2026

2nd Quality Indicators Report for guideline

Atrial Fibrillation: Diagnosis and Management

Health Insurance Organization

May 2026

1. Introductory note

The United Kingdom (UK) National Institute for Health and Care Excellence (NICE) guideline NG196 “Atrial fibrillation: diagnosis and management” was originally developed in 2014 and was last updated in 2021. The updated version of the guideline was made available to the Health Insurance Organization (HIO) in Cyprus through a license agreement with NICE, towards the contextualization of the guideline to the Cyprus healthcare system framework. To this end, the HIO recruited local medical experts in the field of atrial fibrillation, other relevant healthcare professionals, patient representatives, and formed a Technical Expert Committee (TEC). The TEC was supported by the Guidelines Scientific Secretariat who managed the guideline process along with the HIO and provided support for committee recruitment, methodological and scientific issues, stakeholder consultation, guideline publication and dissemination. In a series of meetings, and following a public consultation procedure, the TEC members assessed the scope and the full text of the guideline, implementing modifications if these were well supported by scientific evidence. In addition, the TEC members examined the quality indicators relating to the diagnosis and management of atrial fibrillation that have been developed by NICE, for the UK National Health Service (NHS), in terms of their applicability for the Cyprus General Health System (GESY). Those that were deemed both clinically relevant and technically feasible were selected for implementation. In total, five indicators were suggested by TEC for implementation in the GESY and are listed below, while a full description is available in Appendix I.

Table 1

Quality indicators for the contextualized Atrial fibrillation: diagnosis and management

Indicator name	Indicator description
Indicator A	Proportion of patients admitted to hospital for stroke with a pre-existing diagnosis of atrial fibrillation, who were on anticoagulation.
Indicator B	The percentage of patients registered at the practice aged 65 years and over who have been diagnosed with one or more of the following conditions: coronary heart disease, heart failure, hypertension, diabetes, chronic kidney disease, peripheral arterial disease, or stroke/transient ischemic attack, who have had a pulse rhythm assessment in the preceding 12 months.
Indicator C	The percentage of patients with atrial fibrillation, currently treated with an anticoagulant, who had an assessment in the preceding 12 months of renal function, creatinine clearance, full blood count (FBC) and liver function tests (LFTs) as appropriate for their anticoagulation therapy.

Indicator D	The percentage of patients with atrial fibrillation in whom stroke risk has been assessed using the CHA_2DS_2-VASc score risk stratification scoring system in the preceding 12 months (excluding those patients with a previous CHA_2DS_2-VASc score of 2 or more).
Indicator E	In those patients with atrial fibrillation with a record of a CHA_2DS_2-VASc score of 2 or more, the percentage of patients who are currently treated with anticoagulation drug therapy.

Following the selection of the quality indicators, HIO officers, including information technology (IT) personnel, with the support of an external support scientific committee (Secretariat), ran several tests to finalize the indicator business rules (calculation algorithms), indicator data sources, and collected variables (variable codes) from the HIO data system. Where appropriate, for several diagnoses, both in-hospital and outpatient data sources as well as variable codes were included. Appendix II describes the business rules. The full list of diagnoses included and the correspondence between in-hospital and outpatient diagnoses is presented in Appendix III.

At the end of the first reporting period (10/07/2023 – 09/07/2024), only indicators A and C were incorporated in the HIO IT system, with the relevant findings reported and discussed in the first Quality Indicators Report for the guideline “Atrial Fibrillation: Diagnosis and Management”. At the time, although data required for estimation of indicator B were collected in the HIO IT system, calculation of the specific indicator was not possible for technical reasons. Furthermore, data on indicators D and E (specifically CHA_2DS_2-VASc score) were not available at the time in the HIO IT system and as such these indicators were also excluded from the first Quality Indicators Report. Following the inclusion of CHA_2DS_2-VASc score parameters in the HIO IT system, and after resolving other technical issues, all indicators have been calculated for the present reporting period (and where possible for previous reporting periods) and are included in the current (2^{nd}) Quality Indicators Report. Based on data availability, indicators were calculated successfully for the different periods as presented in Table 2:

Table 2

Calculation of quality indicators across the baseline and reporting periods

PERIOD	10/07/2022 – 09/07/2023	10/07/2023 – 09/07/2024	10/07/2024 – 09/07/2025
INDICATOR A	✓	✓	✓
INDICATOR B	✓	✓	✓
INDICATOR C	✓	✓	✓
INDICATOR D	-	-	✓
INDICATOR E	-	-	✓

As such, this report will focus on all indicators and will compare the indicator output between the baseline period (10/07/2022 – 09/07/2023) and the two reporting periods (period 1: 10/07/2023 – 09/07/2024 and period 2: 10/07/2024 – 09/07/2025). The baseline period corresponds to the last year prior the implementation of the contextualized NICE NG196 "Atrial fibrillation: diagnosis and management" within the framework of GESY. Furthermore, this report aims to put in context the indicators' output by providing an overview of the relevant scientific literature in the subject and similar indicator output or metrics from other healthcare systems across the world in the form of a short narrative literature review. Finally, this report aims to provide suggestions to HIO for further improvement of quality of care in the area assessed by the examined indicators.

2. Methodology

2.1 Synthesis and statistical comparisons

The output of all indicators is presented as a percentage and is visualized in the form of bar charts for each period. Comparisons between the three periods (baseline and reporting period) for indicators A, B and C were carried out using Pearson's Chi-squared test for categorical variables. Statistical significance was set at $p < 0.05$ and all graphs were generated using Microsoft Excel.

2.2 Narrative literature review

The electronic databases of PubMed and Google Scholar were searched from January 2000 until December 2025 using appropriate search terms to identify studies or published reports, providing information relating to all indicators. Studies were considered relevant if they

provided the same indicator metrics or enough data in the form of numerator/denominator to calculate the corresponding indicator metrics. Examples of combinations of search terms used for the selection of relevant studies for each indicator are provided in Table 3. Boolean operators “AND”, “OR” were used to structure search algorithms.

Table 3

Narrative review literature search terms

Indicator	Search terms
Indicator A	(“Atrial Fibrillation admissions for stroke” OR “Atrial Fibrillation patients with stroke” OR “Atrial Fibrillation admission” OR “Atrial Fibrillation stroke”) AND (“on anticoagulation” OR “not on anticoagulants” OR “anticoagulants” OR “oral anticoagulants”)
Indicator B	(“Atrial Fibrillation” OR “AF patients” OR “arrhythmia” OR “arrhythmia patients”) AND (“pulse” OR “pulse rhythm assessment” OR “rhythm assessment” OR “pulse assessment”
Indicator C	(“Atrial Fibrillation” OR “AF patients” OR “arrhythmia” OR “arrhythmia patients”) AND (“on anticoagulation” OR “on anticoagulants” OR “anticoagulants” OR “oral anticoagulants”) AND (“renal function” OR “liver function tests” OR “creatinine” OR “creatinine clearance” OR “full blood count” OR “FBC”)
Indicator D	(“Atrial Fibrillation” OR “AF patients” OR “arrhythmia” OR “arrhythmia patients”) AND (“on anticoagulation” OR “on anticoagulants” OR “anticoagulants” OR “oral anticoagulants”) AND (“CHA_2DS_2-VASc” OR “stroke” OR “stroke risk”)
Indicator E	

3. Results

Updated indicator outputs for the baseline and reporting periods have been provided by HIO in October 2025 and the Secretariat analyzed the data and reviewed the relevant literature in December 2025. The first version of the 2nd Quality Indicators Report was submitted to HIO in December 2025.

The output for all indicators is provided in Table 4 below and summarized in Figures 1 -5.

For indicator A, compared to baseline (61.1%), the Pearson’s Chi-squared test for the 1st reporting period (69.3%) resulted in an χ^2 equal to 2.92 and a borderline non-significant p-value of 0.086. There was no difference in indicator A output between the 1st and 2nd reporting period (p=0.699). On the contrary, for indicator B, a sharp increase was observed during the 1st reporting period (+22.3%, p<0.001) compared to 17.1% in the baseline period. The same

trend was observed between the 2nd (51.4%) and the 1st reporting period (+12%, p<0.001). In indicator C, the results demonstrated no difference between baseline (67.8%) and the 1st reporting period (67.8%), but there was a significant decline in the 2nd reporting period (-9.2%, p<0.001) to 58.6%. Finally, for the remaining indicators, data was only available during the second reporting period and as such no comparisons were made. The indicator output value for indicator D was extremely low at 1.2%, and very high for indicator E (93%).

Table 4

Output for all indicators across the three reporting periods

Indicator	Short description	Indicator (baseline period, 10/07/2022 - 09/07/2023)		Indicator (1st reporting period, 10/07/2023 - 09/07/2024)		Indicator (2nd reporting period, 10/07/2024 - 09/07/2025)	
A	Proportion of atrial fibrillation (AF) patients admitted for stroke, who were on anticoagulation	N: 110 D: 180	61.1%	N: 147 D: 212	69.3% (+8.2%)†	N: 178 D: 263	67.7% (-1.6%)‡
B	The percentage of patients registered at the practice aged 65 years and over diagnosed with high-risk conditions* and who have had a pulse rhythm assessment in the preceding 12 months	N: 20786 D:121436	17.1%	N: 51865 D: 131751	39.4% (+22.3%)†	N: 73085 D: 142200	51.4% (+12%)‡
C	Percentage of AF patients currently treated with an anticoagulant, who had an assessment in the preceding 12 months of renal function, creatinine clearance, FBC and LFTs liver function tests	N: 10098 D:14888	67.8%	N: 11013 D: 16253	67.8% (0%)†	N: 9780 D: 16699	58.6% (-9.2%)‡
D	The percentage of patients with AF in whom stroke risk has been assessed using the CHA_2DS_2-VASc score risk stratification scoring system in the preceding 12 months (excluding those patients with a previous CHA_2DS_2-	n/a n/a	n/a	n/a n/a	n/a	259 22400	1.2%

	VASc score of 2 or more)						
E	In those patients with AF with a record of a CHA_2DS_2-VASc score of 2 or more, the percentage of patients who are currently treated with anticoagulation drug therapy	n/a	n/a	n/a	n/a	253	93.0%
		n/a		n/a		272	

*N: Numerator; D: Denominator; AF: Atrial Fibrillation, FBC: Full Blood Count, LFTs: Liver Function Tests *Coronary heart disease, heart failure, hypertension, diabetes, chronic kidney disease, peripheral arterial disease, or stroke/transient ischemic attack; †Compared to Baseline period; ‡ Compared to 1st reporting period; # Significant at p<0.05 level; n/a: not available – not applicable*

Figure 1

Output of indicator A

[proportion (as percentage) of atrial fibrillation - AF patients admitted for stroke, who were on anticoagulation] for the baseline and reporting periods]

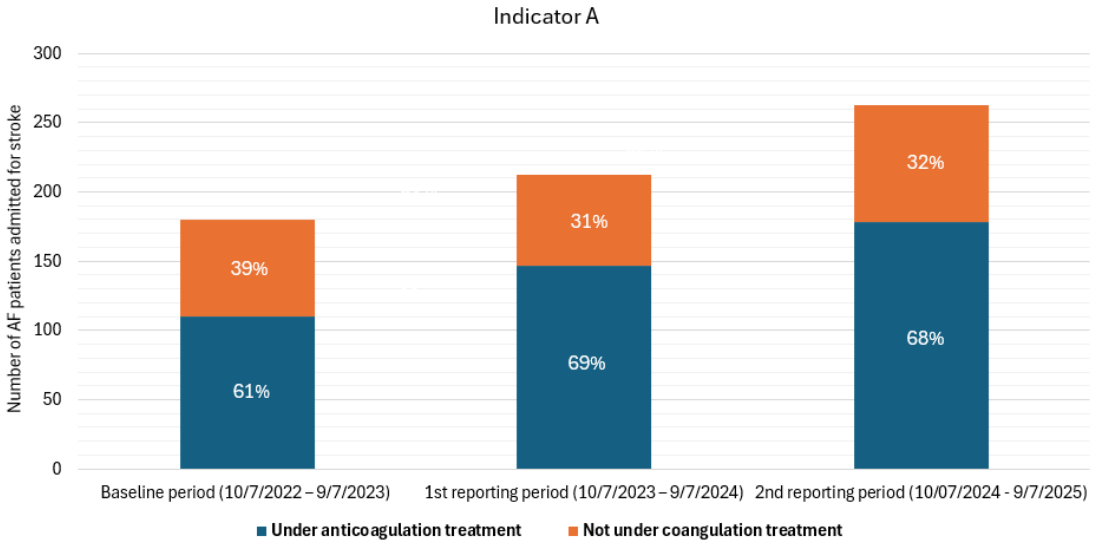


Figure 2

Output of indicator B

[percentage of patients registered at the practice aged 65 years and over diagnosed with one or more of the following conditions: coronary heart disease, heart failure, hypertension, diabetes, chronic kidney disease, peripheral arterial disease, or stroke/transient ischemic attack and who have had a pulse rhythm assessment in the preceding 12 months) for the baseline and reporting periods]

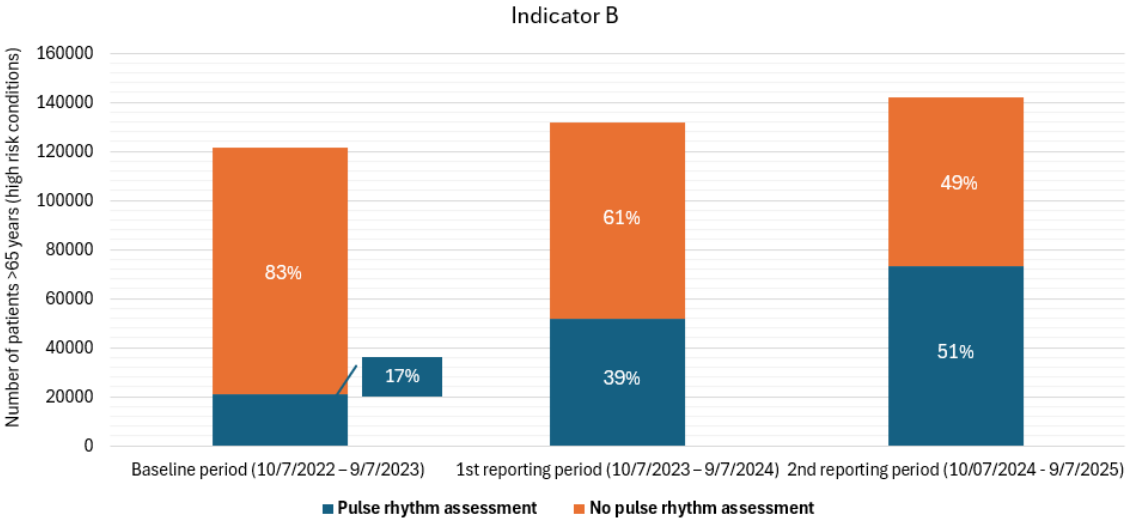


Figure 3

Output of indicator C

[percentage of atrial fibrillation-AF patients currently treated with an anticoagulant, who had an assessment in the preceding 12 months of renal function, creatinine clearance, FBC- Full Blood Count and LFTs-liver function tests) for the baseline and reporting periods]

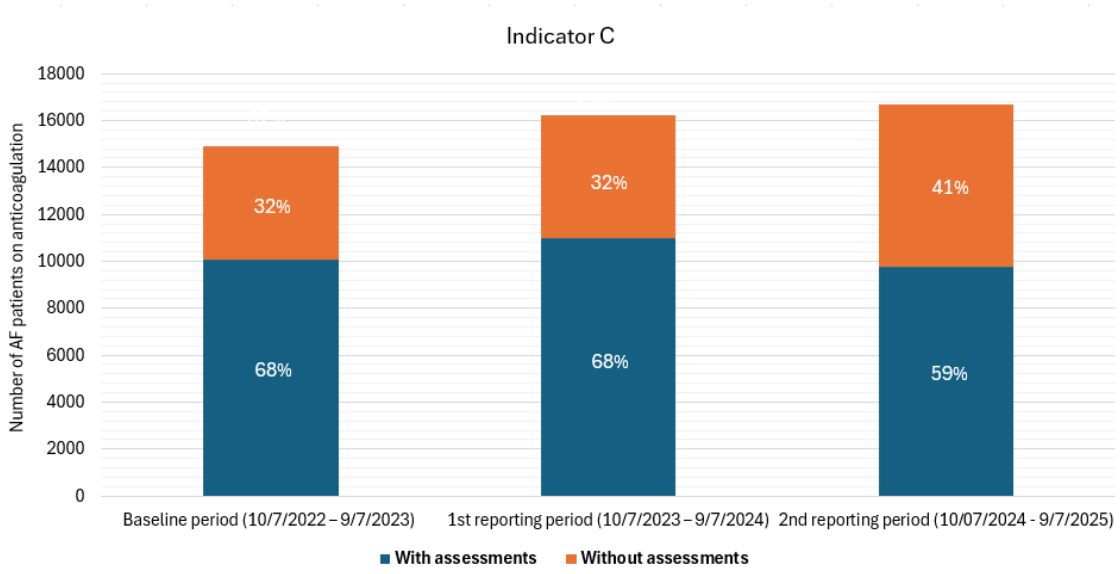


Figure 4- Output of indicator D

[percentage of patients with atrial fibrillation-AF in whom stroke risk has been assessed using the CHA_2DS_2-VASc score risk stratification scoring system in the preceding 12 months (excluding those patients with a previous CHA_2DS_2-VASc score of 2 or more) for the 2nd reporting period]

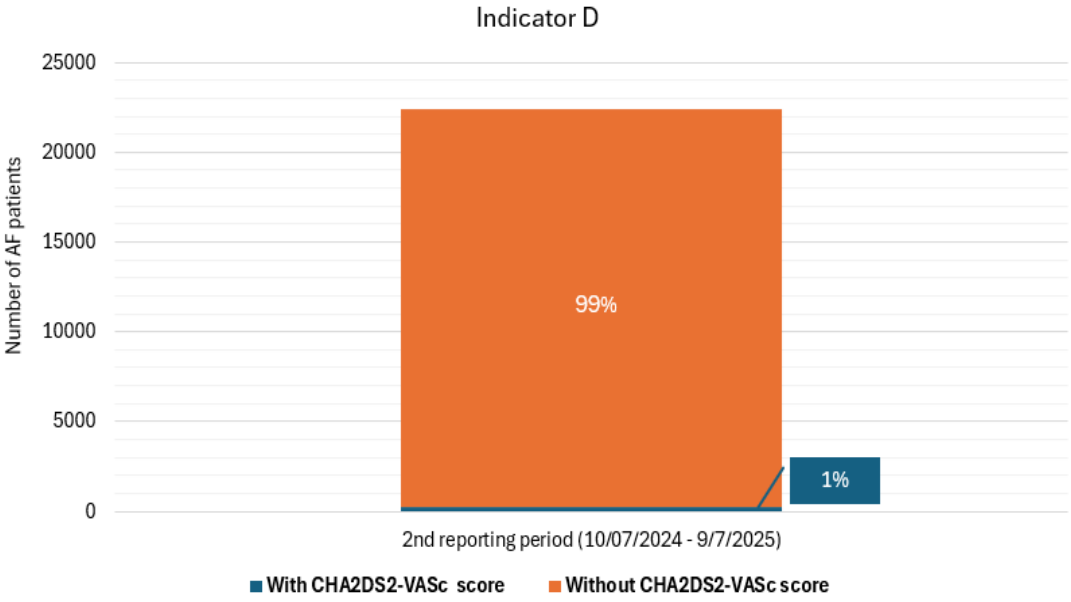
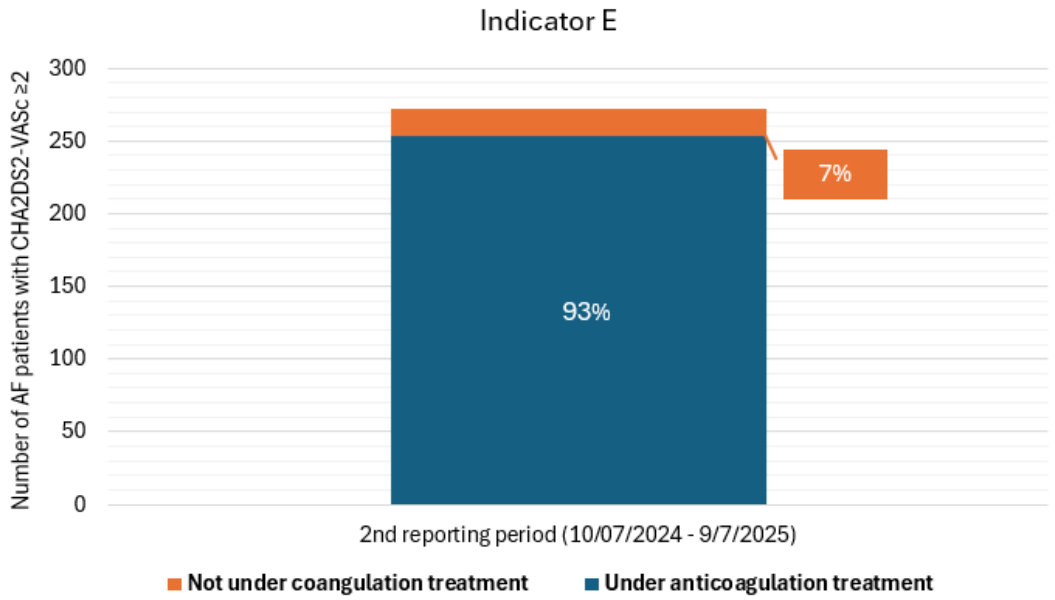


Figure 5

Output of indicator E

[In those patients with atrial fibrillation - AF with a record of a CHA_2DS_2-VASc score of 2 or more, the percentage of patients who are currently treated with anticoagulation drug therapy) for the 2nd reporting period]



4. Narrative review

4.1 Indicator A

Proportion of AF patients admitted for stroke, who were on anticoagulation.

4.1.1 Synthesis of findings

Management of patients with AF includes administration of anticoagulants to reduce the risk of stroke and other complications related to blood clot formation[1]. As these patients experience irregular heartbeats, blood flow is less efficient, and the resulting blockage of blood circulation in the left atrium may increase the risk of blood clot formation. These clots may break loose from their original site, travel through the bloodstream to the brain and block blood flow, causing an ischemic stroke[2]. Anticoagulants (e.g., warfarin, or newer options like apixaban, dabigatran, rivaroxaban) reduce the ability of blood to clot thus considerably minimize the risk of stroke and other thromboembolic complications such as systemic or peripheral artery embolism[3, 4].

Despite the availability of efficacious oral anticoagulation therapy (warfarin) and the introduction of newer and promising alternative anticoagulant options, atrial fibrillation patients at high risk for stroke were often found to be under-treated in the real-world setting. For example, oral anticoagulation treatment levels between 1998 and 2008 were below 60% (range 19%-81.3%) in 21 out of 29 studies reporting oral anticoagulation treatment levels across North America, Europe, Australia and Japan [5]. This underuse of anticoagulants in AF patients is well documented, which can be attributed to a combination of patient-, provider-, and healthcare system-related factors, as well as to concerns about the risks of anticoagulation therapy, especially in the presence of other co-morbidities [6, 7]. Primarily, anticoagulants, while reducing the risk of stroke and other thromboembolic events, increase the risk of major bleeding (e.g., gastrointestinal or intracranial bleeding), a consideration that is taken into account especially during the management of patients with any type of bleeding disorder or elderly patients that are frail and/or at risk of recurrent falls[8]. Furthermore, patients with co-morbidities or elderly patients with polypharmacy are challenging candidates for anticoagulation treatment due to interactions or contraindications between medications. As such, the use of anticoagulants needs to be tailored to individual patients based on this combination of factors and considering the trade-off between risk of thromboembolism and bleeding risk[6].

Beyond the clinical parameters that explain underuse of anticoagulants in AF, the published literature provides evidence on how personal characteristics or preferences as well as systemic limitations may further hinder their use in this high-risk population. More specifically, patients may be reluctant to take anticoagulants because of fear of bleeding or the inconvenience of frequent monitoring (for some types of anticoagulants), in case they have other co-morbidities or if administration of the anticoagulant is accompanied by related dietary restrictions if applicable[9]. Even for oral anticoagulants that are characterized with simpler regimens compared to other option, a recent study based on the United Kingdom (UK)'s primary care electronic health records, which investigated adherence (taking drugs as prescribed) and persistence (continuation of drugs) at 1 year for oral anticoagulants in adults with incident AF, demonstrated that the risk of non-adherence and non-persistence increased over time. Increased stroke risk, as assessed by CHA_2DS_2-VASc score, was associated with reduced risk of non-adherence and non-persistence across all classes of oral anticoagulants. Based on the findings of the same UK study, overall rates of 'primary non-adherence' (stopping after first prescription), 'non-adherent, non-persistence', 'adherent, not persistent', 'non-adherent, persistent', and 'persistent adherence' were 3.5%, 21.2%, 8.6%, 26.5% and 40.2%, respectively. Although these estimates varied across the different classes of oral anticoagulants[10], they are indicative of the potential for improvement in adherence and persistence with anticoagulant therapy among individuals with AF.

Healthcare or socioeconomic limitations may also affect the percentage of anticoagulant administration in AF patients. Minority race, not married or living alone, physical inactivity, alcohol use, self-reported poor physical health, mental health and/or sleep quality problems and inadequate health literacy have been associated with non-adherence in a large questionnaire study conducted in the United States (US) involving 12,159 AF patients[11]. These results were also mirrored in studies from non-western settings[12, 13] although, in general, use of anticoagulants appears to be higher in western compared to non-western settings. Based on the GLORIA-AF (Global Registry on Long-Term Oral Antithrombotic Treatment in Patients With Atrial Fibrillation) Phase III Registry - a large, global, "real-world," prospective registry - there was significant geographic variability in the use of directly acting oral anticoagulants and differences in the time-to-treatment initiation after atrial fibrillation diagnosis, with treatment initiation being fastest in Europe and North America (38 days and 43 days respectively) as opposed to 88 days for Asia and Latin America[14]. Furthermore, based on a multi-national cohort of middle-aged individuals, it was demonstrated that in low- and middle-income countries, only 24% of participants with AF and a $CHADS_2$ score ≥1 received antithrombotic therapy, compared with 85% in high income countries[15]. These discrepancies can be

explained by differences between countries in AF guideline implementation, in regular International Normalized Ratio (INR) monitoring for warfarin or in follow-up care for oral anticoagulants use while regions with limited healthcare resources may not have access to anticoagulants, particularly to more recent alternatives such as direct acting oral anticoagulants[16-18].

Nevertheless, worldwide, driven by the increasing rates observed in Europe and North America, the administration of anticoagulants to AF patients has increased during the last decades, especially for oral anticoagulants and non-vitamin K antagonist oral anticoagulants[19]. A similar trend was confirmed when additional options for antithrombotic treatment were considered in a setting where guideline-recommended therapy is implemented, as evident from the results of the GARFIELD-AF registry study, which involved four sequential cohorts of AF patients from 186 primary care practices in the United Kingdom. There was a statistically significant increase in the use of anticoagulant therapy from the first (2011-2013) to the last cohort (2015-2016), from 54.7% to 73.9%, and this increase in the use of anticoagulant therapy was mainly in patients with CHA_2DS_2-VASc ≥2[20]. However, despite these improvements several studies highlight that there is still evidence for substantial undertreatment in regard to in AF patients' premorbid anticoagulation even in the last decade[21]. Studies that relied on administrative or electronic health records data (or prospective national registries) that calculated proportion of AF patients admitted for stroke, who were on anticoagulation, were also identified and examined where possible. The output of these studies is more comparable to the output provided from the HIO electronic records and characteristic examples from such studies originating from European countries are summarized in Table 5.

Table 5

Characteristic examples of studies reporting the proportion of AF patients admitted for stroke, who were on anticoagulation

#	Author (year)	Country	Atrial Fibrillation (AF) patient group	Antithrombotic treatment	Time period	Proportion of AF patients admitted for stroke, who were on anticoagulation
1	Meinel TR 2020	Switzerland	pre-existing or newly diagnosed AF	VKA and DOAC	2014-2018	3120/8,179 = 38%

2	Larsen LK 2020	Denmark	all patients with an inpatient or outpatient AF diagnosis	OAC including VKA (warfarin and phenprocoumon) and NOAC (dabigatran, apixaban, rivaroxaban, and edoxaban)	2008-2016	All AF patients 2008: 22.6% 2016: 41.5% AF patients with CHA_2DS_2-VASc score ≥2 2008: 33.2% 2016: 63.1%
3	Harbison J 2024	Ireland	Previously confirmed diagnosis of AF	DOACs and warfarin	2017-2022	All AF patients 2281/2835=80.5%
4	David Franc 2024	Czech Republic	Known AF	All, (OAC, warfarin)	2012-2021	All AF patients 2012: 32.1% 2021: 70.7%

OAC: oral anticoagulants; DOAC: directly acting oral anticoagulants; VKA: Vitamin K antagonists; CHA_2DS_2-VASc: Congestive heart failure, Hypertension, Age (> 65 = 1 point, > 75 = 2 points), Diabetes, previous Stroke/transient ischemic attack (2 points)

The studies identified correspond to a small subset of relevant studies and were chosen to be presented as examples because data sources were national registries and/or electronic health records. Other studies based on cohort design and utilizing research tools, such as surveys and questionnaires, provided an identical picture but are not presented here. **Overall, the proportion of AF patients admitted for stroke, who were on anticoagulation in Cyprus was 61% in 2023 and reached 69% in 2024 following the introduction of the Atrial Fibrillation guideline, and these estimates are comparable to, yet slightly lower than those of western Europe for the same period. In the second year of implementation, there was no additional increase in the proportion of AF patients admitted for stroke, who were on anticoagulation (68%) demonstrating the need for sustained improvement efforts.**

It is acknowledged that data entry errors and variations in documentation or reporting practices between different healthcare providers may have influenced the estimates of Indicator A. These practices may include classification of patients as having atrial fibrillation based on a single recorded diagnosis at any point in time, although these entries could reflect transient symptoms or non-recurring episodes rather than confirmed, chronic atrial fibrillation. On the other hand, the use of the same reporting system (HIO data system) across the whole GHS as well as the implementation of the same business rules (calculation algorithms) for both the baseline and reporting period, ensure that the difference observed before and after the

implementation of the guideline is unlikely to be due to variations or limitations in data collection. Nevertheless, there is still room for improvement as a significant fraction of the population at risk appears to remain untreated. However, these remarks should be treated with caution; although the studies reviewed used a similar output metric, the way antithrombotic treatment was categorized was not always clear and not necessarily the same as in the case of Indicator A. Furthermore, the extent of guideline implementation or adherence to these medications was also unclear as well as the effect of different interactions with other drugs. Finally, in most studies reviewed, the percentage of AF patients at higher risk of stroke was not quantified (e.g., using a validated risk tool such as the CHA_2DS_2-VASc Score). Differences in the distribution of more susceptible AF patients between the different countries and across the different study populations could also account for variation in the proportion of patients admitted for stroke, who were on anticoagulation.

4.1.2 Suggestions

Towards improving quality of care in Cyprus for AF patients, it is important to consider appropriate strategies or interventions to optimise adherence to guideline-directed thromboprophylaxis for patients with atrial fibrillation in the primary care setting. Key aspects that relate to the performance of clinical care in Cyprus, which could affect the level of thromboprophylaxis among AF patients, will also need to be addressed. Lack of communication between the specialist (i.e., cardiologist) determining the diagnosis and the primary care physician might delay the initiation of anticoagulation treatment. In this regard, primary care physicians may expect that initiation of treatment was carried out at the time of diagnosis while this may not always be the case. On the other hand, specialists, considering bleeding risks, may be reluctant to initiate anticoagulation immediately. This may be the case in uncommon but plausible situations where information on full medical background and other comorbidities of the patient may not be readily available to the specialist, including potential contraindications for anticoagulation (i.e., significant liver or kidney disease). Furthermore, in future assessments of Indicator A, additional information regarding the type of stroke (haemorrhagic, ischaemic, embolic, lacunar) and whether the patients had other risk factors for stroke, such as Diabetes Mellitus, hypertension and carotid artery stenosis, could further complement the overall picture relating to thromboprophylaxis and stroke risk among AF patients. Considering the outputs of indicator A, the results of the narrative review and feedback from TEC members, as well as taking into account relevant publications, primarily by Pritchet et al.[22] and Gebreyohannes et al.[6], the following suggestions are made:

- **Employ a computerized decision support tool that utilizes the data available in the HIO IT system (including data on CHA_2DS_2-VASc Score) and alert the clinician about patients that are eligible and could benefit from anticoagulation therapy**.
    - Note: This suggestion aligns with the implementation of Indicator E "In those patients with atrial fibrillation with a record of a CHA_2DS_2-VASc score of 2 or more, the percentage of patients who are currently treated with anticoagulation drug therapy", which is expected to provide additional evidence on the level of thromboprophylaxis among AF patients. Regarding the use of computerized decision support tool for supporting the clinician in initiating anticoagulation treatment, although integration of these systems is not uncommon, there is evidence that the greater the number of reminders or alerts a healthcare provider may receive, the less likely they are to respond appropriately due to alert fatigue[23].
- **Enhance communication between specialists and primary care physicians caring for the same patient.**
    - Note: Improved communication can be established by increasing awareness between both primary care physicians and specialists about this unmet need as well as through the development of clear recommendations for communication when a specialist diagnoses AF, ensuring primary care physicians receive timely updates on treatment decisions.
- **Local opinion leaders to promote evidence-based practice in healthcare providers**
    - Note: Local opinion leaders could be individuals perceived as credible and trustworthy by their peers, who can disseminate and implement best evidence through teaching or community outreach[24].
- **Guideline/protocol education sessions and training**
    - Note: This approach can also facilitate the involvement of healthcare providers in updates of the adapted guideline or the development of supporting and educational materials to further enhance their engagement[22].
- **Decision aid for patients to improve guideline adherence**
    - Note: The decision aid could be administered with a booklet and supported by tailored education and support by healthcare professionals[25].

4.2 Indicator B

The percentage of patients registered at the practice aged 65 years and over who have been diagnosed with one or more of the following conditions: coronary heart disease, heart failure, hypertension, diabetes, chronic kidney disease, peripheral arterial disease, or stroke/transient ischemic attack, who have had a pulse rhythm assessment in the preceding 12 months.

4.2.1 Synthesis of findings

This indicator is primarily targeted at individuals aged 65 years and older, as multiple epidemiological studies demonstrate a marked increase in AF prevalence and incidence beginning at this age. While the risk of AF increases progressively with advancing age, several studies report a notable rise around the age of 65[26,27]. In addition to age, this indicator incorporates several comorbid conditions that are well established as either risk factors for the development of AF or as clinical consequences of the arrhythmia itself. These include coronary heart disease[28], heart failure[27,29], hypertension[29-32], diabetes[29-32], chronic kidney disease and renal dysfunction[30,33], peripheral arterial disease[34], stroke[35] and ischemic attack[29,36]. Consequently, their presence significantly increases the likelihood of AF and justifies their inclusion as key risk factors in defining the target population for AF screening. At the same time, evidence suggests a significant increase in AF detection rates with a higher frequency of pulse assessments. Cole et al demonstrated that systematic pulse checks are associated with improved identification of previously undiagnosed AF, highlighting their importance in facilitating early detection and timely initiation of appropriate management[37]. This indicator primarily emphasizes manual pulse palpation as a practical, cost-effective, and widely accessible method for atrial fibrillation screening. Manual pulse palpation has been shown to possess high sensitivity but relatively low specificity for AF detection, making it particularly suitable as an initial screening tool in both community and primary care settings[38]. However, due to its limited specificity, abnormal findings often require confirmation through more precise diagnostic modalities. Alternative screening methods, including single-lead electrocardiograms and automated blood pressure devices with AF detection algorithms, have demonstrated higher diagnostic accuracy and specificity compared to manual palpation[39]. These tools therefore serve as valuable adjuncts or confirmatory methods following an abnormal pulse assessment, enhancing overall screening effectiveness and reliability.

Overall, this indicator assesses opportunistic pulse rhythm assessment in a high-risk group at the primary care setting and represents an effective approach for assessing the detection of atrial fibrillation in vulnerable populations.

Previous studies have assessed the use of opportunistic pulse rhythm assessment among different populations groups that may have a higher risk for atrial fibrillation. In close relation to the target population of Indicator B, other trials demonstrated a detection rate of new AF ranging from 0.5%[40] to 1.6%[41] among the general population and older adults respectively. At the same time, early detection of arrhythmia abnormalities has been documented within the framework of implementing awareness or active screening campaigns for AF in the community setting[42] or the primary care setting[43].

Nevertheless, no study reported pulse rhythm assessment data for a specified time interval among individuals with relevant comorbidities. As a result, there are no data directly comparable with Indicator B. However, and despite the modality employed for screening, existing data suggest low uptake of atrial fibrillation screening among practitioners in the primary care setting, mainly due to time constraints and limited resources[44]. Proposed enablers include reallocating staff roles, involving practice nurses as healthcare professionals who can, theoretically, more easily integrate screening into their workflow, as well as appointing “AF screening champions” within the framework of communication and awareness campaigns[45]. It is acknowledged that given increasing pressure on primary care, widespread screening may not be feasible in all settings although targeting high-risk groups, such as older patients, during routine health visits may be more practical.

In Cyprus, following the guideline implementation two years ago, Indicator B demonstrates a sustained improvement as it has increased from 17.1.% during the baseline period to 39.4% in the first year and 51.4% in the second year of implementation. Although this trend demonstrates gradual improvement, almost half of the at-risk population is not routinely screened via pulse rhythm assessment despite the very low time and cost constraints. Additional actions to improve this indicator need to be undertaken.

4.2.2 Suggestions

Opportunistic screening using pulse rhythm assessment is supported by evidence demonstrating its relatively high sensitivity (although low to moderate specificity) and has been included in AF screening recommendations for several years. Nevertheless, there is absence

of high-quality data to effectively scale these initiatives in the primary care setting in a cost-effective manner[46]. To this effect and considering the realities of the healthcare system of Cyprus the following suggestions are provided:

- **Integrate pulse rhythm assessment into existing workflows**
    - Note: Pulse rhythm assessment could take place during measurement of vital signs prior the consultation by a nurse or during medication renewal visits, to minimize additional workload and improve feasibility.
- **Introduce performance-based financial incentives**
    - Note: Financial incentives should be linked to documentation of pulse checks, to confirm sustained implementation of screening.

4.3 Indicator C

The percentage of patients with atrial fibrillation, currently treated with an anticoagulant, who had an assessment in the preceding 12 months of renal function, creatinine clearance, full blood count (FBC) and liver function tests (LFTs) as appropriate for their anticoagulation therapy.

4.3.1 Synthesis of findings

Routine assessments of renal function, creatinine clearance, FBC, and LFTs are essential for AF patients treated with anticoagulants to ensure safety and effectiveness of the therapy. More specifically, many anticoagulants, especially the more recently developed direct oral anticoagulants (DOACs) (e.g., apixaban, rivaroxaban, dabigatran, edoxaban), are excreted at least partially by the kidneys and as such impaired renal function (assessed via creatinine clearance or estimated glomerular filtration rate - eGFR) can lead to drug accumulation, increasing the risk of bleeding complications[47]. In older AF patients on anticoagulation or in AF patients on anticoagulation that have also other co-morbidities (e.g., diabetes), their renal function may decline or vary over time and may require dose adjustment[48] or to switch to an alternative anticoagulant option[49,50]. Similarly, to ensure safety, FBC assessments are required to identify undiagnosed, mild/severe or worsening anemia (e.g., from gastrointestinal bleeding) or low platelet counts (thrombocytopenia) that may be attributed to or exacerbated by anticoagulation therapy and may occur without noticeable symptoms. Not surprisingly, the severity of anemia in AF patients on oral anticoagulants was associated with major bleeding events in several studies as well as with thromboembolic cardiovascular events[51,52]. Finally, as liver is the primary site for detoxification in the body, it plays a key role in metabolizing anticoagulants, particularly DOACs like rivaroxaban and apixaban[53], and altered drug metabolism may affect anticoagulant levels and as such drug effectiveness and bleeding risk[54].

The literature review picked up several articles, guidelines, and expert opinions stating that regular monitoring of renal function is required to ensure safe use of direct oral anticoagulant[47, 55-57]. Characteristically, according to their summary of product characteristics (SPC), dabigatran is contraindicated in patients with an estimated creatinine clearance <30 mL/min, and rivaroxaban is contraindicated in patients with an estimated creatinine clearance of <15 mL/min[58]. Nevertheless, only a few studies evaluated the frequency of renal function testing in patients with atrial fibrillation taking oral anticoagulants and most of them were not based on electronic health records or national registry data. More specifically, a United States retrospective cohort study using previously collected data from the Michigan Anticoagulant

Quality Improvement Initiative demonstrated that 14% of patients received insufficient monitoring[59]. Another Spanish study involving 692 consecutive AF patients on direct acting oral anticoagulants observed that 39% of their patients received inadequate monitoring[60]. Despite the small number of studies examining this issue, their findings are notable and underscore the important implications of limitations in monitoring of renal function. Based on the study by Gruca M et al., within a 2-year follow-up period, 12% of patients on directly acting oral anticoagulants had a change in renal function, in a quarter of which was significant enough to require a dosage change[59]. Characteristically, a larger study involving 34,926 patients enrolled between 2013 to 2016 and nested within the GARFIELD-AF global registry study, estimated that non-recommended dosing (underdosage and overdosage combined), compared with recommended dosing, was associated with a higher risk of all-cause mortality. More specifically, a statistically significant hazard ratio (HR) for all-cause mortality equal to 1.24 was estimated, with a corresponding hazard ratio of 1.25 for underdosing and a corresponding HR of 1.19 for overdosing[61]. Given the large number of individuals taking this medication across the world, the impact of suboptimal monitoring on morbidity and health costs cannot be underestimated.

On the contrary, the literature review could not identify any studies examining assessments for anemia (and/or low platelets) or liver function tests, in atrial fibrillation patients. Furthermore, the literature review could not identify any study calculating the percentage of AF patients currently treated with an anticoagulant, who did not have an annual assessment of all appropriate tests mentioned above. Nevertheless, while specific data on the exact frequency of full blood count or liver function assessments in real-world practice is limited, annual evaluations are widely recommended, with suggested adjustments based on individual patient risk factors and clinical observations.

Overall, the limited evidence available from the published literature, especially the lack of comparable data on routine monitoring of relevant parameters other than liver function, precludes the direct comparison of Indicator C output with comparable data from other countries. **Nevertheless, given that routine monitoring of renal function, creatinine clearance, FBC, and LFTs in patients treated with anticoagulants, is primarily a patient safety issue, the Indicator C output, which equaled 68% at baseline and fell to 59% during the 2nd reporting period, is considered low.** Consequently, significant effort needs to be undertaken to improve guideline adherence and enhance patient safety.

4.3.2 Suggestions

To further promote routine monitoring of renal function, creatinine clearance, full blood count (FBC) and liver function tests (LFTs) in AF patients, as appropriate for their anticoagulation therapy, the following suggestions are provided, primarily based on feedback from TEC members and basic principles for enhancing guideline adherence:

- **Enhance communication between specialists and primary care physicians responsible for the same patient.**
    - Note: Improved communication can be established by increasing awareness between both primary care physicians and specialists about this unmet need as well as through the development of clear recommendations for frequent communication between primary care physician and the specialist as part of routine monitoring of AF patients on anticoagulants.
- **Offer incentives to healthcare providers**
    - Note: Enhance the role of the relevant atrial fibrillation indicator adopted by HIO (Indicator C) using incentives for general practitioners or specialists[62].
- **Provide educational resources and sessions for healthcare providers**
    - Note: These resources should target primarily general practitioners as well as cardiologists and inform them about the importance of monitoring and its impact on anticoagulation safety and stroke prevention. Specialist cardiologists can be also engaged in the co-creation of these educational resources and sessions.
- **Reviews (audits) of annual monitoring status**
    - Note: Clinicians may respond better to reviews conducted by peer clinicians[22].
- **Address barriers to guideline adherence**
    - Note: Via surveys, data analysis based on the HIO IT system or other methods to identify convenient and cost-effective options to improve guideline adherence. A targeted questionnaire sent to the relevant healthcare providers would be useful in this case, to investigate the underlying factors that could explain the poor guideline adherence as Indicator C indicates.
- **Use of nudges to promote guideline adherence**
    - Note: Nudges correspond to subtle changes in how choices are presented that can significantly influence a decision maker's behavior in a predictable manner without restricting his/her choices or relying on economic incentives[63].

4.4 Indicator D

The percentage of patients with atrial fibrillation in whom stroke risk has been assessed using the CHA2DS2-VASc score risk stratification scoring system in the preceding 12 months (excluding those patients with a previous CHA2DS2-VASc score of 2 or more).

Indicator E

In those patients with atrial fibrillation with a record of a CHA2DS2-VASc score of 2 or more, the percentage of patients who are currently treated with anticoagulation drug therapy.

4.4.1 Synthesis of findings

The CHA_2DS_2-VASc score is a validated clinical risk stratification tool recommended by the European Society of Cardiology (ESC) and the American College of Cardiology/American Heart Association (ACC/AHA) guidelines for estimating the annual risk of stroke and for guiding decisions regarding the initiation of oral anticoagulation therapy for stroke prevention in patients with AF. The CHA_2DS_2-VASc score was developed by Lip et al. in 2010[64] after the refinement of the 2006 Birmingham/National Institute for Health and Clinical Excellence (NICE) stroke risk stratification scheme. This refinement involved reclassifying existing risk factors and incorporating additional clinically relevant variables, thereby transforming the original schema into a comprehensive risk factor-based model. The score was subsequently validated and compared with earlier stroke risk stratification schemes in a real-world cohort of patients with atrial fibrillation (n = 1,084) from the Euro Heart Survey on Atrial Fibrillation, demonstrating improved identification of patients at truly low risk of thromboembolic events. Each letter in the CHA_2DS_2-VASc acronym, represents a stroke risk factor, with assigned points as summarized by Jia X et al.[65] and presented in Table 6.

Table 6: Description of CHA_2DS_2-VASc elements

Parameters	Points	Description
Congestive heart failure	1	Recent signs/symptoms of heart failure or objective evidence of reduced left ventricular ejection fraction
Hypertension	1	Diagnosis of hypertension as resting blood pressure > 140/90 mm Hg on at least 2 occasions or current antihypertensive treatment
Age ≥ 75 years	2	Age ≥ 75 years
Diabetes mellitus	1	Diagnosis of diabetes mellitus as fasting glucose > 125 mg/dL or treatment with oral hypoglycemic agent and/or insulin
Stroke/TIA/TE	2	Previous stroke, transient ischemic attack or thromboembolism
Vascular disease	1	Previous myocardial infarction, peripheral artery disease or aortic plaque
Age 65–74 years	1	Age 65–74 years
Sex category	1	Female gender

Owing to its simplicity, wide availability, and clinical applicability, the CHA_2DS_2-VASc score has been widely adopted in both international guidelines and routine clinical practice. One of its major advantages is its ability to accurately identify patients with an extremely low risk of stroke, while minimizing the number of patients categorized as having an intermediate or moderate risk[61, 65, 66].

Several studies have demonstrated the clinical importance of the CHA_2DS_2-VASc score in risk stratification and therapeutic decision-making in patients with atrial fibrillation. A nationwide Danish cohort study evaluated patients with AF and low $CHADS_2$ scores who were not treated with vitamin K antagonists or heparin. This study demonstrated that stroke risk increased progressively with higher CHA_2DS_2-VASc scores, even among patients classified as low risk by the $CHADS_2$ score. Importantly, the CHA_2DS_2-VASc score was shown to more accurately identify truly low-risk patients, highlighting that the $CHADS_2$ score alone may be insufficient for optimal risk stratification[67]. This refined risk assessment allows for improved identification of patients who are likely to benefit from anticoagulation therapy and consistent findings were

also reported in a large cohort study by Harb et al., which included 165,184 consecutive patients from a large prospective registry. In this study, higher CHA_2DS_2-VASc scores were independently associated with increased long-term mortality, regardless of the presence or absence of AF, further supporting the score's prognostic significance beyond stroke prediction[68]. Moreover, the study by Coppens et al., demonstrated that the CHA_2DS_2-VASc score could distinguish patients with AF and $CHADS_2$ = 1 who were truly at low risk of stroke from those who would benefit from anticoagulation. This finding is particularly relevant in clinical scenarios where the decision to initiate anticoagulant therapy is uncertain[69]. Finally, a population-based study, using the computerized database of the largest health maintenance organization in Israel, assessed over one million individuals without previously diagnosed AF, showed that higher CHA_2DS_2-VASc scores were directly associated with an increased incidence of new-onset AF[70]. These findings suggest that the CHA_2DS_2-VASc score may also be useful in identifying individuals at increased risk of developing AF who could benefit from targeted screening strategies. Taken together, these findings underscore the importance of accurate and standardized calculation of the CHA_2DS_2-VASc score, as it directly influences clinical decision-making regarding anticoagulation therapy in patients with atrial fibrillation.

Nevertheless, data on real life application of risk stratification using CHA_2DS_2-VASc score among people with AF is limited. As a validated tool recommended by several clinical guidelines, CHA_2DS_2-VASc score is expected to be implanted widely across different healthcare systems across the world. Nevertheless, data from population level studies or registry-based cohorts that report the actual implementation of this tool in the clinical setting is scarce. This finding is not surprisingly as the individual parameters included in the calculation of CHA_2DS_2-VASc Score are routinely collected or are readily available in the medical records of patients. Consequently, several studies just calculate this parameter for the sample population of interest without reporting data on patients with missing data. Health services studies that focus on guideline implementation for risk-stratification focus primarily on whether anticoagulation treatment is in-line with guideline recommendations according to the CHA_2DS_2-VASc score, rather than whether CHA_2DS_2-VASc score was actively collected for all AF patients[71,72].

Although the focus was not the assessment of risk stratifications and use of CHA_2DS_2-VASc score was not directly reported, several registry studies reported that data availability was complete and calculation of CHA_2DS_2-VASc score was possible for all patients[73-75]. The review identified only a small but prospective study from a single hospital in Pakistan over a single year (2023), that showed that stroke risk stratification using CHA_2DS_2-VASc score was limited to approximately 80% of consecutive AF patients[76]. In a more specific patient group of

individuals that experience AF as a post-operative complication of coronary artery bypass grafting, a questionnaire study across several hospitals in China aiming to assess adherence to guideline recommendations among surgeons and other healthcare professionals, showed very low implementation (<30%) in the use CHA2DS2-VASc score (as well as in the use of HAS-BLED)[77]. However, for the same target patient group, a registry-based cohort study in Sweden reported availability of CHA_2DS_2-VASc score in 100% of the participants[78]. In Turkey, another questionnaire-based, but small-scale, study, focusing on physicians caring for elderly population across different healthcare settings, reported that awareness and familiarity with CHA_2DS_2-VASc score was moderate to high (73.4%). However, in the same study, 52% of physicians correctly identified that a score of ≥2 necessitated anticoagulation therapy in the absence of contraindications, while 42.3% were unsure, highlighting the potential knowledge gaps in this population[79].

In Cyprus, data were available from a single year of implementation and Indicator D (fraction of eligible AF patients that had to be assessed for stroke risk) was exceptionally low (1%). Based on the available evidence and in-line with the existing guideline, the target percentage of AF patients that should be assessed for their stroke risk in an annual basis should be 100%. As such, the underlying reasons for the poor performance in this indicator should be addressed and remedied. A plausible explanation for the very low proportion of patients with atrial fibrillation who have been assessed for stroke risk using the CHA_2DS_2-VASc score may relate to limitations in the current methodology used to identify eligible patients within the HIO Information System. At present, patients are classified as having atrial fibrillation based on a single recorded diagnosis at any point in time, using codes such as ICD-10 / ISICD2: I48.0, I48.1, I48.2, I48.9 or ICPC-II K78. However, this approach may lead to misclassification, as such entries could reflect transient symptoms, or isolated, non-recurring episodes rather than confirmed, chronic atrial fibrillation. Consequently, the denominator used for quality indicators may be inflated with patients who do not truly have chronic atrial fibrillation, thereby underestimating the proportion of patients appropriately assessed with the CHA_2DS_2-VASc score. For this reason, HIO has decided to revise the AF identification criteria by requiring at least two recorded diagnoses, to improve the accuracy of quality care indicators and better reflect actual clinical practice. Nevertheless, this is a problem that is expected to have affected all indicators horizontally and the root causes of the poor performance demonstrated in indicator D may be better explained by low awareness of this indicator by the physicians or limited willingness to complete the CHA_2DS_2-VASc score calculation tool embedded in the HIO Information System.

Among the small number of AF patients that had their stroke risk assessed and had CHA_2DS_2-VASc score of 2 or more, the percentage of patients who are currently treated with anticoagulation drug therapy was relatively high (93%). This compares favorably with published estimates from other countries where guideline adherent anticoagulation treatment based on CHA_2DS_2-VASc was relatively low. Reports involving Asian AF patients indicated percentage of guideline adherent anticoagulation treatment as low as approximately 10% in Taiwan between 1996 to 2011[80] but increasing up to 38.3% in 2015 in Korea, attributed to the introduction of non-vitamin K antagonist oral anticoagulants (NOAC) therapy in more recent years[81]. During the same period, guideline adherent treatment in the United States was estimated to be 18.8%[82]. More recent studies demonstrated much higher fractions of treatment adherence as 71.8% in United Arab Emirates in 2023[71] and 78% in Denmark during 2022 (rising from 53.1% in 2013)[83]. Although also based on recent data, in Germany the corresponding percentage for AF patients with CHA_2DS_2-VASc of 3 was 12.8% in women and 15.6% in men, for AF patients with CHA_2DS_2-VASc of 4 was 13.7% in women and 17.1% in men, and in the highest risk category (CHA_2DS_2-VASc ≥ 5), was 14% in women and 18.4% in men. However, these estimates are based on medication prescriptions within only the first 30 days following AF diagnosis and an elderly population with multiple comorbidities[72].

At the same time, the shift from the previous risk scoring system ($CHADS_2$) to CHA_2DS_2-VASc may have influenced the lowest anticoagulation treatment in previous years as it has been demonstrated that up to two-thirds of AF patients categorized as low risk by the $CHADS_2$ score, were classified as high risk by CHA_2DS_2-VASc and had Class I indication for oral anticoagulants (OACs), primarily through the inclusion of age ≥65 years as a risk factor[84].

Overall, Indicator E demonstrates evidence of guideline adherent treatment in AF patients with CHA_2DS_2-VASc score of 2 or more. Following this, it should be noted that the relatively small number of patients included in this analysis limits the external validity of the findings with respect to the underlying atrial fibrillation population in Cyprus. As such, robust conclusions cannot be reliably inferred at this stage. A more comprehensive evaluation of stroke risk using CHA_2DS_2-VASc score, ideally among a substantially larger proportion of AF patients, is required prior to recalculating Indicator E in the next reporting period, to ensure more generalizable assessment of this indicator.

4.4.2 Suggestions

Beyond the suggestions provided in response to Indicators A, B, and C, towards improving risk stratification and adherent guideline prescribing assessed via Indicators D and E, the following suggestions are provided:

- **Employ a computerized decision support tool that utilizes the data available in the HIO IT system (including data on CHA_2DS_2-VASc Score) and alert the clinician about patients that are eligible and could benefit from anticoagulation therapy**
    - Note: Same suggestion as provided in response to Indicator A. Following implantation of Indicator D and E, the development of the decision support tool is more feasible and relevant to everyday clinical practice.
- **Provide educational resources and sessions for healthcare providers about CHA_2DS_2-VASc score and guideline adherent prescribing of anticoagulants**
    - Note: These resources should target cardiologists, general practitioners, pharmacists, and nurses on the importance of monitoring and its impact on anticoagulation safety and stroke prevention. Specialist cardiologists can be also engaged in the co-creation of these educational resources and sessions.

5. Summary

In summary, the introduction of the contextualized NG196 “Atrial fibrillation: diagnosis and management” guideline to the Cyprus Health care system allowed the assessment of key quality care indicators. Data collected following the first two years of guideline implementation provides evidence that at least the proportion of Atrial Fibrillation patients at risk of stroke receive anticoagulation therapy at higher levels compared to baseline. This improvement is in line with the practices in western settings and ensures improved outcomes across this sensitive population. Nevertheless, more should be done to further optimise this metric because when compared to the first-year data, the indicator’s estimate did not improve further. To this effect, this report provides some relevant suggestions. Similarly, there was steady increase in the number of patients >65 years with comorbidities who are screened with pulse rhythm assessment, and this indicator has demonstrated a steady increase over the two years after guideline implementation. Nevertheless, still approximately half of the high-risk population that should have been screened, did not receive a pulse rhythm assessment in the last 12 months, and additional measures should be undertaken to strengthen performance in

this indicator as well. On the other hand, the proportion of patients with Atrial fibrillation and on anticoagulation therapy, that are routinely monitored for renal function, liver function and anemia, appears low and slightly decreasing since the implementation of the guideline. Although estimates for routine monitoring in other countries are scarce and direct comparisons difficult, the implementation of these assessments is widely accepted as best practice and highly relevant to patient safety. Relevant suggestions have also been provided for the improvement of this metric as well. Finally, indicators D and E were assessed for the first time in the second year of guideline implementation. The percentage of AF patients whose stroke risk has been assessed using the CHA_2DS_2-VASc score risk stratification scoring system in the preceding 12 months is extremely low but among those that were found to have a CHA2DS2-VASc ≥ 2, anticoagulation therapy is mostly prescribed as indicated. However, generalizability of indicator E findings is low due to the extremely small sample size.

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APPENDIX I

<u>Indicator A:</u> Proportion of patients admitted to hospital for stroke with a pre-existing diagnosis of atrial fibrillation, who were on anticoagulation.

<u>Numerator:</u> The number of patients in the denominator on anticoagulation before admission.

<u>Denominator:</u> The number of patients admitted to hospital with a primary diagnosis of stroke, who had a pre-existing diagnosis of atrial fibrillation.

<u>Calculation:</u> (Numerator/denominator)*100

<u>Specifications:</u>

- Calculated on an annual basis, at the end of the year
- Calculated across the whole GESY

<u>Data source:</u> HIO information system (For the denominator: in-hospital diagnosis of "stroke" combined with electronic record diagnosis of atrial fibrillation. For the numerator: "anticoagulation prescription" status from the patient's electronic record, going back 3 months before the date of admission).

Minimum population: The indicator is appropriate to assess performance at the whole country level.

Exclusions: No exclusions apply for this indicator.

Indicator B: The percentage of patients registered at the practice aged 65 years and over who have been diagnosed with one or more of the following conditions: coronary heart disease, heart failure, hypertension, diabetes, chronic kidney disease (CKD), peripheral arterial disease (PAD), or stroke/transient ischemic attack (TIA) who have had a pulse rhythm assessment in the preceding 12 months.

Numerator: The number of patients in the denominator who have had a pulse rhythm assessment in the preceding 12 months.

Denominator: The number of patients aged 65 and over registered at a General Practitioner (GP) practice who have been diagnosed with one or more of the following conditions: coronary heart disease, heart failure, hypertension, diabetes, CKD, PAD, or stroke/TIA.

Calculation: (Numerator/denominator)*100

Specifications:

- Calculated on an annual basis, at the end of the year
- Calculated separately for each health care practitioner registered at GESY

Data source: HIO information system (For the denominator: Patient age at start of reporting period and Information on different diagnoses with no time restriction, obtained from patient's

electronic record. For the numerator: information on performance of pulse rhythm assessment from the patient's electronic record in the preceding 12 months before the date of indicator evaluation).

Minimum population: The indicator is appropriate to assess performance at individual healthcare practitioner level.

Exclusions: People with diagnosed atrial fibrillation.

Indicator C: The percentage of patients with atrial fibrillation, currently treated with an anticoagulant, who had an assessment in the preceding 12 months of renal function, creatinine clearance, full blood count (FBC) and liver function tests (LFTs) as appropriate for their anticoagulation therapy.

Numerator: The number of patients in the denominator who have had a review in the preceding 12 months of the following: Assessment of renal function, creatinine clearance, full blood count (FBC) and liver function tests (LFTs) as appropriate for their anticoagulation therapy.

Denominator: The number of patients with atrial fibrillation, currently treated with an anticoagulant.

Calculation: (Numerator/denominator)*100

Specifications:

- Calculated on an annual basis, at the end of the year
- Calculated separately for each health care practitioner registered at GESY
- Assessments (parts of the numerator) can be carried out any time during the year (and as such, each individual component will be recorded separately), not as part of an annual review

Data source: HIO information system (for the denominator: AF diagnosis -any time diagnosis- and “anticoagulation prescription” status from the patient’s electronic record, going back 6 months before the date of indicator evaluation. For the numerator: activities -claims- recorded at the patient’s electronic record going back 12 months before the date of indicator evaluation).

Minimum population: The indicator is appropriate to assess performance at individual healthcare practitioner level.

Exclusions: No exclusions apply for this indicator.

Indicator D: The percentage of patients with atrial fibrillation in whom stroke risk has been assessed using the CHA_2DS_2-VASc score risk stratification scoring system in the preceding 12 months (excluding those patients with a previous CHA_2DS_2-VASc score of 2 or more)

Numerator: The number of patients in the denominator in whom stroke risk has been assessed using the CHA_2DS_2-VASc score risk stratification scoring system in the preceding 12 months.

Denominator: The number of patients with atrial fibrillation.

Calculation: (Numerator/denominator)*100

Specifications:

- Calculated on an annual basis, at the end of the year
- Calculated separately for each health care practitioner registered at GESY
- All patients with past AF diagnosis will be included.

Data source: HIO information system (For the denominator: AF diagnosis -any time diagnosis- from the patient’s electronic record. For the numerator: activity of filling specific $CHAD_2DS_2$-VASc score questionnaire any time during 12 preceding months before the date of indicator evaluation).

Minimum population: Minimum population: The indicator is appropriate to assess performance at the whole country level.

Exclusions: Patients with atrial fibrillation with a previous CHA_2DS_2-VASc score of 2 or more.

Indicator E: In those patients with atrial fibrillation with a record of a CHA_2DS_2-VASc score of 2 or more, the percentage of patients who are currently treated with anticoagulation drug therapy.

Numerator: The number of patients in the denominator who were prescribed oral anticoagulants in the 6 months leading up to and including the date of indicator evaluation.

Denominator: The number of patients with most recent CHA_2DS_2-VASc stroke risk assessment score of 2 or more.

Calculation: (Numerator/denominator)*100

Specifications:

- Calculated on an annual basis, at the end of the year
- Calculated separately for each health care practitioner registered at GESY
- All patients with past AF diagnosis will be considered.

Data source: HIO information system (For the denominator: AF diagnosis -any time diagnosis- from the patient's electronic record in addition to having a $CHAD_2DS_2$-VASc score of 2 at their last annual $CHAD_2DS_2$-VASc score assessment. For the numerator: "anticoagulation

prescription" status from the patient's electronic record, going back 6 months from the date of indicator evaluation).

Minimum population: The indicator is appropriate to assess performance at the whole country level.

Exclusions: No exclusions apply for this indicator.

APPENDIX II: BUSSINESS RULES

The "Business Rules" Appendix complements the contextualized NG196 clinical guideline "Atrial fibrillation: diagnosis and management" and can be used as an aid to understand the patient groups and activities included in each indicator output.

Important information: *The draft business rules format employed here follows the format described by NHS Digital described in the Business Rules Supporting Information (Version 1.2 – 01/04/2017) and consist of two main sections:*

- *Dataset specification*
    - *Qualifying Dates (number of dates to determine the relevant period(s) to extract data for and for identifying which activity to include in each extract)*
        - *Reporting Period Start Date (RPSD)*
        - *Reporting Period End Date (RPED)*
        - *Qualifying dates determine a quality service period for which the indicator is assessed. The quality service period can be defined differently using different RPSD and/or RPED, depending on the nature of data collection (cumulative data collection Vs non-cumulative data collection).*
    - *Patient selection criteria (definition of patient populations, further criteria define the clinical aspects of interest using appropriate internal, national, or*

international coding system in line with the format used in the HIO electronic system)

- *The patient selection criteria can be applied at the individual doctor level and/or GESY level.*

- *Populations (Subsets of patients to which further logic rules may apply).*
- *Clinical code clusters (may need to be specified for any dates associated with them to be identified)*
- *Clinical data extraction criteria (data items to be exported from the HIO electronic system for subsequent processing)*

- *Data export – Output*
  - *Data exports are provided a name and a description and state for which population the logic rule(s) should be applied to.*
  - *The output forms an indicator which may comprise*
    - *A single count of patients meeting the criteria*
    - *A numerator and denominator combination producing a fractional figure*
      - *Separate logic rules may be required to be specified for numerator and denominator population*
    - *A Boolean TRUE/FALSE result*

Indicator A: Proportion of patients admitted to hospital for stroke with a pre-existing diagnosis of atrial fibrillation, who were on anticoagulation.

Indicator A business rules:

Reporting period -> Annually -> non-cumulative data collection

Reporting unit (minimum population) -> across the whole GESY

RPSD = e.g. 01/01/2022

RPED = e.g. 31/12/2022

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF STROKE_HOS = 1	Next Rule	Reject	Rule 1 allows the selection of all hospitalizations for stroke. Definition of stroke according to ICDXX coding (depending on

				current HIO system configuration)
2	IF AF_DIAGN = 1	Select	Reject	Rule 2 allows the selection of patients with a diagnosis of AF within the subset of patients hospitalized for stroke. Any-time diagnosis of AF applies.
End of denominator rules				

STROKE_HOS = Hospitalization for stroke, AF_DIAGN = Diagnosis for AF

Numerator (numerators rules apply to the population selected as the denominator)				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	ACG_PRES =1	Next Rule	Reject	Rule 1 allows the selection of patients with at least one anticoagulation prescription during the reporting period
2	IF (ACG_PRES_DATE> STROKE_DATE – 3 MONTHS)	Select	Reject	Rule 2 allows the selection of the subset of patients with anticoagulation prescription(s) within 3 months before the stroke admission.
End of numerator rules				

ACG_PRES= Anticoagulation prescription, ACG_PRES_DATE= Date of anticoagulation prescription, STROKE_DATE = Date of STROKE admission

<u>Indicator B:</u> The percentage of patients registered at the practice aged 65 years and over who have been diagnosed with one or more of the following conditions: coronary heart disease, heart failure, hypertension, diabetes, CKD, PAD, or stroke/TIA who have had a pulse rhythm assessment in the preceding 12 months.

<u>Indicator C business rules:</u>

Reporting period -> Annually -> non-cumulative data collection

Reporting unit (minimum population) -> each health care practitioner registered at GESY

RPSD = e.g. 01/01/2022

RPED = e.g. 31/12/2022

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF PAT_AGE > 65	Next Rule	Reject	Rule 1 allows the selection of all patients with age greater than 65 years at RPSD
2	IF (CHD = 1 *OR* HF =1 *OR* HT=1 *OR* DB=1 *OR* CKD=1 *OR* PAD=1 *OR* STROKE=1 *OR* TIA=1)	Select	Reject	Rule 2 allows the selection of patients with at least one disease within a pre-specified list (coronary heart disease, heart failure, hypertension, diabetes, chronic kidney disease, peripheral artery disease, stroke, transient ischemic attack) with the patients aged 65 and older.
End of denominator rules				

CHD=Coronary Heart Disease, HF=Heart Failure, HT= Hypertension, DB=Diabetes, CKD= Chronic Kidney Disease, PAD= Peripheral Artery Disease, STROKE=Stroke, TIA= Transient Ischemic Attack

Numerator (numerators rules apply to the population selected as the denominator)				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF PRA = 1	Select	Reject	Rule 1 allows the selection of all patients with at least one pulse rhythm assessment
End of numerator rules				

PRA=pulse rhythm assessment

<u>Indicator C:</u> The percentage of patients with atrial fibrillation, currently treated with an anticoagulant, who have had a review in the preceding 12 months which included: assessment of renal function, creatinine clearance, FBC and LFTs as appropriate for their anticoagulation therapy.

<u>Indicator D business rules:</u>

Reporting period -> Annually -> non-cumulative data collection

Reporting unit (minimum population) -> each health care practitioner registered at GESY

RPSD = e.g. 01/01/2022

RPED = e.g. 31/12/2022

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF AF_DIAGN = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a diagnosis of atrial fibrillation (any time diagnosis)
2	IF ACG_PRES =1	Next Rule	Reject	Rule 2 allows the selection of subset of patients with at least one anticoagulation prescription during the reporting period
3	IF (ACG_PRES_DATE> RPED – 6 MONTHS)	Select	Reject	Rule 3 allows the selection of subset of patients with an anticoagulation prescription going back 6 months before the date of indicator evaluation within the group of atrial fibrillation patients with at least one anticoagulation prescription
End of denominator rules				

AF_DIAGN= Diagnosis for AF, ACG_PRES= Anticoagulation prescription, ACG_PRES_DATE= Date of anticoagulation prescription, RPED= Reporting Period End Date

Numerator (numerators rules apply to the population selected as the denominator)

Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF (REN_FUN_ASS = 1 *AND* CREAT_CL=1 *AND* FBC=1 *AND* LFT=1)	Select	Reject	Rule 1 allows the selection of all patients that undergone all the assessment from a prespecified list (renal function assessment, creatinine clearance, full blood count, liver function test)
End of numerator rules				

REN_FUN_ASS= Renal Function Assessment, CREAT_CL= Creatinine Clearance, FBC= Full Blood Count, LFT= Liver Function Test

Indicator D: The percentage of patients with atrial fibrillation in whom stroke risk has been assessed using the CHA_2DS_2-VASc score risk stratification scoring system in the preceding 12 months (excluding those patients with a previous CHA_2DS_2-VASc score of 2 or more)

Indicator E business rules:

Reporting period -> Annually -> non-cumulative data collection

Reporting unit (minimum population) -> each health care practitioner registered at GESY

RPSD = e.g. 01/01/2022

RPED = e.g. 31/12/2022

Calculation: (Numerator/denominator)*100

Denominator				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF AF_DIAGN = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a diagnosis of atrial fibrillation (any time diagnosis)
2	IF CVAS = 0	Select	Next Rule	Rule 2 allows the selection of patients without performance of CHA_2DS_2-VASc (any-time).
3	IF CVAS = 1	Next Rule	Reject	Rule 3 allows the selection of patients with performance of CHA_2DS_2-VASc (any-time).
4	IF CVAS_DATE < RPSD	Next Rule	Reject	Rule 4 allows the selection of patients with performance of CHA_2DS_2-VASc after the start of the reporting period.
5	IF CVAS_SC < 2	Select	Reject	Rule 5 allows the selection of patients with performance of CHA_2DS_2-VASc before the start

				of the reporting period and CHA_2DS_2-VASc score <2. Patients with a previous CHA_2DS_2-VASc score of or more are excluded.
End of denominator rules				

AF_DIAGN= Diagnosis for AF, CVAS= Performance of CHA2DS2-VASc tool, CVAS_DATE= Date of CHA2DS2-VASc, RPSD= Reporting Period Starting Date, CVAS_SC= CHA2DS2-VASc score

Numerator (numerators rules apply to the population selected as the denominator)				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CVAS = 1	Select	Reject	Rule 1 allows the selection of all patients with performance of CHA_2DS_2-VASc.
End of numerator rules				

CVAS= Performance of CHA_2DS_2-VASc tool

<u>Indicator E:</u> In those patients with atrial fibrillation with a record of a CHA_2DS_2-VASc score of 2 or more, the percentage of patients who are currently treated with anticoagulation drug therapy.

<u>Indicator E business rules:</u>

Reporting period -> Annually -> non-cumulative data collection

Reporting unit (minimum population) -> each health care practitioner registered at GESY

RPSD = e.g 01/01/2022

RPED = e.g. 31/12/2022

Calculation: (Numerator/denominator)*100

Denominator (numerators rules apply to the population selected as the denominator)				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF AF_DIAGN = 1	Next Rule	Reject	Rule 1 allows the selection of all patients with a diagnosis of atrial fibrillation (any time diagnosis)
2	IF CVAS =1	Next Rule	Reject	Rule 2 allows the selection of subset of patients with performance of CHA_2DS_2-VASc.
3	IF CVAS_DATE > RPSD	Next Rule	Reject	Rule 3 allows the selection of subset of patients with performance of CHA_2DS_2-VASc within the yearly reporting period
4	CVAS_SC < 2	Reject	Select	Rule 4 allows selection of subset with CHA_2DS_2-VASc score of 2 or more
End of denominator rules				

AF_DIAGN= Diagnosis for AF, CVAS= Performance of CHA2DS2-VASc tool, CVAS_DATE= Date of CHA2DS2-VASc, RPSD= Reporting Period Starting Date, CVAS_SC= CHA_2DS_2-VASc score

Numerator (numerators rules apply to the population selected as the denominator)				
Rule number	Rule	Action if true	Action if false	Rule description or comments
1	IF CVAS = 1	Select	Reject	Rule 1 allows selection of all patients with performance of CHA_2DS_2-VASc.
2	IF ACG_PRES =1	Next Rule	Reject	Rule 2 allows the selection of patients with at least one anticoagulation prescription
3	IF (ACG_PRES_DATE> RPED – 6 MONTHS)	Select	Reject	Rule 3 allows the selection of subset of patients with an anticoagulation prescription going back 6 months before the date of indicator evaluation
End of numerator rules				

ACG_PRES= Anticoagulation prescription, ACG_PRES_DATE= Date of anticoagulation prescription, RPED= Reporting Period End Date

APPENDIX III

#	CODE outpatient	Description (Code outpatient)	Code Inpatient	Description (Code inpatient)
1	E10.0	Type 1 diabetes mellitus with coma	E10.01	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με κώμα: καθορισμένος ως απορρυθμισμένος
2	E10.1	Type 1 diabetes mellitus with ketoacidosis	E10.11	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με διαβητική κετοξέωση: καθορισμένος ως απορρυθμισμένος
3	E10.2	Type 1 diabetes mellitus with renal complications	E10.20 E10.21	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με νεφρικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με νεφρικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
4	E10.3	Type 1 diabetes mellitus with ophthalmic complications	E10.30 E10.31	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με οφθαλμικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με οφθαλμικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
5	E10.4	Type 1 diabetes mellitus with neurological complications	E10.40 E10.41	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με νευρολογικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με νευρολογικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
6	E10.5	Type 1 diabetes mellitus with peripheral circulatory complications	E10.50 E10.51	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με επιπλοκές από τα περιφερικά αγγεία: μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με επιπλοκές από τα περιφερικά αγγεία: καθορισμένος ως απορρυθμισμένος
7	E10.6	Type 1 diabetes mellitus with other specified complications	E10.60 E10.61	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με άλλες καθορισμένες επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με άλλες καθορισμένες επιπλοκές: καθορισμένος ως απορρυθμισμένος
8	E10.7	Type 1 diabetes mellitus with multiple complications	E10.72 E10.73 E10.74 E10.75	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με πολλαπλές επιπλοκές: με άλλες πολλαπλές επιπλοκές, μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με πολλαπλές επιπλοκές: με άλλες πολλαπλές επιπλοκές, καθορισμένος ως απορρυθμισμένος

				Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με πολλαπλές επιπλοκές: με διαβητικό πόδι, μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με πολλαπλές επιπλοκές: με διαβητικό πόδι, καθορισμένος ως απορρυθμισμένος
9	E10.8	Type 1 diabetes mellitus with unspecified complications	E10.80 E10.81	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με μη καθορισμένες επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: με μη καθορισμένες επιπλοκές: καθορισμένος ως απορρυθμισμένος
10	E10.9	Type 1 diabetes mellitus without complications	E10.90 E10.91	Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: χωρίς επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 1]: χωρίς επιπλοκές: καθορισμένος ως απορρυθμισμένος
11	E11.0	Type 2 diabetes mellitus with coma	E11.01	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με κώμα: καθορισμένος ως απορρυθμισμένος
11	E11.1	Type 2 diabetes mellitus with ketoacidosis	E11.11	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με διαβητική κετοξέωση: καθορισμένος ως απορρυθμισμένος
13	E11.2	Type 2 diabetes mellitus with renal complications	E11.20 E11.21	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με νεφρικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με νεφρικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
14	E11.3	Type 2 diabetes mellitus with ophthalmic complications	E11.30 E11.31	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με οφθαλμικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με οφθαλμικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
15	E11.4	Type 2 diabetes mellitus with neurological complications	E11.40 E11.41	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με νευρολογικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με νευρολογικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
16	E11.5	Type 2 diabetes mellitus with peripheral circulatory complications	E11.50 E11.51	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με επιπλοκές από τα περιφερικά αγγεία: μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με επιπλοκές από τα περιφερικά αγγεία: καθορισμένος ως απορρυθμισμένος

17	E11.6	Type 2 diabetes mellitus with other specified complications	E11.60 E11.61	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με άλλες καθορισμένες επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με άλλες καθορισμένες επιπλοκές: καθορισμένος ως απορρυθμισμένος
18	E11.7	Type 2 diabetes mellitus with multiple complications	E11.72 E11.73 E11.74 E11.75	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με πολλαπλές επιπλοκές: με άλλες πολλαπλές επιπλοκές, μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με πολλαπλές επιπλοκές: με άλλες πολλαπλές επιπλοκές, καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με πολλαπλές επιπλοκές: με διαβητικό πόδι, μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με πολλαπλές επιπλοκές: με διαβητικό πόδι, καθορισμένος ως απορρυθμισμένος
19	E11.8	Type 2 diabetes mellitus with unspecified complications	E11.80 E11.81	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με μη καθορισμένες επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: με μη καθορισμένες επιπλοκές: καθορισμένος ως απορρυθμισμένος
20	E11.9	Type 2 diabetes mellitus without complications	E11.90 E11.91	Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: χωρίς επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη ινσουλινοεξαρτώμενος σακχαρώδης διαβήτης [τύπου 2]: χωρίς επιπλοκές: καθορισμένος ως απορρυθμισμένος
21	E13.0	Other specified diabetes mellitus with coma	E13.01	Άλλες μορφές σακχαρώδη διαβήτη: με κώμα: καθορισμένος ως απορρυθμισμένος
22	E13.1	Other specified diabetes mellitus with ketoacidosis	E13.11	Άλλες μορφές σακχαρώδη διαβήτη: με διαβητική κετοξέωση: καθορισμένος ως απορρυθμισμένος
23	E13.2	Other specified diabetes mellitus with renal complications	E13.20 E13.21	Άλλες μορφές σακχαρώδη διαβήτη: με νεφρικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με νεφρικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
24	E13.3	Other specified diabetes mellitus with ophthalmic complications	E13.30 E13.31	Άλλες μορφές σακχαρώδη διαβήτη: με οφθαλμικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με οφθαλμικές επιπλοκές: καθορισμένος ως απορρυθμισμένος

25	E13.4	Other specified diabetes mellitus with neurological complications	E13.40 E13.41	Άλλες μορφές σακχαρώδη διαβήτη: με νευρολογικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με νευρολογικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
26	E13.5	Other specified diabetes mellitus with peripheral circulatory complications	E13.50 E13.51	Άλλες μορφές σακχαρώδη διαβήτη: με επιπλοκές από τα περιφερικά αγγεία: μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με επιπλοκές από τα περιφερικά αγγεία: καθορισμένος ως απορρυθμισμένος
27	E13.6	Other specified diabetes mellitus with other specified complications	E13.60 E13.61	Άλλες μορφές σακχαρώδη διαβήτη: με άλλες καθορισμένες επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με άλλες καθορισμένες επιπλοκές: καθορισμένος ως απορρυθμισμένος
28	E13.7	Other specified diabetes mellitus with multiple complications	E13.72 E13.73 E13.74 E13.75	Άλλες μορφές σακχαρώδη διαβήτη: με πολλαπλές επιπλοκές: με άλλες πολλαπλές επιπλοκές, μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με πολλαπλές επιπλοκές: με άλλες πολλαπλές επιπλοκές, καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με πολλαπλές επιπλοκές: με διαβητικό πόδι, μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με πολλαπλές επιπλοκές: με διαβητικό πόδι, καθορισμένος ως απορρυθμισμένος
29	E13.8	Other specified diabetes mellitus with unspecified complications	E13.80 E13.81	Άλλες μορφές σακχαρώδη διαβήτη: με μη καθορισμένες επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: με μη καθορισμένες επιπλοκές: καθορισμένος ως απορρυθμισμένος
30	E13.9	Other specified diabetes mellitus without complications	E13.90 E13.91	Άλλες μορφές σακχαρώδη διαβήτη: χωρίς επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Άλλες μορφές σακχαρώδη διαβήτη: χωρίς επιπλοκές: καθορισμένος ως απορρυθμισμένος
31	E14.0	Unspecified diabetes mellitus with coma	E14.01	Μη καθορισμένος σακχαρώδης διαβήτης: με κώμα: καθορισμένος ως απορρυθμισμένος
32	E14.1	Unspecified diabetes mellitus with ketoacidosis	E14.11	Μη καθορισμένος σακχαρώδης διαβήτης: με διαβητική κετοξέωση: καθορισμένος ως απορρυθμισμένος

33	E14.2	Unspecified diabetes mellitus with renal complications	E14.20 E14.21	Μη καθορισμένος σακχαρώδης διαβήτης: με νεφρικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: με νεφρικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
34	E14.3	Unspecified diabetes mellitus with ophthalmic complications	E14.30 E14.31	Μη καθορισμένος σακχαρώδης διαβήτης: με οφθαλμικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: με οφθαλμικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
35	E14.4	Unspecified diabetes mellitus with neurological complications	E14.40 E14.41	Μη καθορισμένος σακχαρώδης διαβήτης: με νευρολογικές επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: με νευρολογικές επιπλοκές: καθορισμένος ως απορρυθμισμένος
36	E14.5	Unspecified diabetes mellitus with peripheral circulatory complications	E14.50 E14.51	Μη καθορισμένος σακχαρώδης διαβήτης: με επιπλοκές από τα περιφερικά αγγεία: μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: με επιπλοκές από τα περιφερικά αγγεία: καθορισμένος ως απορρυθμισμένος
37	E14.6	Unspecified diabetes mellitus with other specified complications	E14.60 E14.61	Μη καθορισμένος σακχαρώδης διαβήτης: με άλλες καθορισμένες επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: με άλλες καθορισμένες επιπλοκές: καθορισμένος ως απορρυθμισμένος
38	E14.7	Unspecified diabetes mellitus with multiple complications	E14.72 E14.73 E14.74 E14.75	Μη καθορισμένος σακχαρώδης διαβήτης: με πολλαπλές επιπλοκές: με άλλες πολλαπλές επιπλοκές, μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: με πολλαπλές επιπλοκές: με άλλες πολλαπλές επιπλοκές, καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: με πολλαπλές επιπλοκές: με διαβητικό πόδι, μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: Με πολλαπλές επιπλοκές, με διαβητικό πόδι: Μη καθορισμένος ως απορρυθμισμένος
39	E14.8	Unspecified diabetes mellitus with unspecified complications	E14.80 E14.81	Μη καθορισμένος σακχαρώδης διαβήτης: με μη καθορισμένες επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: με μη καθορισμένες επιπλοκές: καθορισμένος ως απορρυθμισμένος

40	E14.9	Unspecified diabetes mellitus without complications	E14.90 E14.91	Μη καθορισμένος σακχαρώδης διαβήτης: χωρίς επιπλοκές: μη καθορισμένος ως απορρυθμισμένος Μη καθορισμένος σακχαρώδης διαβήτης: χωρίς επιπλοκές: καθορισμένος ως απορρυθμισμένος
41	G45.9	Transient cerebral ischaemic attack, unspecified	G45.92 G45.93 G45.99	Παροδικό ισχαιμικό εγκεφαλικό επεισόδιο, μη καθορισμένο: Πλήρης υποχώρηση των συμπτωμάτων εντός 1 έως 24 ωρών Παροδικό ισχαιμικό εγκεφαλικό επεισόδιο, μη καθορισμένο: Πλήρης υποχώρηση των συμπτωμάτων σε λιγότερο από 1 ώρα Παροδικό ισχαιμικό εγκεφαλικό επεισόδιο, μη καθορισμένο: Πορεία υποχώρησης των συμπτωμάτων μη καθορισμένη
42	I10	Essential (primary) hypertension	I10.90 I10.91 I10.00 I10.01	Ιδιοπαθής υπέρταση, μη καθορισμένη: Χωρίς υπερτασική κρίση Ιδιοπαθής υπέρταση, μη καθορισμένη: Με υπερτασική κρίση Καλοήθης ιδιοπαθής υπέρταση: Χωρίς υπερτασική κρίση Καλοήθης ιδιοπαθής υπέρταση: Με υπερτασική κρίση
43	I11.0	Hypertensive heart disease with (congestive) heart failure	I11.00 I11.01	Υπερτασική καρδιοπάθεια με (συμφορητική) καρδιακή ανεπάρκεια: Χωρίς υπερτασική κρίση Υπερτασική καρδιοπάθεια με (συμφορητική) καρδιακή ανεπάρκεια: Με υπερτασική κρίση
44	I13.2	Hypertensive heart and renal disease with both (congestive) heart failure and renal failure	I13.20 I13.21	Υπερτασική καρδιοπάθεια και νεφροπάθεια με αμφότερες (συμφορητική) καρδιακή ανεπάρκεια και νεφρική ανεπάρκεια: Χωρίς υπερτασική κρίση Υπερτασική καρδιοπάθεια και νεφροπάθεια με αμφότερες (συμφορητική) καρδιακή ανεπάρκεια και νεφρική ανεπάρκεια: Με υπερτασική κρίση
45	I15.0	Renovascular hypertension	I15.00 I15.01	Νεφραγγειακή υπέρταση: Χωρίς υπερτασική κρίση Νεφραγγειακή υπέρταση: Με υπερτασική κρίση
46	I15.1	Hypertension secondary to other renal disorders	I15.10 I15.11	Υπέρταση δευτεροπαθής σε άλλες νεφρικές διαταραχές: Χωρίς υπερτασική κρίση Υπέρταση δευτεροπαθής σε άλλες νεφρικές διαταραχές: Με υπερτασική κρίση
47	I15.2	Hypertension secondary to endocrine disorders	I15.20 I15.21	Υπέρταση δευτεροπαθής σε ενδοκρινικές διαταραχές: Χωρίς υπερτασική κρίση Υπέρταση δευτεροπαθής σε ενδοκρινικές διαταραχές: Με υπερτασική κρίση
48	I15.8	Other secondary hypertension	I15.80 I15.81	Άλλη δευτεροπαθής υπέρταση: Χωρίς υπερτασική κρίση Άλλη δευτεροπαθής υπέρταση: Με υπερτασική κρίση
49	I15.9	Secondary hypertension, unspecified	I15.90 I15.91	Δευτεροπαθής υπέρταση, μη καθορισμένη: Χωρίς υπερτασική κρίση Δευτεροπαθής υπέρταση, μη καθορισμένη: Με υπερτασική κρίση
50	I25.1	Atherosclerotic heart disease	I25.10	Αθηροσκληρωτική καρδιοπάθεια: Χωρίς αιμοδυναμικά σημαντικές στενώσεις

			I25.11 I25.12 I25.13 I25.14 I25.15 I25.16 I25.19	Αθηροσκληρωτική καρδιοπάθεια: Νόσος ενός αγγείου Αθηροσκληρωτική καρδιοπάθεια: Νόσος δύο αγγείων Αθηροσκληρωτική καρδιοπάθεια: Νόσος τριών αγγείων Αθηροσκληρωτική καρδιοπάθεια: Στένωση της αριστερής κύριας στεφανιαίας αρτηρίας [αριστερού στελέχους] Αθηροσκληρωτική καρδιοπάθεια: Με στενωμένα τα αγγεία της αορτοστεφανιαίας παράκαμψης [by-pass] Αθηροσκληρωτική καρδιοπάθεια: Με στενωμένες ενδοαγγειακές προθέσεις [stent] Αθηροσκληρωτική καρδιοπάθεια: Μη καθορισμένη
51	I25.2	Old myocardial infarction	I25.20 I25.21 I25.22 I25.29	Παλαιό έμφραγμα του μυοκαρδίου: Από (>) 29 ημερών έως (<) 4 μηνών Παλαιό έμφραγμα του μυοκαρδίου: Από (>) 4 μηνών έως (<) ενός έτους Παλαιό έμφραγμα του μυοκαρδίου: Άνω (>) του ενός έτους Παλαιό έμφραγμα του μυοκαρδίου: Μη καθορισμένο
52	I50.0	Congestive heart failure	I50.00 I50.01	Πρωτοπαθής δεξιά καρδιακή ανεπάρκεια Δευτεροπαθής δεξιά καρδιακή ανεπάρκεια
53	I50.1	Left ventricular failure	I50.11 I50.12 I50.13 I50.14 I50.19	Αριστερή καρδιακή ανεπάρκεια: Ασυμπτωματική Αριστερή καρδιακή ανεπάρκεια: Με συμπτώματα στην έντονη κόπωση Αριστερή καρδιακή ανεπάρκεια: Με συμπτώματα στην ήπια κόπωση Αριστερή καρδιακή ανεπάρκεια: Με συμπτώματα στην ηρεμία Αριστερή καρδιακή ανεπάρκεια: Μη καθορισμένη
54	N18.9	Chronic kidney disease, unspecified Chronic renal impairment Chronic uraemia NOS Diffuse sclerosing glomerulonephritis NOS	N18.89	Άλλη χρόνια νεφρική νόσος μη καθορισμένου σταδίου

Disclaimer: This analysis was conducted using routinely collected data recorded according to the definitions, reporting frameworks, and treatment guidelines in effect during the study period; subsequent changes in these processes may limit direct comparability with more recent data