number of ECG tests (i.e., subgroups of 0 ECGs, 1 ECG, 2 ECGs, and ≥ 3 ECGs)

ECG = electrocardiogram

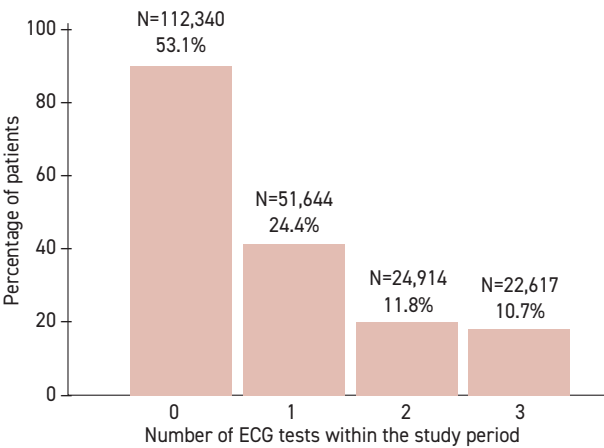


Table 2. Logistic regression for ECG testing

Index	OR (95%CI)
Age (years)	1.01 (1.01–1.01)
Female sex	1.07 (1.05–1.09)
Hypertension	1.21 (1.18–1.23)
Intermediate socioeconomic group	1.13 (1.10–1.15)
High socioeconomic group	1.13 (1.11–1.17)
BMI 25–29.9	1.20 (1.17–1.22)
BMI ≥ 30	1.25 (1.22–1.28)
Chronic kidney disease	1.12 (1.10–1.14)
Obstructive sleep apnea	1.47 (1.37–1.59)
Chronic obstructive pulmonary disease	1.43 (1.38–1.48)
Inflammatory bowel disease	1.25 (1.14–1.37)
Hyperlipidemia	1.29 (1.26–1.32)
Rheumatoid arthritis	1.25 (1.12–1.39)
Beta-blockers	1.12 (1.09–1.15)

95%CI = confidence interval, BMI = body mass index, OR = odds ratio

DISCUSSION

The main findings of this study, which included a cohort of 211,515 members at a high-risk for AF from the second largest health fund in Israel, indicate that within a median follow-up time of 5 years. Although at a relatively high risk for AF and stroke, 53.1% of participants did not undergo an electrocardiogram test while 24.4% had one electrocardiogram test throughout the entire follow-up time. Female sex, older age, sleep apnea, and COPD were among the indices independently associated with electrocardiogram testing. Referral for electrocardiogram testing resulted in electrocardiogram performance within a median time of 5 days for most patients, with higher compliance in the ≥ 75-years-old age group.

Cardiovascular diseases (CVDs) are a leading cause of morbidity and mortality worldwide. Together with atherosclerotic disease, AF is one of the common CVDs associated with dire outcomes and significant economic burden, prompting efforts toward early detection [11]. Although electrocardiogram is a low-cost and readily available test, the frequency and timing of AF screening via electrocardiogram are under debate, and no consensus exists regarding a cost-effective strategy that yields high rates of early detection. The present study adds insights regarding the real-world use of electrocardiogram in a large-scale cohort of high-risk elderly patients.

The fact that over half of the patients did not undergo any electrocardiogram test within the 5-year follow-up

period is important. Given that the prevalence of multiple CVDs is age-dependent, it may seem surprising that these patients did not undergo any electrocardiogram test.

Denmark has the largest population-based, real-world, digital electrocardiogram database including all patients who underwent at least one electrocardiogram test since the year 2000. A 2024 publication reported that this dataset included data on > 2.4 million unique patients with a median age of 57 years at the time of the first electrocardiogram test. In contrast to our cohort, 97% of electrocardiogram recordings in this dataset were performed in hospitals, which may indicate that a major clinical event had some impact on the incentive to perform the test. The predominant age group in this cohort was 61–80 years (45%). Patients older than 80 years comprised only 18% of the population. Similar to the present study, no sex differences were recorded in the number of electrocardiograms performed. However, unlike our cohort, in which 52% of patients had only one electrocardiogram test, in Denmark, 34% had one electrocardiogram test, while 42% had between two and five electrocardiogram tests. This discrepancy may be attributed to the long follow-up period (~20 years) in the Danish cohort and the fact that most tests were conducted in hospitals [12]. To the best of our knowledge, aside from this cohort, no other large-scale studies have reported the true prevalence of electrocardiogram testing in this patient population.

Suggested indices associated with electrocardiogram testing included high BMI, sleep apnea, hyperlipidemia, and hypertension. This observation suggests that conventional risk factors for CVD are associated with a higher prevalence of electrocardiogram testing. This finding is in accordance with prior evidence indicating that higher odds for electrocardiogram abnormalities are expected in patients with multiple risk factors [13–16].

Patient compliance with electrocardiogram referrals was encouraging in the present analysis, with 81.1% of referred patients undergoing an electrocardiogram test within a median time of 5 days. This finding underscores that the lower performance rates are not attributable to patient compliance or electrocardiogram availability, which further reinforces electrocardiogram as a readily accessible screening tool for high-risk populations.

Our findings align with and extend recent evidence on AF screening. While the 2022 USPSTF report concluded that evidence was insufficient to support routine electrocardiogram-based screening in asymptomatic adults [17], more recent randomized evidence suggests potential benefit. A metaanalysis of seven randomized

controlled trials, including STROKESTOP, LOOP, and GUARDAF, demonstrated that systematic screening was associated with increased AF detection and oral anticoagulant initiation, as well as a modest but statistically significant 7% relative reduction in stroke or systemic embolism, without an increase in bleeding or mortality [18]. Consistent findings have also been reported in the AMALFI trial, which similarly showed higher AF detection with screening strategies [19]. These findings underscore the clinical relevance of our observation that over half of high-risk elderly individuals did not undergo electrocardiogram testing, highlighting a potential gap between evidence and practice.

Several limitations to this study should be acknowledged. First, this retrospective analysis is based on MHS records, and patients who underwent electrocardiograms outside of MHS facilities were not included. Second, we lack information on the reasons for undergoing electrocardiograms. As a result, we cannot distinguish between the rates of electrocardiograms performed for symptoms versus screening. While some electrocardiograms were clearly symptom-driven, excluding patients with prior or newly diagnosed CVDs likely reduced the risk of non-screening electrocardiogram referrals. This result suggests that the rate of electrocardiograms performed for screening in asymptomatic patients is even lower.

CONCLUSIONS

In a real-world, large-scale cohort study, fewer than half of the patients older than 65 years of age who were at high risk for AF and stroke underwent an electrocardiogram within a 5-year follow-up period. When patients were referred to an electrocardiogram test, 81.1% complied with the referral within a median of 5 days. This finding supports professional guidelines advocating for systematic AF screening, particularly in high-risk populations [20].

Correspondence

Prof. S. Minha

Dept. of Cardiology, Shamir Medical Center (Assaf Harofeh), Zerifin 70300, Israel

Phone: (972-8) 977-9738

Email: minha.saar@gmail.com; minha@shamir.gov.il

Acknowledgments

The authors thank Fadwa Dabbah-Assadi PhD and Rumiana Petrova PhD (Bioforum Ltd.) for their assistance in the manuscript preparation.

AS & SM were paid consultants to Pfizer in connection with the study. RH & MT are employees of Pfizer Pharmaceuticals Israel, Ltd.

Funding

This study was sponsored by Pfizer Pharmaceuticals Israel, Ltd. and was executed by KSM Medical Research Center–Maccabi Research and Innovation Center.

References

- Shiyovich A, Shalev V, Chodick G, et al. Shifting from vitamin K antagonists to non-vitamin K antagonist oral anticoagulants in patients with atrial fibrillation: predictors, patterns and temporal trends. *BMC Cardiovasc Disord* 2021; 21: 493.
- Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation as an independent risk factor for stroke: the Framingham Study. *Stroke* 1991; 22: 983-8.
- Wang W, Saczynski JS, Lessard D, et al. Presence of geriatric conditions is prognostic of major bleeding in older patients with atrial fibrillation: a cohort study. *J Gen Intern Med* 2022; 37: 3893-9.
- Kalarus Z, Średniawa B, Mitreğa K, et al. Prevalence of atrial fibrillation in the 65 or over Polish population. Report of cross-sectional NOMED-AF study. *Kardiol Pol* 2023; 81: 14-21.
- Lip GY, Laroche C, Popescu MI, et al. Improved outcomes with European Society of Cardiology guideline-adherent antithrombotic treatment in high-risk patients with atrial fibrillation: a report from the EORP-AF General Pilot Registry. *Europace* 2015; 17 (12): 1777-86.
- Hindricks G, Potpara T, Dagres N, et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS): The Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. *Eur Heart J* 2020; 42: 373-498.
- Van Gelder IC, Rienstra M, Bunting KV, et al. 2024 ESC Guidelines for the management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS): Developed by the task force for the management of atrial fibrillation of the European Society of Cardiology (ESC), with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. Endorsed by the European Stroke Organisation (ESO). *Eur Heart J* 2024; 45: 3314-414.
- Hogan WR, Wagner MM. Chapter 32: Information technology standards in biosurveillance. In: *Handbook of Biosurveillance*. Academic Press: 439-52.
- Characterization and classification of geographical units by the socio-economic level of the population, 2015 [Available from <https://www.cbs.gov.il/en/publications/Pages/2023/socio-2019-e.aspx>] [Accessed 6 November 2024].
- Coresh J, Turin TC, Matsushita K, et al. Decline in estimated glomerular filtration rate and subsequent risk of end-stage renal disease and mortality. *JAMA* 2014; 311: 2518.
- Batta A, Hatwal J, Batta A, et al. Atrial fibrillation and coronary artery disease: an integrative review focusing on therapeutic implications of this relationship. *World J Cardiol* 2023; 15: 229.
- Polcwiartek C, Andersen MP, Christensen HC, et al. The danish nationwide electrocardiogram (ECG) cohort. *Eur J Epidemiol* 2024; 39: 325-33.
- Sahranavard T, Alimi R, Arabkhaaei J, et al. Association of major and minor ECG abnormalities with traditional cardiovascular risk factors in the general population: a large scale study. *Sci Rep* 2024; 14: 11289.
- Gonçalves MAA, Pedro JM, Silva C, et al. Prevalence of major and minor electrocardiographic abnormalities and their relationship with cardiovascular risk factors in Angolans. *Int J Cardiol Heart Vasc* 2022; 39: 100965.
- Niu J, Deng C, Zheng R, et al. The association and predictive ability of ECG abnormalities with cardiovascular diseases: A prospective analysis. *Glob Heart* 2020; 15: 59.
- Krittayaphong R, Muenkaew M, Chiewvit P, et al. Electrocardiographic predictors of cardiovascular events in patients at high cardiovascular risk: a multicenter study. *J Geriatr Cardiol JGC* 2019; 16: 630-8.
- Kahwati LC, Asher GN, Kadro ZO, et al. Screening for atrial fibrillation: updated evidence report and systematic review for the US Preventive Services Task Force. *JAMA* 2022; 327: 368-83.
- Langén V, Winstén AK, Airaksinen KEJ, Teppo K. Clinical outcomes of atrial fibrillation screening: a meta-analysis of randomized controlled trials. *Ann Med* 2025; 57 (1): 2457522.
- Wijesurendra R, Pessoa-Amorim G, Buck G, et al. Remote screening for asymptomatic atrial fibrillation: the AMALFI randomized clinical trial. *JAMA* 2025; 334: 1349-57.
- Mairesse GH, Moran B, Van Gelder IC, et al; ESC Scientific Document Group. Screening for atrial fibrillation: a European Heart Rhythm Association (EHRA) consensus document endorsed by the Heart Rhythm Society (HRS), Asia Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulación Cardíaca y Electrofisiología (SOLAECE). *Europace* 2017; 19 (10): 1589-623.

Capsule

Ensirelvir for COVID-19 postexposure prophylaxis in household contacts

In a randomized, placebo-controlled trial, **Hayden** and colleagues evaluated ensirelvir, an oral SARS-CoV-2 protease inhibitor, for postexposure prophylaxis in household contacts of infected individuals. Ensirelvir significantly reduced the incidence of symptomatic COVID-19 infection compared with placebo when administered shortly after exposure. The protective effect was strongest when treatment was initiated early. Viral load reduction and

shorter duration of symptoms were also observed among breakthrough cases. The drug was generally well tolerated, with mild adverse events such as gastrointestinal symptoms and transient laboratory changes. These results support ensirelvir as an effective option for preventing Covid-19 transmission in high-risk exposure settings.

N Engl J Med 2026; 394: 1905

Eitan Israeli