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SPECIAL ARTICLE

A multidisciplinary team approach in the 2024 ESC guidelines for the management of patients with Atrial Fibrillation—what is the role of nurses and allied professionals? A Clinical Consensus Statement of the Association of Cardiovascular Nursing and Allied Professions (ACNAP) and the European Heart Rhythm Association (EHRA) of the ESC

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The complexity of atrial fibrillation (AF) requires an integrated, multifaceted, multidisciplinary, and holistic team approach to optimize the management of AF patients. Active engagement of patients and involvement of nurses and various allied professionals (AP) and a strong collaboration with physicians is crucial in this respect as indicated by the 2024 European Society of Cardiology Guidelines on the management of AF. This is also reflected in these latest guidelines by the concept of AF-CARE, which emphasizes the importance of including the patient, carers, and various healthcare professionals. In this Clinical Consensus Statement, the role of nurses and APs is highlighted and includes optimal approaches on their involvement in the implementation and execution for these guideline recommendations in daily clinical practice. Moreover, additional detail will be provided to the key components and their requirements to allow this integrated multidisciplinary care to be implemented alongside the perspective of the patient. This Statement also examines the challenges and opportunities in relation to their application to clinical practice and how optimal multidisciplinary care can be implemented.

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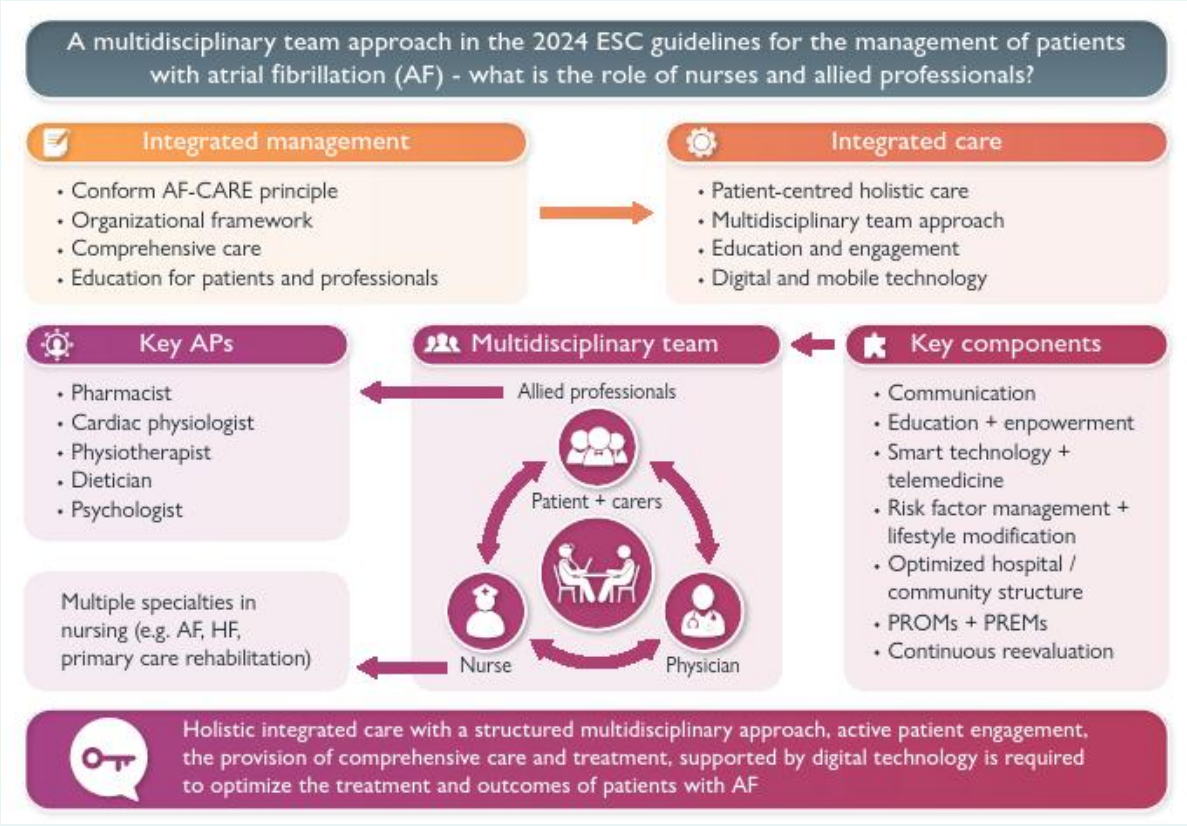
Graphical Abstract



Keywords Atrial fibrillation • Clinical Practice Guidelines • Models of care • Multidisciplinary teams • Nurses Allied Professionals

Highlights

- The 2024 ESC Guidelines for the management of atrial fibrillation suggest a holistic, multifaceted and multidisciplinary approach in providing care and treatment to patients with atrial fibrillation, following the AF-CARE approach.
- This approach emphasizes the importance of multidisciplinary collaboration, including the patient, carers and various healthcare professionals. Nurses and allied professionals fulfill significant roles within this approach. This statement details these roles and provides clinical implications for nurses and allied professions for the implementation and execution of the guideline recommendations in clinical practice.
- Moreover, crucial key aspects, as well as challenges and opportunities for nurses and allied professions will be provided based on the components of the AF-CARE approach.

Introduction

The European Society of Cardiology (ESC) Guidelines provide practice recommendations to assist health professionals in selecting the best available care and treatment strategies and making informed or shared decisions with patients in daily practice based on the latest evidence. The 2024 ESC Guidelines for the management of atrial fibrillation (AF) are the latest available ESC guidelines in the field of AF.[1] To optimize patient outcomes, these guidelines stress the importance of using a patient-centred integrated care approach to deliver comprehensive care and treatment with a multidisciplinary team, including the patient, carers, and various healthcare professionals. To allow this, nurses and allied professionals (AP) play a key role in the care and treatment of AF patients and to work efficiently together with physicians.[2]

Nevertheless, despite the fact that these guidelines provide evidence-based recommendations in the management of AF, they lack clear guidance on implementing these recommendations in clinical practice and do not outline the roles and responsibilities of the various health care providers involved in the multidisciplinary team.

Therefore, the aim of this Clinical Consensus Statement by the Association of Cardiovascular Nursing and Allied Professions (ACNAP) and the European Heart Rhythm Association (EHRA) is to

provide an overview of the established and potential role of nurses and APs as part of an integrated care approach as recommended by the 2024 ESC Guidelines for the management of AF. Moreover, key components and members of the integrated approach will be higlighted, clinical implications for the day-to-day work of nurses and APs will be provided as well as challenges and opportunities in this respect.

Integrated care in AF

Integrated AF care goes beyond therapeutic management alone and focuses on additional fundamentals that form a holistic (addressing the person as a whole) and integrated care approach (i.e. optimizing the delivery and coordination of healthcare services based on patient preferences and aligned with guideline recommendations, to promote the overall well-being of the patient). The patient-centred integrated AF-CARE approach includes various key fundamentals (*Figure 1*).[1] First of all, delivering comprehensive care and treatment following the **CARE** elements of the pathway is key (i.e. **C**omorbidity and risk factor management, **A**void stroke and thromboembolism, **R**educe symptoms by rate and rhythm control, **E**valuation and dynamic re-assessment). Moreover, these CARE components should be supplemented with strategies to promote lifestyle recommendations, psychosocial support, education for patients, family, and caregivers, and a structured follow-up and clear communication between primary and specialized care.[1]

This all should be implemented in a patient-centred approach, meaning that the care will be provided based on the needs and preferences of the patient, whilst actively engaging the patient to work as partners alongside the healthcare providers in the care process. Structured educational programs for healthcare professionals and targeted education for patients will allow shared decision-making and will empower patients to emphasize their self-care. To implement these key fundamentals, the involvement of various healthcare professionals and disciplines a multidisciplinary team approach is required together with better translational care. The implementation of CARE and the involved healthcare professionals within this multidisciplinary AF team can be diverse and varies between different countries, centres and healthcare systems. This requires coordination, communication, and collaboration so that various healthcare professionals work together with the patient, on a comprehensive and individualized treatment plan (*Figure 2*). Finally, the use of digital technology is helpful to guide the integrated approach.

Multidisciplinary team approach

Initial editions of ESC Guidelines on AF management acknowledged differences in the delivery of care and patient characteristics globally and underpinned the need to adapt them when applied to multiple healthcare settings.[4,5] However, despite this, implicit recognition of the need to address aspects beyond AF-specific management, they were devoted to review scientific evidence to support recommendations on the different AF-specific diagnostic tests and therapies. There was no mention of multidisciplinary care or the participation of different disciplines. The words 'nurse' or 'allied professional' were lacking in the entire document of those editions (*Table 1*).

However, with each new iteration of the guidelines, the role of nurses and APs became more evident. The guidelines have evolved in terms of outlining who should be involved in providing care to people with AF and the recent 2024 guideline highlights the importance of integrated AF care and ensures a inclusive approach to care that includes primary care physicians, cardiologists, nurses, and APs.[1] They recommend comprehensive treatment, which means that AF-specific therapy should be complemented with treatment of underlying cardiovascular diseases and lifestyle interventions, which in general requires a multidisciplinary approach.

Key health care professionals and their roles

The multidisciplinary team (MDT) surrounding the patient is essential for successful AF care from screening and diagnostic assessment to ongoing long-term management of AF.[1] Integrated management with a structured MDT approach should be used in all AF patients to improve clinical outcomes according to the ESC guidelines.[1] The structure of the team can vary depending on the needs and the complexity of the patient but should consist of a core team including the patients' general practitioner (GP), to which additional APs and physicians, with varied specializations can be invited to join as the team deems necessary and based on the individual patient case.

Figure 2, adapted from the 2020 AF ESC guidelines lists the core MDT including (1) the patient, (2) carers/family, (3) AF nurse, (4) general practitioner, (5) cardiologist (depending on the need of the patient this could be either a general cardiologist, a cardiologist with an interest in arrhythmia/AF management or an electrophysiologist), (6) pharmacist. This MDT approach is essential in providing optimal AF care.

The MDT should collaborate with and support (i.e. education, empowerment and guidance for self-care and self-management) the patient and the patient's relatives during the entire patient journey, and suggestions for the potential roles of the key persons in the core team, and the additional supportive individuals during the process are discussed below and in *Table 2*. Improving the knowledge of patients about their condition and how to contribute to a healthy lifestyle is THE key, whilst building rapport and trust in the patient-professional relationship is another crucial factor. Achieving and maintaining lifestyle changes is challenging, but the patient might feel encouraged by a structured and supportive approach.

Screening

Routine heart rhythm assessment during health care in those aged 65 and over is recommended to detect AF early.[1] Furthermore, in individuals aged 75 and above, or with a high risk of stroke should be screened using prolonged non-invasive ECG-based approach.[1,6] Screening for AF can take place for example by the GP, by nurses at the general practitioners,[7,8] by pharmacists[9,10] podiatrists[11] by special screening centres,[12] or other locations. There are many different devices that can be used in AF screening,[13] and it is of importance to assess the patient's digital literacy and understanding of the implications of screening.[14] Regardless of the mode of screening, the diagnosis of AF is made by a physician overreading the ECG.[1]

Diagnostic assessment

At the initial diagnostic assessment of the patient, many key disciplines within the MDT are involved. An example of a potential structure for the patient and the patient's carers/family is to first meet the AF nurse in conjunction with a physician to provide the team with a detailed medical history, including co-morbidities, structured assessment of symptoms and quality of life (QoL), determination of the CHA_2DS_2-VA score, bleeding risks and identify patient support systems.[15,16] A cardiac physiologist can, prior to or at the meeting, perform an ECG to give detailed information about the cardiac rhythm and an echocardiogram to provide a structural and functional assessment. A pharmacist can explore the current medication of the patient, with a particular view towards bleeding and potential interactions with oral anticoagulants (OACs) and future rhythm control strategies.[17] In addition, utilize the opportunity to manage co-morbidities and optimize blood pressure to reduce recurrence and progression of AF and prevent adverse cardiovascular events[18] in accordance with the AF-CARE recommendation.[1]

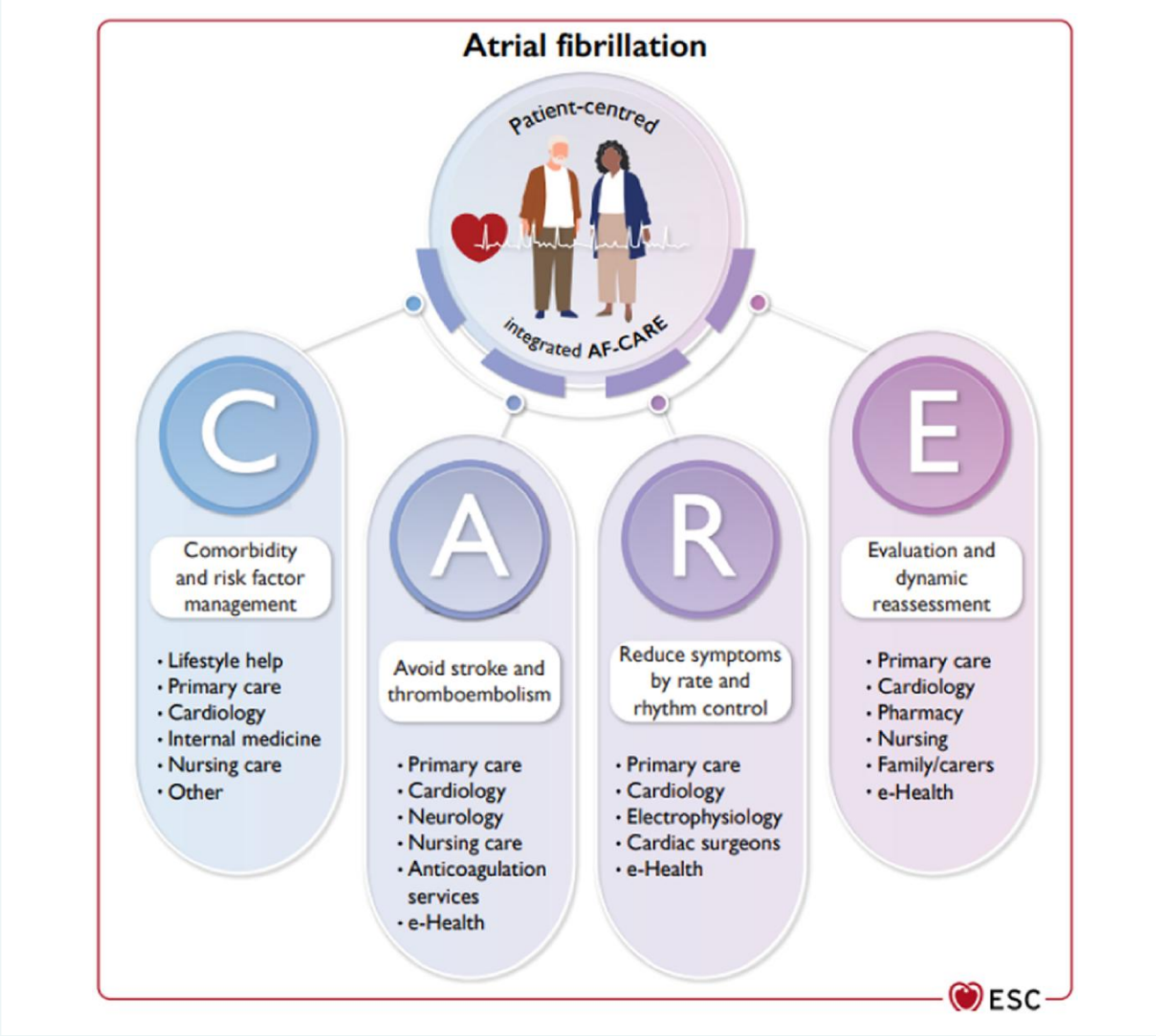


Figure 1 Patient centred AF-CARE approach as indicated by the 2024 European Society of Cardiology atrial fibrillation guidelines. Figure adopted from Van Gelder *et al.*[1]

Symptoms and QoL

The patient's symptoms and QoL should be assessed at the initial diagnostic assessment, this may evaluate treatment effects, as well as guide further treatment.[19] It is important to reassess the patient's symptoms and QoL at times of changes in medical management or in case of changes in medical status. Where symptoms and QoL assessment show high levels of anxiety, involvement of additional MDT members may be appropriate to employ strategies for anxiety reduction, such as involvement of psychologists or physiotherapists for yoga.[20,21]

Management plan

The key members of the MDT, including the patient and, depending on the patient's wishes, family, or carers, should be involved in the formation of the management plan.[1] *Table 2* describes the role of the wide MDT. However, it is vital that the patient is not only seen as a recipient of the information, but rather as an active participant in the MDT who will work towards fulfilling the key individual goals of the patient.[22] It is also important to continuously review patients as many who historically may not have met the criteria for anticoagulation may well have had changes that deem them suitable based on CHA_2DS_2-VA score.[18]

Adherence to treatment

Once the management plan is decided, it is important that not only the core team continues to assess the adherence of the patient but all professionals that interact with the patient focus on reinforcing the importance of their treatment regimen. The pharmacist has a potential key role in providing specialized information about the treatment effects of medication.[15] Additionally, APs have an important role in the adherence to treatment of co-morbidities and can for example enable adequate physical activity and promote a healthy diet.[23]

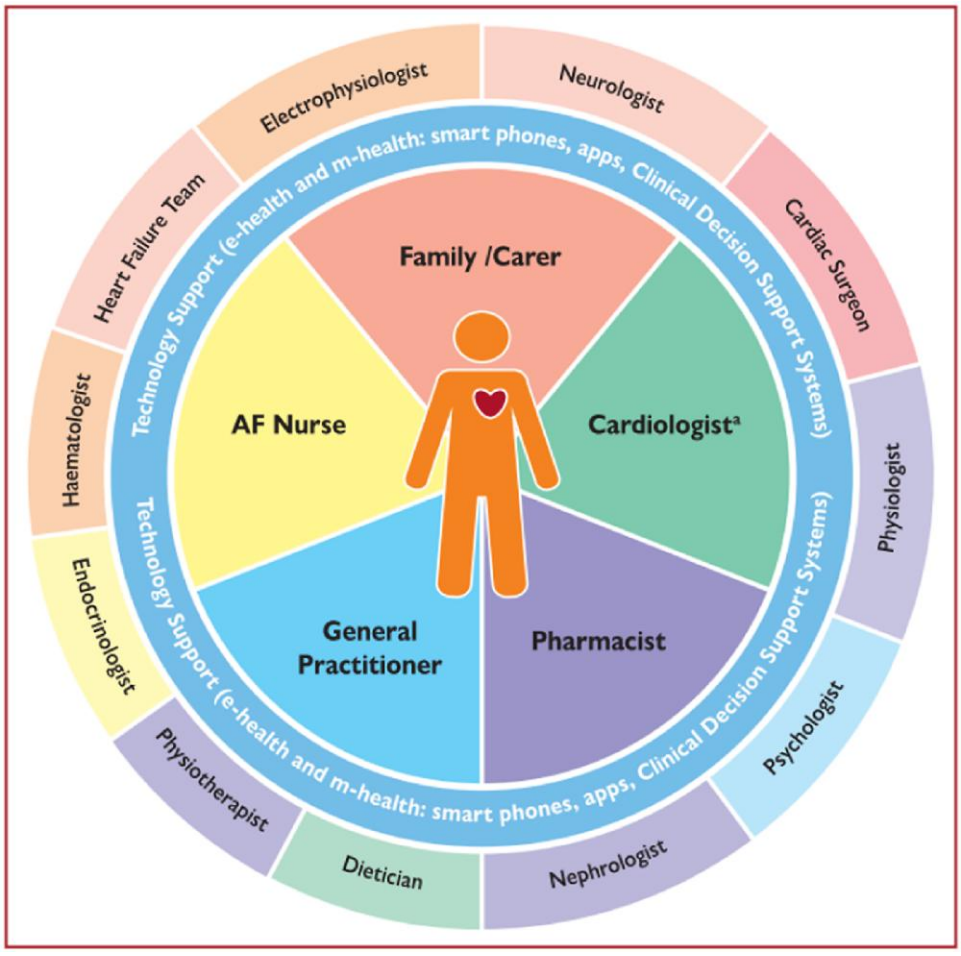


Figure 2 Involvement of a multidisciplinary team in the care of an atrial fibrillation patient (an example). Figure adopted from Hindricks *et al.*[3]

Table 1 Number of appearances of different terms in the most recent European Society of Cardiology atrial fibrillation guidelines

Year	Multidisciplinary	Team[a]	Nurse[b]	Allied professionals
2010	0	0	0	0
2012	0	0	0	0
2016	16	30	5	5
2020	15	17	7	1
2024	26	35	7	1

[a]Includes 'heart team'.
[b]Includes 'nursing'.

AF-CARE

C—co-morbidity and risk factor management

Assessment of cardiovascular risk factors can be done by different members of the core team, and interventions on these based on identified co-morbidities and lifestyle factors. For example, Pharmacists have shown to not only improve anticoagulation rates for people with AF but also optimize blood pressure ensure holistic management of the individual patient.[18,24,25]

A—avoid stroke and thromboembolism

Assessment of stroke risk as per CHA_2DS_2-VAscore, and assessment of bleeding risks can be done by any member of the core team and forms the basis for the decision on oral anticoagulation treatment in AF patients. Bleeding and stroke risks should be regularly reassessed and documented by the team, leading to update of the management plan accordingly.[18]

R—reduce symptoms by rate and rhythm control

The decision to pursue rate or rhythm control is of key importance for AF patients and should be jointly decided by the MDT and documented in the management plan. Patient-reported outcome measures (PROMs) should be measured before, during, and after any novel strategies are implemented. Decisions on better symptom control need to be dynamic, with adaptations of the management plan depending on patient's wishes and any new symptoms and medical history.

E—evaluation and dynamic reassessment

The importance of continuous monitoring and adapting treatment plans for patients with AF is essential to ensure optimal outcomes by adjusting

Table 2 **The role of healthcare professionals including allied professionals and their involvement at the various stages of atrial fibrillation management from screening, diagnosis, therapy (treatment), and longer-term prevention**

	Core team	Screening	Diagnostic assessment	Symptoms and QoL	Management plan	Adherence to treatment	C—Comorbidity and risk factor management	A—Avoid stroke and thromboembolism	R—Reduce symptoms by rate and rhythm control	E—Evaluation and dynamic reassessment
							Based on MDT management plan	Based on MDT management plan	Based on MDT management plan	Based on MDT management plan
Patient	Yes	Digital literacy assessed	Active participant	Active participant	Participates/ informed	Vital	Active involvement	Active decision	Active decision	Active decision
General practitioner	Yes	Interpretation of ECG	Diagnosis Medical history Co-morbidities Determination of AF pattern CHA_2DS_2-VA	Symptom assessment EHRA	Participates	Regular review	Assessment of co-morbidities Referral to appropriate NAP	CHA_2DS_2-VA Initiation of OAC Bleeding risk assessment Interactions	Initiation of rate control treatment Referral to cardiologist /electrophysiologist	Re-assessment of new and existing co-morbidities Regular stratification of risk for stroke and thromboembolism Assess and manage modifiable bleeding risk factors
Cardiologist	Yes	Interpretation of ECG. Follow-up of patients via Cardiac implantable electronic device (CIED)	As per above Echocardiogram Decision on further advanced imaging as appropriate	As per above	(Participates)	Review on occasion	Assessment of co-morbidities	CHA_2DS_2-VA Initiation of OAC Bleeding risk assessment Interactions	Initiation of ant arrhythmic drugs (depending on co-morbidities)/ cardioversion/ablation	Re-assessment of new and existing co-morbidities Regular stratification of risk for stroke and thromboembolism Assess and manage modifiable bleeding risk factors Continue OAC despite rhythm control if risk of thromboembolism
AF nurse	Yes	Initiation of screening—including digital health literacy	Diagnosis Medical history Co-morbidities Determination of AF pattern CHA_2DS_2-VASc In depth discussion about co-morbidities Digital health literacy Support structures	Regular review of PROMs EHRA score Other PROMs incl Symptoms scores (AFSS etc) QoL assessment	Participates	Regular review	Structured assessment of co-morbidities Weight Waist measurement Alcohol consumption	CHA_2DS_2-VA Structured bleeding risk assessment	Clinical reassessment Rate control achieved PROMs	Re-assessment of new and existing co-morbidities Regular stratification of risk for stroke and thromboembolism Assess and manage modifiable bleeding risk factors Check impact of symptoms before and after treatment PROMs
Pharmacist		Initiation of screening	Assessment of medication, polypharmacy	Symptoms for adverse effects	(Participates)	Regular review	Pharmacological management of co-morbidities as appropriate e.g. Blood pressure management and review of medication/ interactions	CHA_2DS_2-VA Initiation of OAC Bleeding risk assessment Interactions (if prescribers) Discussion if needed Interaction assessment	Involved in AAD initiation, interaction	Assess and manage modifiable bleeding risk factors Ongoing review of medication/interactions and optimisation

Continued

Table 2 ***Continued***

	Core team	Screening	Diagnostic assessment	Symptoms and QoL	Management plan	Adherence to treatment	C—Comorbidity and risk factor management	A—Avoid stroke and thromboembolism	R—Reduce symptoms by rate and rhythm control	E—Evaluation and dynamic reassessment
Technology tools supporting	Depending on digital literacy/ availability	Needed	Possible	Possible		Regular reminders	Monitoring of weight Blood pressure management	*Medication reminder* *CHA_2DS_2-VA assessment* *Bleeding risk* *TTR*	Medication reminder Symptoms assessment Heart rate monitoring	Medication reminder Symptoms assessment Heart rhythm monitoring
Cardiac physiologist			ECG Echo Advanced imaging						ECG LTER Exercise ECG	ECG Exercise ECG Echocardiogram
Carer/family					Participates	Involved	Involved	Involved	Involved	Involved
Physiotherapist				Medical yoga	(Participates)	Involved if required/ requested	Involved	Awareness of OAC treatment	Involved if required/ requested	Involved if required
Dietician					(Participates)	Involved if required/ requested	Involved			Involved if required
Psychologist				If needed	(Participates)	Involved if required/ requested			Involved if required/ requested	Involved if required
Podiatrist		Pulse palpation				Involved if required/ requested				

AAD, antiarrhythmic drugs; AF, atrial fibrillation; CHA_2DS_2-VA, Atrial Fibrillation Stroke Risk calculates; COPD, chronic obstructive pulmonary disease; ECG, electrocardiogram; ECHO, echocardiogram; EHRA, European Heart Rhythm Association; HF, heart failure; MDT, multidisciplinary team; NAP, nurses and allied professionals; OAC, oral anticoagulant; PROMs, patient reported outcome measures.

therapies based on any changes in the patient's condition, lifestyle, or response to treatment. Nurses and allied professions involvement enhances patient care through continuous monitoring e.g. physiologist evaluation of heart structure and function, pharmacists and nurses in support patient education including lifestyle modifications and adjustments in treatment to help prevent complications associated with AF.

Clinics and use of digital technology from diagnostics to monitoring care

Implementing a MDT approach for AF in daily clinical practice, in alignment with the ESC 2024 guidelines, requires a multifaceted approach with the patient at the centre.[1] The use of digital tools and apps supports the empowerment of patients and streamlines data collection, while decision-support software assists healthcare providers in making evidence-based decisions in partnership with patients.[26] A number of digital tools have been shown to support MDT working in AF management and are endorsed in the guidelines.

Single-lead ECGs have revolutionized AF detection by providing accessible, user-friendly, and continuous monitoring options.[27] The guidelines recommend the use of a 30-second rhythm strip for the detection of AF.[3] The role in self-management of AF is less clear, but in partnership with the MDT, provision for self-monitoring may be supported. This may be augmented by encouraging patients to use wearable devices like smartwatches for continuous monitoring of heart rate and rhythm, providing valuable data for early AF detection and management, although this is contingent on local funding arrangements.

MDT working can also be supported using integrated risk assessment calculators, such as integrating CHA_2DS_2-VA scores into electronic health records for efficient patient risk stratification and personalized treatment decisions.[28] Work to develop electronic algorithms that align with the ESC guidelines has been demonstrated to assist clinicians in making evidence-based decisions for AF management, such as choosing appropriate anticoagulation therapy and rate or rhythm control strategies. Moreover, it can assist in the shared decision-making process with patients.[28] These could potentially benefit from medication interaction checkers within electronic health records to prevent adverse drug reactions and ensure safe prescribing of anticoagulants and antiarrhythmic medications, since drug interactions are a major cause of bleeding in those on oral anticoagulant medication.[29]

Telemedicine platforms can be used for remote consultations, enabling patients to connect with their healthcare team for regular follow ups and reducing the burden on in-person visits, especially demonstrated during the COVID-19 pandemic.[30] Apps designed for patient education ensure that patients have access to reliable information about AF, its management, and lifestyle modifications but need to be carefully selected prior to recommendation to ensure that the advice is according to guidelines and provides sufficient support to promote adherence to recommendations.[31] However, the use of apps and other digital technology should be used to support the current care not to replace it. Recent findings from the AF-Edu Care study demonstrated sustained knowledge in participants using an App but also highlighted that although awareness around risk factors increased, this did not translate into participants making changes to their lifestyle.[32] Moreover, not all patients have a smartphone and can use apps. Alternatives (e.g. in the form of in-person visits or telephone calls) should be foreseen for the older patients and those with literacy issues.

An optimized hospital or community structure, including specialized AF clinics and associated collaborative MDT meetings, ensures coordinated delivery of care and reduces unplanned readmission.[33] By integrating these key components, healthcare institutions can enhance the quality of care for AF patients and improve their outcomes in the evolving landscape of AF management.[34] Establishing specialized AF clinics within cardiology departments involving members of the MDT can centralize care and ensure that AF patients receive a comprehensive evaluation, including rhythm assessment, risk stratification, and treatment initiation. This fosters collaboration among the MDT, including cardiologists, electrophysiologists, nurses, pharmacists, and nutritionists, amongst other health care professionals, to create a holistic approach to AF management. These clinics should be supported by regular meetings to discuss complex cases, review treatment plans, and ensure a coordinated approach to patient care. These clinics can be augmented using standardized AF patient pathways that guide the timing and frequency of assessments, tests, and interventions, ensuring consistency in care delivery across the life course whilst providing tailored care based on the needs, values, and preferences of the individual (*Figure 3*). The value of such regular meetings was shown by a group in London set up a weekly multidisciplinary team video conference discussing complex patients with a cardiologist, haematologist, General Practitioner in primary care and clinical pharmacist. This enabled sharing of patient records between primary care and hospital specialists with improved communication and shared learning, which translated with significantly increased prescribing of anticoagulation by 6.3% [from 77% to 83% ($P < 0.0001$)], in comparison to 2.8% average improvement in England.[18]

The capturing of data on the provision of the patient pathway by the MDT can be enhanced by contributing to well-designed clinical registries. AF registries are indispensable tools for capturing comprehensive data on the epidemiology, management, and outcomes of patients with AF.[35] They must include PROMs, and the data must be able to be sex-disaggregated. Registries can play a vital role in improving patient care, advancing research, and guiding healthcare policies and practices related to AF. By addressing these needs, AF registries contribute significantly to enhancing the quality of care and the overall well-being of individuals with AF.

Clinical examples: applying the guidelines in practice

In general, integrated management with a MDT approach is based on the concept of integrated care and fuses four indispensable fundamentals, including a patient-centred MDT approach, providing comprehensive care and treatment, supported by smart technology.[3,36]

Although numerous integrated practice approaches have been developed, the evidence is scarce and heterogeneous.[37] Some randomized clinical trials showed an increase in the use of evidence-based care and a reduction of cardiovascular hospitalization and cardiovascular death at follow-up in patients managed with an integrated care approach compared to those with usual care.[38,39] In addition, this is also supported by some observational studies, which found fewer hospitalizations and strokes when integrated AF care was used.[40,41]

The initial trial to evaluate the effectiveness of the approach was performed in the Netherlands. In the AF-Clinic, a nurse and a cardiologist formed the treatment team, and a dedicated software system was used, which incorporated all recommendations of the leading international guidelines current at the time. The associated single-centre randomized controlled trial (RCT) ($n = 712$) compared the integrated AF-Clinic approach, with usual care provided by a cardiologist, and demonstrated a significant reduction in the primary composite endpoint of cardiovascular hospitalization or mortality [hazard ratio (HR) 0.63 95% confidence interval (CI) 0.44–0.90, $P = 0.017$].[38] A *post hoc* analysis also demonstrated a significant reduction in all-cause mortality (HR 0.44, 95% CI 0.23–0.85, $P = 0.014$).[42] A systematic review and meta-analysis investigating different approaches of integrated care delivery, confirmed these findings.[39]

More recently, the RACE IV trial evaluated this concept in a multicentre RCT ($n = 1375$) in the Netherlands and strikingly did not show significant differences in the same primary outcome as per the initial trial. However, in a pre-specified analysis evaluating the effect in experienced centres (defined as those centres that provided the integrated approach prior to commencing the study) vs. non-experienced centres, a significant reduction in the composite endpoint of cardiovascular hospitalization and mortality, HR 0.52, 95% CI 0.37–0.71 vs. HR 1.24, 95% CI 0.94–1.63, respectively; $P < 0.001$ for interaction was seen in favour of the experienced centre.[43]

The IMPACT-AF study was a cluster randomized trial ($n = 2281$) with patients in the intervention group receiving an educational intervention for patients and care providers, aiming to improve quality in terms of improving anticoagulation therapy in patients with AF and at risk for stroke. Oral anticoagulant use significantly increased from 68% at baseline to 80% at 1 year in the intervention group, vs. 64% to 67% in usual care, demonstrating the impact of an integrated educational intervention.[44] Also another Belgian trial showed that a nurse-led educational intervention that also included electronic monitoring of oral anticoagulation medication in AF patients led to very high regimen adherence values of 94%.[45,46]

Due to the underlying risk factor burden in the development or worsening of AF, the importance of comprehensive treatment, i.e. risk factor management and lifestyle modification, beyond AF symptom control and anticoagulation therapy, has become apparent. Obstructive sleep apnoea is an important risk factor. However, its management is often poorly integrated in AF clinical practice[47] and integrated multidisciplinary approaches have been suggested.[48] A prospective study ($n = 183$) explored the impact of a virtual sleep-disordered breathing pathway in outpatient service with collaboration between the sleep specialist and cardiology teams, demonstrating short processing times, detection of moderate to severe sleep-disordered breathing in 55% of referred patients, and high patient satisfaction with the care received (91%).[49]

An Australian RCT explored the impact of patient education on hospitalization in patients with AF provided by nurses and pharmacists in the patients' home, in collaboration with a cardiology team.[50] Although this intervention cannot be categorized as an integrated care approach, the focus on patient-centred education, and a multidisciplinary team approach, demonstrated significant reductions in hospitalization.[51] As mentioned before, technology is crucial to support patients and care providers in providing comprehensive and complete care. This became even more apparent during the COVID-19 pandemic. Due to practical limitations, an integrated mHealth approach was developed as a response to this. This TeleCheck-AF consists of a structured teleconsultation (Tele), an on-demand app-based heart rate, rhythm and symptom monitoring (Check) and comprehensive AF management provided by a multidisciplinary team (AF).[52] A retrospective analysis demonstrated that the approach was well accepted by patients and care providers,[30] and optimal motivation and adherence to the app-based monitoring approach, with older age being a positive predictor.[53]

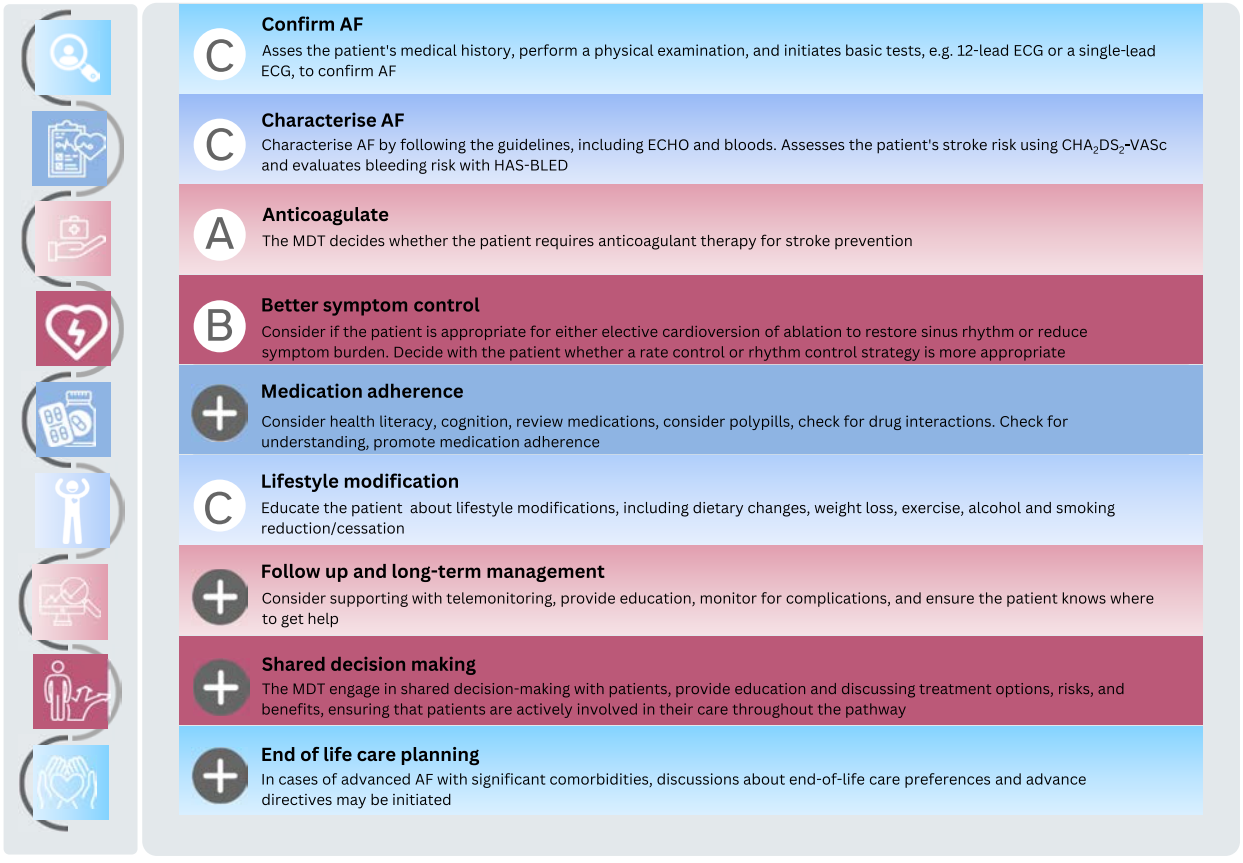


Figure 3 The CC-ABC pathway for atrial fibrillation patient follow-up. The +-symbol indicates additional considerations that Nurses and Allied Professionals should make in implementing the guidelines. AF, atrial fibrillation; ECHO; echocardiogram; ECG, electrocardiogram; MDT, multidisciplinary team.

Challenges and opportunities

Adherence to guidelines

As part of AF management, adherence is one of the key components to reduce the stroke risk with anticoagulant medication (namely DOACs) and lifestyle changes (in relation to modifiable risk factors) and the need for ongoing education and advice. However, the literature demonstrates that adherence to the guidelines remains suboptimal and the importance of improving treatment adherence is identified in the 2024 AF guidelines.[54] The reasons are varied including patient-related factors (examples include the difficulties in managing multiple comorbidities such as diabetes and sleep apnoea along with their AF, or side-effects from medications) to clinician and organizational related factors (e.g. lack of access to specialist services, limited resources in time and personnel). The 2024 guidelines suggest the use of appropriate tools (such as patient education programmes and more practical tools such as pillboxes) to support adherence along with regular review with the MDT. As part of an exploration into poor guideline adherence, a gap analysis of current clinical practice across Europe was undertaken as part of the EHRA-PATHS project (*"Addressing multimorbidity in elderly atrial fibrillation patients through interdisciplinary, tailored, patient-centred care pathways'*).[55] The EHRA-PATHS project aims to address these gaps in practice with a focus on comorbidity and risk factor management to holistic, inclusive, and personalized treatment strategies. This clearly aligns with the AF-CARE component of the 2024 guidelines with C outlining these key aspects of AF management.

From the healthcare professionals' perspective, a survey of 339 clinicians across Europe recorded varying rates of specialist services (including diabetes and heart failure for instance) in their clinical practice. The respondents also identified barriers to guideline adherence including the lack of an integrated care model along with organizational issues (lack of time and personnel) and patient adherence. The respondents identified key areas that would improve adherence and these included (i) improving access to lifestyle and health promotion interventions, including early management of risk factors for comorbidities, (ii) Organizational restructuring to enable innovation in care provision, (iii) Working towards achieving an evidence-based and integrated approach to multimorbid AF care for all, and (iv) aiming for greater collaboration and interdisciplinary working. It is clear from the survey that there is sub-optimal guideline adherence across Europe, but at the same time highlights the complexity of AF management.[55] The need for a coordinated collaborative organizational approach is evident and this may potentially provide an opportunity to improve guideline adherence. This shows a drive for integrated care amongst APs and is in clear alignment with the 2024 guidelines.

Training of nurses and allied professions

The management of patients with atrial AF presents a multifaceted challenge in the healthcare sector,[56] this needs to be underpinned by qualified staff with appropriate training and ongoing education. The ESC's Association of Cardiovascular Nurses and Allied Professions (ACNAP) has recently published a Core Curriculum for cardiovascular nurses and APs, which aims to support the development of core skills in the field of cardiovascular care while following a patient-centred approach.[57] AF management is an ever-evolving field with ongoing research, clinical advancements and guideline updates. It is well recognized that education, particularly for APs, is a continuous process that ensures evidence-based clinical currency aiming to improve patient outcomes. The Core Curriculum has the potential to serve as a guide to clinical practice. The 2024 AF guidelines acknowledge the importance of education for nurses and APs but also recognize that education interventions may not be adequate to sustain behaviour change.[1] This highlights the complexity of AF care and the need for further studies on the effectiveness of additional education of nurses and APs to optimize patient self-management. Unfortunately, within the 2024 guidelines, there is no specific information on the type of training required for nurses and APs.

Introduction of novel technologies and treatment modalities in AF required knowledgeable healthcare professionals who are able to integrate these into clinical practice.[58] As such, innovative models of education and training for healthcare professionals are required that adapt to these changes and, at the same time, are patient-centred. Interprofessional education models bring all professions together to learn, foster teamwork, communication, and a shared understanding of AF care.

There are several innovative approaches to the delivery of education into health, including the use of immersive learning platforms and app-based learning.[59] Simulated Learning Environments offer a safe and controlled environment where healthcare professionals can practice managing AF cases, with high-fidelity simulations using advanced mannequins and computer-based scenarios to replicate real-life situations. This hands-on experience supports professionals in developing and refining their clinical skills, decision-making, and multidisciplinary approach within a risk-free setting.[60] The recent introduction of Virtual Reality (VR) and Augmented Reality (AR) technologies has provided immersive experiences using VR headsets or AR applications.[61] They provide opportunities to interact with 3D representations of cardiac anatomy, visualize electrophysiological mechanisms, and practice procedures virtually.[62] This technology enhances spatial understanding and procedural skills.

Virtual consultations and remote monitoring are now commonplace, and health professionals need training to simulate remote consultations. E-Learning and Mobile Apps tailored to AF management offer flexible, accessible, and self-paced education and examples are interactive modules, case studies, quizzes, and real-time updates on AF guidelines and research.

The ESC guidelines are a cornerstone in shaping the management and treatment of cardiovascular diseases, and the Be Guidelines Smart Programme were introduced to disseminate the most up-to-date and evidence-based guidelines for the management of cardiovascular conditions.

Innovative models of education and training are essential to prepare healthcare professionals to manage AF patients. These models harness technology, interprofessional collaboration and global networking to ensure that professionals are equipped with the knowledge and skills needed to provide high-quality, patient-centred care.

Patient perspective

As previously stated, there is an emphasis on patient education and empowerment with a focus on self-care as a key component of patient-centred AF management in the 2024 guidelines.[1] AF-CARE places the patient at the centre of care, and this is a major change from the 2020 guidelines. Shared decision-making is also identified as important, especially in relation to anti-coagulation and arrhythmia management. Although the guidelines stress the importance of an integrated patient-centred approach, this does not always manifest in clinical practice. There is a paucity of literature on patients' perspectives in AF and often the concerns of patients are not fully discussed or acknowledged, nor is there evidence on how additional education directed to patients and their family would optimize shared decision-making.[63] Patients' personal health practices and beliefs are an important part of how they approach and manage their health and any associated conditions and healthcare professionals need to be cognizant of this, especially as other non-AF factors may adversely affect a person's health.[64] A recent study explored patients' perspectives via in-depth interviews, which gave patients an opportunity to explain, in their own words, how they were approaching their health in relation to AF. Thirty patients (65 years or older) with AF from across Europe commented on the negative impact of their AF symptoms on daily activities suggesting that their

symptoms were not well managed. Although they had some knowledge about AF, there was a lack of understanding about their comorbidities and how they related to their AF (diabetes and hypertension for example). The participants also raised concerns regarding their medications, especially DOAC medication and expressed a need for more education and information on their medications. Similarly, in relation to modifiable risk factors, all were motivated to make lifestyle adjustments but again, a lack of education and advice on how to implement and maintain these lifestyle changes was reported. Previous research on injectables for cardiovascular disease also highlighted the importance of knowledge and education about medication whilst also noting that there are significant organizational and governance-related barriers that affect the delivery of care and affect guideline adherence.[65] The importance of person-centred care was also viewed as important in these interviews and as reported in coronary disease and heart failure, a person-centred approach improves patient experience and ensures patients feel included in decision-making.[66,67] Healthcare professionals, including the primary care physician, play a key role in assisting patients to manage their AF and central to this is a person-centred approach with shared decision-making as reflected in the 2024 guidelines. The addition of AF-CARE to the latest guidelines ensures a focus on the patient as a joint decision-maker, along with their MDT on their AF management. Critically, a key recommendation is on access to patient-centred management using AF-CARE (refer to Recommendation Table 4 and Figure 3 in the 2024 guidelines).

Future directions

Guidelines are suboptimal without good implementation in daily clinical practice. Previous sections showed that a MDT approach including the patient, physician, but also nurses and APs is pivotal in this respect but that there is room for improvement. Current evidence on the use of an integrated approach with a MDT providing holistic care and treatment in AF is still scarce and contrasting. Additional evaluations of this approach in day-to-day practice are warranted to strengthen the current recommendations in the ESC Guidelines on the management of AF, with not only a focus on its impact on clinical outcomes. Moreover, additional data on the cost-effectiveness of these approaches is warranted. There is also a high need for instrumental information and guidance on the implementation of these interventions, information on the quality of care together with a systematic assessment of its impact on PROMs and PREMs (patient-reported experience measures) as they provide valuable insights into patients' own perspectives and experiences about their health in general and medical condition in particular.[68] The ICHOM (International Consortium for Health Outcomes Measurement) consortium, for example, has already formulated a standard set of outcome measures for patients with AF.[69] One should also keep in mind that these MDT approaches should be feasible to realize in daily clinical practice and current fragmentation of care is a hurdle in this respect.

The ESC and its associations can assist in the implementation of a multidisciplinary team approach in AF management by means of various initiatives. (i) Identification of expert centres in multidisciplinary AF management. (ii) Training of nurses and APs via expert centres, webinars, etc. (iii) Setting up initiatives such as Be Guidelines Smart and EHRA-PATHS focusing on the practical implementation of the Guidelines in daily clinical practice and stimulating the collaboration and referral to other subspecialties and professions.[70] (iv) Patient-friendly versions of the Guidelines to better involve patients in their care. (v) Decision support tools and/or structured digital clinical practice Guidelines that can help to implement the latest ESC Guidelines and that are valuable for nurses and APs responsible for structuring the care of AF patients. If clinical practice guidelines are also published in a structured and digitalized format, this will allow computers and electronic health records systems to read and process these guidelines to assist healthcare providers in their decision-making (e.g. efficient patient risk stratification and a personalized treatment plan).[71]

In summary, additional evidence and various initiatives are still needed to fully involve nurses, APs and other subspecialties in the management of AF patients to fully incorporate them in the AF team.

Conclusions

This statement on behalf of the Association of Cardiovascular Nursing and Allied Professions and the European Heart Rhythm Association of the European Society of Cardiology highlighted the role of a multidisciplinary team approach in the care of AF patients. A holistic integrated care approach including nurses and APs from different disciplines is the way to move forward. Advice is given concerning the key actors and key components of such a multidisciplinary approach. Education of healthcare providers, telemedicine platforms, improved hospitals or community structures (e.g. specialized AF clinics), better care pathways etc. can contribute to more effective and efficient care delivery and improved patient outcomes.

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Data availability

Data is not available.

References

1. Van Gelder IC, Rienstra M, Bunting KV, Casado-Arroyo R, Caso V, Crijns HJGM, *et al.* 2024 ESC Guidelines for the management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS): developed by the task force for the management of atrial fibrillation of the European Society of Cardiology (ESC), with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. Endorsed by the European Stroke Organisation (ESO). *Eur Heart J* 2024;**45**:3314–3414.
2. Hendriks JM, Heidbuchel H. The management of atrial fibrillation: an integrated team approach—insights of the 2016 European Society of Cardiology guidelines for the management of atrial fibrillation for nurses and allied health professionals. *Eur J Cardiovasc Nurs* 2019;**18**:88–95.
3. Hindricks G, Potpara T, Dagres N, Arbelo E, Bax JJ, Blomström-Lundqvist C, *et al.* 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association of Cardio-Thoracic Surgery (EACTS): the Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC. *Eur Heart J* 2021;**42**:373–498.
4. Camm AJ, Kirchhof P, Lip GY, Schotten U, Savelieva I, Ernst S, *et al.* Guidelines for the management of atrial fibrillation: the Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC). *Eur Heart J* 2010;**31**: 2369–2429. Practice Guideline 2010/08/31.
5. Camm AJ, Lip GY, De Caterina R, Savelieva I, Atar D, Hohnloser SH, *et al.* 2012 focused update of the ESC Guidelines for the management of atrial fibrillation: an update of the 2010 ESC Guidelines for the management of atrial fibrillation. Developed with the special contribution of the European Heart Rhythm Association. *Eur Heart J* 2012;**33**: 2719–2747. Practice Guideline 2012/08/28.
6. Svennberg E, Friberg L, Frykman V, Al-Khalili F, Engdahl J, Rosenqvist M. Clinical outcomes in systematic screening for atrial fibrillation (STROKESTOP): a multicentre, parallel group, unmasked, randomised controlled trial. *Lancet* 2021;**398**:1498–1506.
7. Fitzmaurice DA, Hobbs FDR, Jowett S, Mant J, Murray ET, Holder R, *et al.* Screening versus routine practice in detection of atrial fibrillation in patients aged 65 or over: cluster randomised controlled trial. *BMJ* 2007;**335**:383–383.
8. Hobbs R, Fitzmaurice D, Mant J, Murray E, Jowett S, Bryan S, *et al.* A randomised controlled trial and cost-effectiveness study of systematic screening (targeted and total population screening) versus routine practice for the detection of atrial fibrillation in people aged 65 and over: the SAFE study. *Health Technol Assess* 2005;**9**:90.
9. Lowres N, Neubeck L, Salkeld G, Krass I, McLachlan AJ, Redfern J, *et al.* Feasibility and cost-effectiveness of stroke prevention through community screening for atrial fibrillation using iPhone ECG in pharmacies. The SEARCH-AF study. *Thromb Haemost* 2014; **111**:1167–1176.
10. da Costa FA, Mala-Ladova K, Lee V, Tous S, Papastergiou J, Griffiths D, *et al.* Awareness campaigns of atrial fibrillation as an opportunity for early detection by pharmacists: an international cross-sectional study. *J Thromb Thrombolysis* 2020;**49**:606–617.
11. Hicks L, Newton J, Nayar R, Mackay K. Empowering podiatrists to perform pulse checks for opportunistic atrial fibrillation detection during annual diabetes foot checks. *Open Heart* 2019;**6**:e000795.
12. Freedman B, Camm J, Calkins H, Healey JS, Rosenqvist M, Wang J, *et al.* Screening for atrial fibrillation: a report of the AF-SCREEN international collaboration. *Circulation* 2017;**135**:1851–1867.
13. Svennberg E, Tjong F, Goette A, Akoum N, Di Biase L, Bordachar P, *et al.* How to use digital devices to detect and manage arrhythmias: an EHRA practical guide. *EP Europace* 2022;**24**:979–1005.
14. Vollbrecht H, Arora V, Otero S, Carey K, Meltzer D, Press VG. Evaluating the need to address digital literacy among hospitalized patients: cross-sectional observational study. *J Med Internet Res* 2020;**22**:e17519.
15. Lip GYH. The ABC pathway: an integrated approach to improve AF management. *Nat Rev Cardiol* 2017;**14**:627–628.
16. Hendriks JM. Integrated care in atrial fibrillation—are we truly integrating? *Int J Care Coord* 2020;**23**:71–74.
17. Ritchie LA, Penson PE, Akpan A, Lip GYH, Lane DA. Integrated care for atrial fibrillation management: the role of the pharmacist. *Am J Med* 2022;**135**:1410–1426.
18. Chahal JK, Antoniou S, Earley M, Ali S, Saja K, Singh H, *et al.* Preventing strokes in people with atrial fibrillation by improving ABC. *BMJ Open Qual* 2019;**8**:e000783.
19. Chung MK, Eckhardt LL, Chen LY, Ahmed HM, Gopinathannair R, Joglar JA. *et al.* Lifestyle and risk factor modification for reduction of atrial fibrillation: a scientific statement from the American Heart Association. *Circulation* 2020;**141**:e750–e772.
20. Wahlström M, Rosenqvist M, Medin J, Walfridsson U, Rydell-Karlsson M. MediYoga as a part of a self-management programme among patients with paroxysmal atrial fibrillation —a randomised study. *Eur J Cardiovasc Nurs* 2020;**19**:74–82.
21. Särnholm J, Skúladóttir H, Rück C, Axelsson E, Bonnert M, Bragesjö M, *et al.* Cognitive behavioral therapy improves quality of life in patients with symptomatic paroxysmal atrial fibrillation. *J Am Coll Cardiol* 2023;**82**:46–56.
22. Osborn R, Squires D. International perspectives on patient engagement: results from the 2011 Commonwealth Fund Survey. *J Ambul Care Manage* 2012;**35**:118–128.
23. Sabzwari SRA, Garg L, Lakkireddy D, Day J. Ten lifestyle modification approaches to treat atrial fibrillation. *Cureus* 2018;**10**:e2682.
24. Quintens C, Verhamme P, Vanassche T, Vandenbriele C, Van den Bosch B, Peetermans WE, *et al.* Improving appropriate use of anticoagulants in hospitalised patients: a pharmacist-led Check of Medication Appropriateness intervention. *Br J Clin Pharmacol* 2022;**88**:2959–2968.
25. Virdee MS, Stewart D. Optimizing the use of oral anticoagulant therapy for atrial fibrilation in primary care: a pharmacist-led intervention. *Int J Clin Pharm* 2017;**39**:173–180.
26. Guo Y, Lip GYH. Beyond atrial fibrillation detection: how digital tools impact the care of patients with atrial fibrillation. *Eur J Intern Med* 2021;**93**:117–118.
27. Ramkumar S, Nerlekar N, D'Souza D, Pol DJ, Kalman JM, Marwick TH. Atrial fibrillation detection using single lead portable electrocardiographic monitoring: a systematic review and meta-analysis. *BMJ Open* 2018;**8**:e024178.
28. Orchard J, Neubeck L, Freedman B, Li J, Webster R, Zwar N, *et al.* Ehealth tools to provide structured assistance for atrial fibrillation screening, management, and guideline-recommended therapy in metropolitan general practice: the AF—SMART study. *J Am Heart Assoc* 2019;**8**:e010959.
29. Gulilat M, Keller D, Linton B, Pananos AD, Lizotte D, Dresser GK, *et al.* Drug interactions and pharmacogenetic factors contribute to variation in apixaban concentration in atrial fibrillation patients in routine care. *J Thromb Thrombolysis* 2020;**49**:294–303.
30. Gawalko M, Duncker D, Manninger M, van der Velden RMJ, Hermans ANL, Verhaert DVM, *et al.* The European TeleCheck-AF project on remote app-based management of atrial fibrillation during the COVID-19 pandemic: centre and patient experiences. *EP Europace* 2021;**23**:1003–1015.
31. Pearsons A, Hanson CL, Gallagher R, O'Carroll RE, Khonsari S, Hanley J, *et al.* Atrial fibrillation self-management: a mobile telephone app scoping review and content analysis. *Eur J Cardiovasc Nurs* 2021;**20**:305–314.
32. Knaepen L, Desteghe L, Delesie M, Önder R, Vijgen J, Dendale P, *et al.* Effectiveness of the AF-EduCare and AF-EduApp approach to improve atrial fibrillation knowledge and risk factor awareness in patients with atrial fibrillation: a randomized controlled trial. *Eur J Cardiovasc Nurs* 2025;**24**:266–276.
33. Bhat A, Zhang J, Chen H, Samson E, Latunahima A, Khanna S, *et al.* Impact of a specialised AF clinic on unplanned AF-related rehospitalisation. *Heart Lung Circ* 2023;**32**:S198.
34. Pearsons A, Hendriks J, Neubeck L. Understanding for whom, under what conditions, and how an integrated approach to atrial fibrillation service delivery works: a realist review. *Eur J Cardiovasc Nurs* 2024;**23**:323–336.
35. Mazurek M, Huisman MV, Lip GYH. Registries in atrial fibrillation: from trials to real-life clinical practice. *Am J Med* 2017;**130**:135–145.
36. Kirchhof P, Benussi S, Kotecha D, Ahlsson A, Atar D, Casadei B, *et al.* 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. *Europace* 2016;**18**:1609–1678.
37. Hendriks JM, Gallagher C, Middeldorp ME, Lau DH, Sanders P. Risk factor management and atrial fibrillation. *Europace* 2021;**23**:ii52–ii60.
38. Hendriks JM, de Wit R, Crijns HJ, Vrijhoef HJM, Prins MH, Pisters R, *et al.* Nurse-led care vs. usual care for patients with atrial fibrillation: results of a randomized trial of integrated chronic care vs. routine clinical care in ambulatory patients with atrial fibrillation. *Eur Heart J* 2012;**33**:2692–2699.
39. Gallagher C, Elliott AD, Wong CX, Rangnekar G, Middeldorp ME, Mahajan R, *et al.* Integrated care in atrial fibrillation: a systematic review and meta-analysis. *Heart* 2017; **103**:1947–1953.
40. Conti A, Canuti E, Mariannini Y, Viviani G, Poggioni C, Boni V, *et al.* Clinical management of atrial fibrillation: early interventions, observation, and structured follow-up reduce hospitalizations. *Am J Emerg Med* 2012;**30**:1962–1969.
41. Tran HN, Tafreshi J, Hernandez EA, Pai SM, Torres VI, Pai RG. A multidisciplinary atrial fibrillation clinic. *Curr Cardiol Rev* 2013;**9**:55–62.
42. Hendriks JML, Tieleman RG, Vrijhoef HJM, Wijtvliet P, Gallagher C, Prins MH, *et al.* Integrated specialized atrial fibrillation clinics reduce all-cause mortality: post hoc analysis of a randomized clinical trial. *Europace* 2019;**21**:1785–1792.
43. Wijtvliet E, Tieleman RG, van Gelder IC, Pluymaekers NAHA, Rienstra M, Folkeringa RJ, *et al.* Nurse-led vs. usual-care for atrial fibrillation. *Eur Heart J* 2020;**41**:634–641.
44. Vinereanu D, Lopes RD, Bahit MC, Xavier D, Jiang J, Al-Khalidi HR, *et al.* A multifaceted intervention to improve treatment with oral anticoagulants in atrial fibrillation (IMPACT-AF): an international, cluster-randomised trial. *Lancet* 2017;**390**:1737–1746.
45. Delesie M, Knaepen L, Dendale P, Vijgen J, Ector J, Verbeeck J, *et al.* Effect of targeted education for atrial fibrillation patients: design of the EduCare-AF study. *Eur J Clin Invest* 2021;**51**:e13442.
46. Knaepen L, Delesie M, Vijgen J, Dendale P, Ector J, Desteghe L, *et al.* Adherence to oral anticoagulation measured by electronic monitoring in a Belgian atrial fibrillation population. *Clin Res Cardiol* 2023;**112**:1812–1823.
47. Hendriks JM, Lee G, Desteghe L, Linz D. Sleep apnoea management in atrial fibrillation in clinical practice: key messages for health care professionals based on a joint survey by EHRA and ACNAP. *Eur J Cardiovasc Nurs* 2022;**21**:641–642.
48. Desteghe L, Hendriks JML, McEvoy RD, Chai-Coetzer CL, Dendale P, Sanders P, *et al.* The why, when and how to test for obstructive sleep apnea in patients with atrial fibrillation. *Clin Res Cardiol* 2018;**107**:617–631.

49. Verhaert DVM, Betz K, Gawalko M, Hermans ANL, Pluymaekers NAHA, van der Velden RMJ, *et al.* A VIRTUAL sleep Apnoea management pathway for the work-up of Atrial fibrillation patients in a digital Remote Infrastructure: VIRTUAL-SAFARI. *Europace* 2022;**24**:565–575.
50. Hendriks JM, Brooks AG, Rowett D, Moss JR, Gallagher C, Nyfort-Hansen K, *et al.* Home-based education and learning program for atrial fibrillation: rationale and design of the HELP-AF study. *Can J Cardiol* 2019;**35**:846–854.
51. Sanders P. Home-based education reduces hospitalisations in patients with atrial fibrillation. In: *ESC Congress 2019 Late Breaking Science Session*. ESC Congress, 1 September 2019, Paris, France.
52. Linz D, Pluymaekers N, Hendriks JM. TeleCheck-AF for COVID-19. *Eur Heart J* 2020; **41**:1954–1955.
53. Gawalko M, Hermans ANL, Van Der Velden RMJ, Betz K, VM Verhaert D, Hillmann HAK, *et al.* Patient motivation and adherence to an on-demand app-based heart rate and rhythm monitoring for atrial fibrillation management: data from the TeleCheck-AF project. *Eur J Cardiovasc Nurs* 2023;**22**:412–424.
54. Raparelli V, Proietti M, Cangemi R, Lip GYH, Lane DA, Basili S. Adherence to oral anticoagulant therapy in patients with atrial fibrillation. Focus on non-vitamin K antagonist oral anticoagulants. *Thromb Haemost* 2017;**117**:209–218.
55. Lee G, Baker E, Collins R, Merino JL, Desteghe L, Heidbuchel H. The challenge of managing multimorbid atrial fibrillation: a pan-European European Heart Rhythm Association (EHRA) member survey of current management practices and clinical priorities. *EP Europace* 2022;**24**:2004–2014.
56. Rienstra M, Hobbelt AH, Alings M, Tijssen JGP, Smit MD, Brügemann J, *et al.* Targeted therapy of underlying conditions improves sinus rhythm maintenance in patients with persistent atrial fibrillation: results of the RACE 3 trial. *Eur Heart J* 2018;**39**:2987–2996.
57. Neubeck L, Ross C, Jones J, Simpson M, Mindham R, Jaarsma T, *et al.* The core curriculum for cardiovascular nurses and allied professionals. *Eur J Cardiovasc Nurs* 2023;**22**: e62–e113.
58. Heidbuchel H, Dagres N, Antz M, Kuck K-H, Lazure P, Murray S, *et al.* Major knowledge gaps and system barriers to guideline implementation among European physicians treating patients with atrial fibrillation: a European Society of Cardiology international educational needs assessment. *Europace* 2018;**20**:1919–1928.
59. Rosselló X, Stanbury M, Beeri R, Kirchhof P, Casadei B, Kotecha D. Digital learning and the future cardiologist. *Eur Heart J* 2019;**40**:499–501.
60. Shin S, Park JH, Kim JH. Effectiveness of patient simulation in nursing education: meta-analysis. *Nurse Educ Today* 2015;**35**:176–182.
61. Plotzky C, Lindwedel U, Sorber M, Loessl B, König P, Kunze C, *et al.* Virtual reality simulations in nurse education: a systematic mapping review. *Nurse Educ Today* 2021; **101**:104868.
62. Aslani N, Behmanesh A, Garavand A, Maleki M, Davoodi F, Shams R. The virtual reality technology effects and features in cardiology interventions training: a scoping review. *Med J Islam Repub Iran* 2022;**36**:77.
63. Lee GA. Always fibrillating: is your patient handling their atrial fibrillation? *Eur J Cardiovasc Nurs* 2013;**12**:107–108.
64. Lee G, Hendriks JM. Improving outcomes in cardiovascular care—time to refocus on the hidden determinants of health? *Eur J Cardiovasc Nurs* 2023;**22**:e53–e54.
65. Lee GA, Durante A, Baker EE, Vellone E, Caggianelli G, Dellafiore F, *et al.* Patients' perceptions on the facilitators and barriers using injectable therapies in dyslipidaemia: an empirical qualitative descriptive international study. *J Adv Nurs* 2023;**79**:4687–4696.
66. Wolf A, Vella R, Fors A. The impact of person-centred care on patients' care experiences in relation to educational level after acute coronary syndrome: secondary outcome analysis of a randomised controlled trial. *Eur J Cardiovasc Nurs* 2019;**18**:299–308.
67. Hendriks JM, Lee G. Shared decision-making: the patient on the forefront of care coordination. *Eur Heart J Qual Care Clin Outcomes* 2020;**6**:231–233.
68. Moons P, Norekvål TM, Arbelo E, Borregaard B, Casadei B, Cosyns B, *et al.* Placing patient-reported outcomes at the centre of cardiovascular clinical practice: implications for quality of care and management. *Eur Heart J* 2023;**44**:3405–3422.
69. Seligman WH, Das-Gupta Z, Jobi-Odeneye AO, Arbelo E, Banerjee A, Bollmann A, *et al.* Development of an international standard set of outcome measures for patients with atrial fibrillation: a report of the International Consortium for Health Outcomes Measurement (ICHOM) atrial fibrillation working group. *Eur Heart J* 2020;**41**: 1132–1140.
70. Heidbuchel H, Van Gelder IC, Desteghe L; EHRA-PATHS Investigators. ESC and EHRA lead a path towards integrated care for multimorbid atrial fibrillation patients: the Horizon 2020 EHRA-PATHS project. *Eur Heart J* 2021;**43**:1450–1452.
71. De Angelis G, Davies B, King J, McEwan J, Cavallo S, Loew L, *et al.* Information and communication technologies for the dissemination of clinical practice guidelines to health professionals: a systematic review. *JMIR Med Educ* 2016;**2**:e16.