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**EHRA SURVEY**

EHRA European Heart Rhythm Association

# Contemporary management of atrial fibrillation in patients with cancer—the 2025 European Heart Rhythm Association survey

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**Aims** This study aimed to assess current clinical practices in the diagnosis and management of atrial fibrillation (AF) among patients with active cancer or a history of cancer therapy.

**Methods and results** A 25-item, physician-based survey was developed by the European Heart Rhythm Association in collaboration with the European Society of Cardiology Council of Cardio-Oncology and the International Cardio-Oncology Society. The survey was disseminated electronically. A total of 380 participants from 74 countries completed the questionnaire, with respondents primarily working as electrophysiologists (30%), general cardiologists (25%), and cardio-oncologists (22%). Nearly two-thirds reported that active cancer '*definitely*' or '*most probably*' influenced clinical decisions regarding AF diagnosis and management. When AF was diagnosed, rhythm control was the preferred management strategy for symptomatic patients, while rate control was favoured for asymptomatic individuals. A little over 40% reported that a history of cancer therapy '*definitely*' or '*most probably*' influenced clinical decisions regarding AF. The rhythm control was the most common strategy (40%). In both populations, opportunistic screening for AF and direct oral anticoagulants (DOACs) were preferred strategies. A high level of uncertainty was noted concerning the role of invasive treatment options.

**Conclusion** The survey revealed that, despite the lack of robust evidence specific to this patient cohort, contemporary treatment of AF in patients with active cancer or a history of cancer therapy generally follows guidelines developed for the broader AF population. These findings highlight the urgent need for more dedicated data to inform clinical decision-making in cardio-oncology patients with AF.

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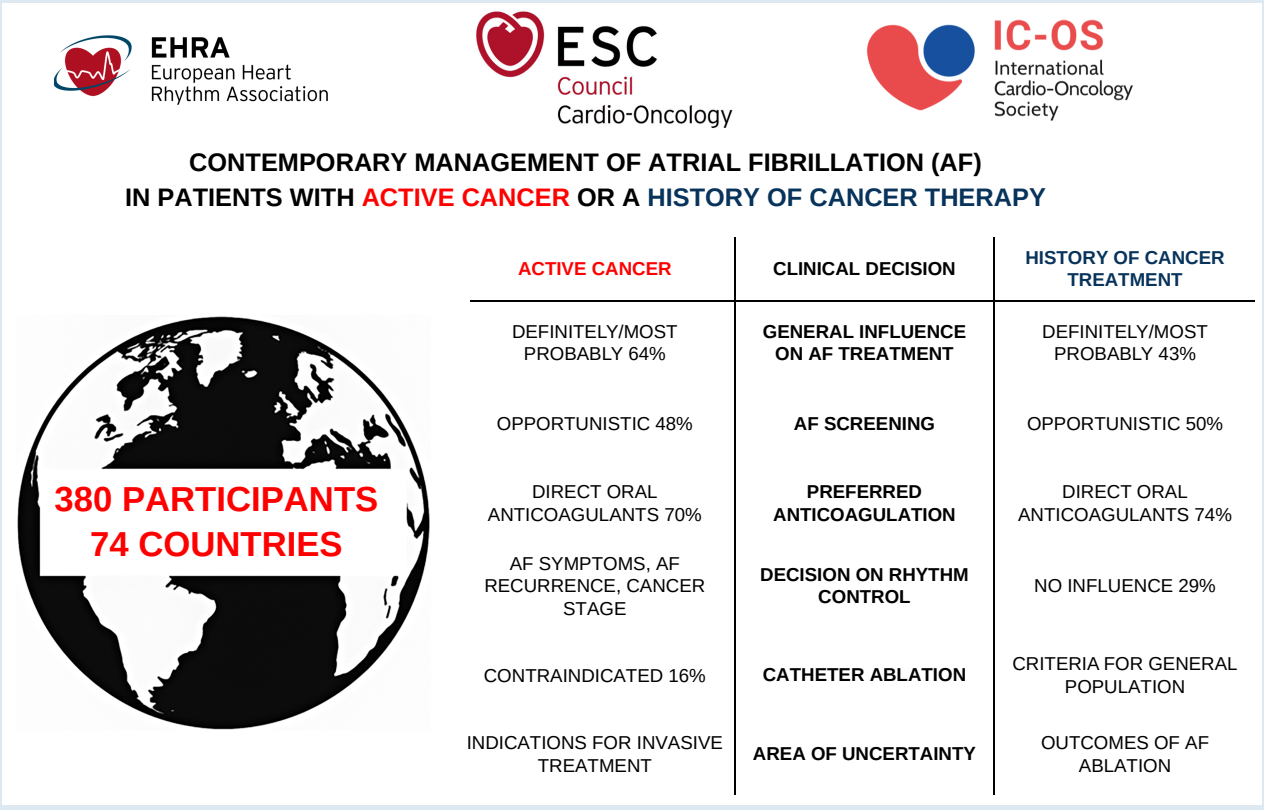
## Graphical Abstract




**Keywords** Arrhythmia • Atrial fibrillation • Cancer • Cardio-oncology • Anticoagulation • Antiarrhythmic drugs • Ablation

## Introduction

Atrial fibrillation (AF) is a common disease, with an estimated global incidence of 4.48 million cases, and is associated with a wide range of adverse health outcomes, including stroke, heart failure, and premature death.[1,2] Patients with cancer have a higher risk of developing AF due to various pathophysiological mechanisms, including older age, chronic inflammation, and cardiac side effects of anticancer treatment.[3–6] The coexistence of AF and cancer appears to significantly and reciprocally affect the outcomes of both conditions.[3,7,8] Current guidelines and expert consensus documents generally recommend similar approaches to the management of AF in patients with and without cancer, including anticoagulation and rhythm or rate control.[5,9,10] However, the evidence supporting these recommendations is limited and largely based on observational data or expert opinions. Patients with cancer appear to have a higher risk of bleeding while on anticoagulation therapy and a disputable risk of stroke.[7,11] Rhythm and rate control are the two main strategies for managing AF symptoms.[1,12] Recent randomized trials suggest that early rhythm control is associated with improved clinical outcomes, particularly in patients with a high burden of comorbidities. Early observational data on rhythm control in patients with cancer suggest that this may also hold true for this population.[13–16] Data on antiarrhythmic drug use in this population remain scarce, whereas catheter ablation of AF in patients with cancer is considered effective but carries a higher risk of complications.[17–21]

The aim of this study was to assess current clinical practices in the diagnosis and treatment of atrial fibrillation in patients with active cancer or a history of cancer therapy.

## Methods

This physician-based survey was developed by the Scientific Initiatives Committee (SIC) of the European Heart Rhythm Association (EHRA), in collaboration with the European Society of Cardiology (ESC) Council of Cardio-Oncology (CCO) and the International Cardio-Oncology Society (ICOS).

Based on the literature, a dedicated task force designed a 25-item online questionnaire to assess current clinical practice and inform future research initiatives in the field of arrhythmia management in cardio-oncology. The questionnaire consisted of single- and multiple-choice questions and was divided into three main sections: (i) general information about the respondent and centre, (ii) active cancer, and (iii) history of cancer treatment. The National Comprehensive Cancer Network's definition of a cancer survivor—which covers the patient's lifespan from the time of diagnosis through the remainder of life—was considered unfeasible for the purposes of our survey. We assumed significant pathophysiological and clinical differences between patients undergoing active anticancer treatment and those who had completed their treatment.[22] Active cancer was defined as cancer diagnosed within the previous six months; recurrent, regionally advanced, or metastatic cancer; cancer for which treatment had been administered within the last six months; or haematological cancer without complete remission.[23] A history of cancer was arbitrarily defined as at least one year since completion of cancer therapy. The two core sections of the questionnaire included questions on the diagnosis of AF, anticoagulation, and rate or rhythm control, with particular emphasis on catheter ablation.

The questionnaire was piloted among a small group, and changes were made accordingly. In accordance with the methodology used in previous EHRA SIC surveys, the questionnaire was disseminated via the EHRA Research Network, the mailing lists of the ESC CCO and ICOS, personal communications, and dedicated social media channels. This approach

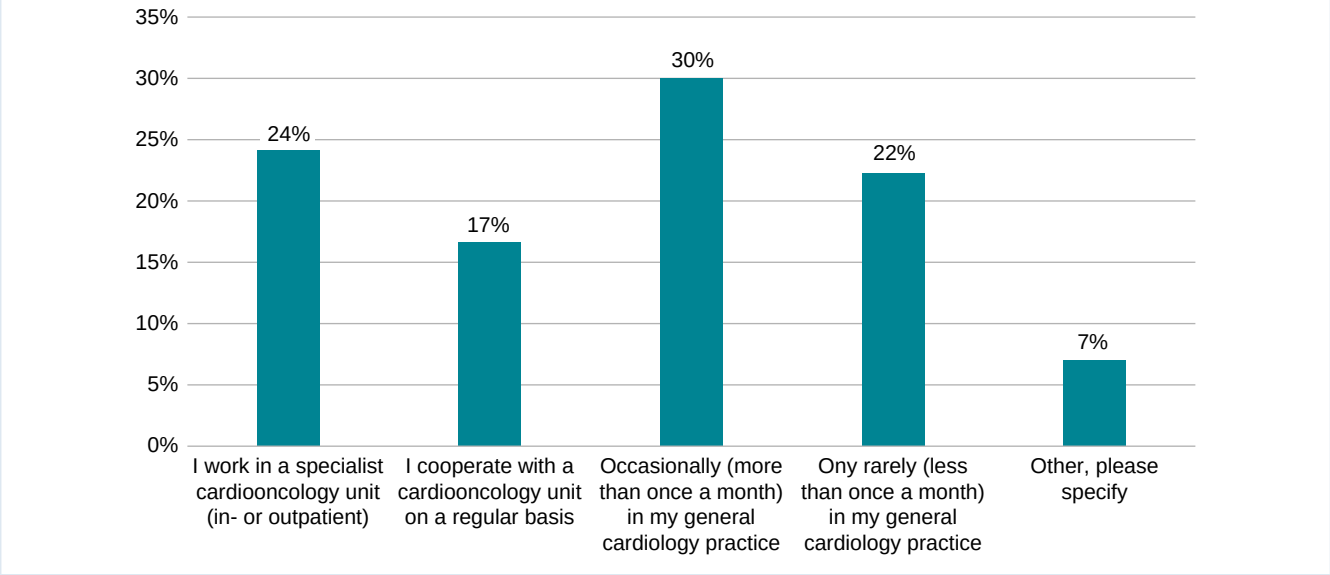



**Figure 1** Respondents' experience in management of patients with active cancer.

promoted broad participation from medical professionals involved in the diagnosis and treatment of cardio-oncology patients. However, it also introduced the risk of overrepresentation of certain respondent groups and made it impossible to calculate a response rate.

The survey remained open between 2 December 2024 and 14 January 2025. Participation in the survey was voluntary. Anonymized data regarding participants, their institutions, and available services were collected in compliance with the European General Data Protection Regulation (GDPR) 2016/679. As long as respondents provided data on clinical background or experience with cardio-oncological patients, their record was included in the analysis regardless of completion rate. To maintain clarity, survey results were presented as percentages (number of responses/total number of responses to each individual question). No formal statistical analysis was performed.

# Results

A total of 380 participants from 74 countries responded to the questionnaire (see Supplementary material online, *Figure S1*). The majority of respondents were from Europe (60%, 227/380), mainly from Poland, Spain and Germany, ($n = 57$, 37, and 34, respectively). Participants also came from both Americas (17%, 64/380), Asia/Australia (11%, 42/380), and Africa (3%, 13/380). Thirty-five participants did not disclose their country of origin. Approximately half of the respondents were affiliated with university hospitals, in both outpatient and inpatient settings, and about 10% worked in specialized cancer centres. The respondents' institutions included general cardiology departments (85%, 306/364), oncology departments (69%, 252/364), electrophysiology/electrotherapy (55%, 200/364), cardio-oncology wards (20%, 72/364), and cardio-oncology outpatient clinics (42%, 152/364). Our respondents were primarily electrophysiologists (30%, 114/375), followed by general cardiologists (25%, 94/375), cardio-oncologists (22%, 81/375), cardiology fellows (9%, 32/375), and oncologists (3%, 11/375). Other medical professionals were also represented, including haematologists, general practitioners, pharmacologists, physiologists, and nurses. *Figure 1* summarizes the respondents' exposure to patients with active cancer ($n = 373$).

## Patients with active cancer

Overall, most respondents stated that active cancer 'definitely' (29%, 92/321) or 'most probably' (35%, 111/321) influenced their clinical decisions regarding AF diagnosis and management; another 26% (84/321) responded 'possibly', 9% (29/321) 'probably not', and 1% (5/321) 'definitely not'.

Active cancer, regardless of type, was considered an additional stroke risk factor beyond the $CHA_2DS_2$-VA score by 61% (198/326) of responders. Metastatic disease was viewed as a stroke risk factor by 9% (28/326), and a further 6% (21/326) agreed depending on the cancer type, localization, or stage. In contrast, 12% (41/326) disagreed, and 12% (38/326) were uncertain about this association.

When asked about their preferred anticoagulation strategy, the majority of respondents (70%, 230/327) favoured direct oral anticoagulants (DOACs). Parenteral anticoagulation with unfractionated or low molecular weight heparins was preferred by 13% (44/327), vitamin K antagonists (VKA) by 3% (10/327), and left atrial appendage closure (LAAC) by 1% (3/327). Five per cent of respondents had no personal preference (15/327), while 8% were uncertain (25/327). Details on the criteria influencing the choice of anticoagulant strategy ($n = 330$) are presented in Supplementary material online, *Figure S2*.

A decision to withhold or discontinue anticoagulation was made by a cardio-oncology team (including an oncologist or haematologist) in 65% (237/364) of cases, by a cardiology team (without oncologist/haematologist involvement) in 22% (81/364), and independently by a physician in 17% (61/364). The patient and/or family were involved in the decision-making process in 45% (165/364) of cases.

Percutaneous left atrial appendage closure (LAAC) was considered a valid option in patients with cancer with high bleeding risk or history of bleeding in 49% (159/325). However, 17% (55/325) of respondents indicated that its use was limited due to the risk of systemic and peripheral thromboembolism. In 7% (24/325) of cases, active cancer did not influence the decision regarding LAAC, and 6% (19/325) considered surgical LAAC as an option. Notably, there was a high degree of uncertainty regarding LAAC in patients with cancer—21% (68/325) of respondents expressed uncertainty.

To diagnose atrial fibrillation, 48% (156/325) of respondents reported using opportunistic screening [e.g. 12-lead surface electrocardiogram (ECG) at each visit], 20% (66/325) preferred systematic screening with long-term monitoring, and 26% (83/325) did not screen for AF at all. Only 6% (20/325) were uncertain about their approach.

When AF was diagnosed, the preferred management strategy for symptomatic patients was rhythm control (74%, 240/324), while for asymptomatic patients, rate control was preferred (60%, 192/317).

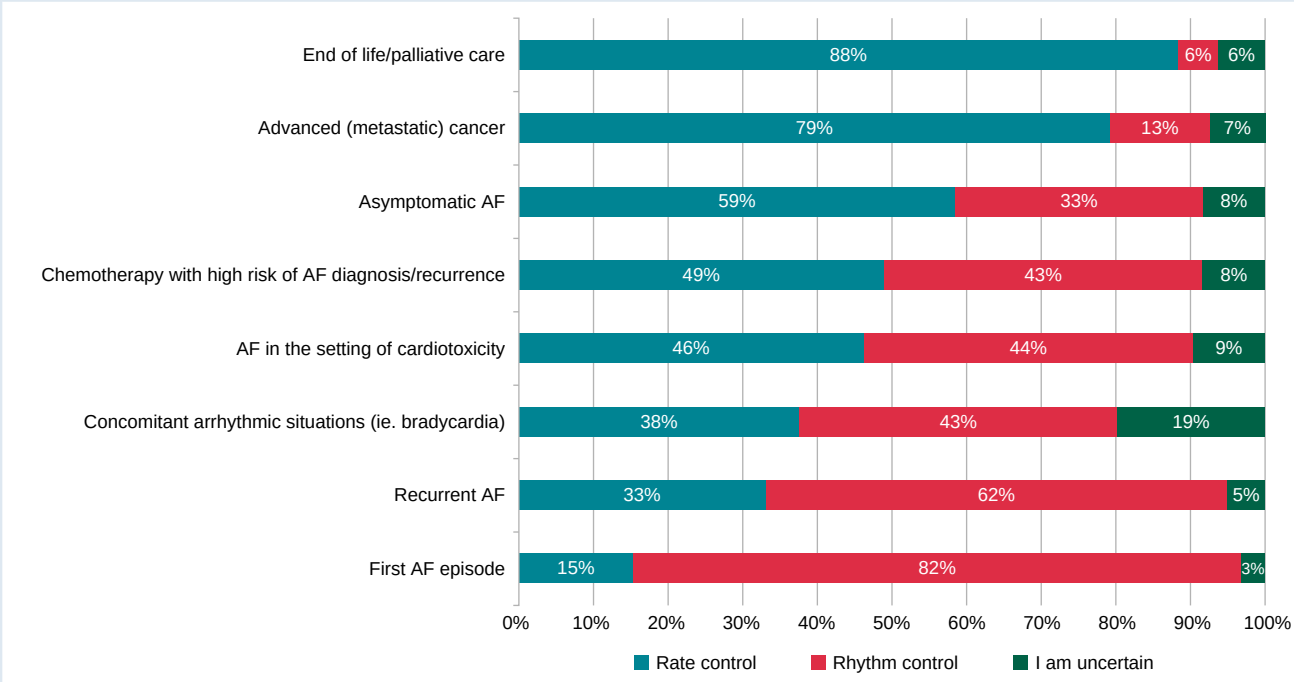



**Figure 2** Preference for rate or rhythm control in different clinical scenarios. AF, atrial fibrillation.

Respondents' ($n = 328$) preferences for rhythm or rate control in various clinical scenarios are presented in *Figure 2*. Beta-blockers and amiodarone were considered to be the two most valuable antiarrhythmic drugs (AADs). More detailed information on AAD use is presented in Supplementary material online, *Figure S3*. Catheter ablation of AF or atrial tachycardia/flutter was considered contraindicated only by 16% (217/325) and 11% (262/325) of respondents, respectively. However, 17% (54/325) were uncertain about AF ablation, and 9% (28/325) about ablation of atrial tachycardia/flutter.

## Patients with a history of cancer treatment

Most respondents indicated that a history of cancer treatment influenced their clinical decisions regarding AF diagnosis and management to a moderate degree: 'possibly' in 32% (99/312) and 'most probably' in 30% (95/312); other responses were: 'definitely' in 13% (40/312), 'probably not' in 20% (62/312) and 'definitely not' in 5% (16/312).

A preference for DOAs in this population was reported by 74% (230/313) of respondents, followed by no preference (13%, 40/313) and parenteral anticoagulation (7%, 22/313). Only a small minority (<4% each) indicated a preference for VKA treatment or expressed uncertainty in this area.

Regarding AF screening, opportunistic screening (e.g. ECG at each visit) was the preferred approach for 50% (157/311) of respondents. Systematic screening using long-term monitoring and the absence of any screening strategy accounted for 23% (71/311) and 22% (69/311) of responses, respectively; only 5% (14/311) were uncertain.

Rhythm control was the preferred strategy (40%, 125/313) over rate control (24%, 66/313); however, 29% (90/313) of respondents reported that the history of cancer treatment did not influence their decision-making, and 10% (32/313) were uncertain.

The decision to perform catheter ablation for AF was 'definitely' influenced by a history of cancer in 9% (24/305) of respondents, 'most probably' in 18% (54/305), 'possibly' in 36% (110/305), 'probably not' in 31% (95/305), and 'definitely not' in 7% (22/305), with no respondents reporting uncertainty. The choice of ablation type was based predominantly on the type of AF according to local practice, irrespective of cancer history (48%, 146/306). Other reported influencing factors included prior chest radiation therapy (13%, 40/306), documented cardiac toxicity (11%, 34/306), and involvement in ongoing scientific projects (6%, 18/306). Additionally, 22% (68/306) of respondents indicated they did not perform AF ablation. Respondents' opinions on the effectiveness of catheter ablation and its impact on survival in patients with a history of cancer are presented in *Figure 3*.

# Discussion

This worldwide survey on clinical practice regarding arrhythmia treatment in patients with active cancer or a history of cancer, developed and conducted in cooperation with EHRA, the ESC Council of Cardio-Oncology, and ICOS, yielded several notable findings.

Overall, active cancer influenced decisions on AF diagnosis and treatment in at least 65% of respondents. Regarding anticoagulation, active cancer was commonly considered an additional stroke risk factor, and DOACs were the preferred treatment option. This finding is consistent with previous publications.[5,24,25] However, in more complex clinical scenarios, several factors may influence the choice of anticoagulation, with thrombocytopenia and high bleeding risk being among the most important considerations (see Supplementary material online, *Figure S2*). The $CHA_2DS_2$-VASc score, a widely adopted clinical tool for identifying individuals with AF who are at elevated risk of stroke, is recommended for use in cancer populations.[1,9] However, published studies report a high percentage of at-risk patients who do not receive anticoagulation, as well as general limitations of this score in patients with cancer.[26,27] All DOACs interact with *P*-glycoprotein or cytochrome P450 3A4 (CYP3A4) to varying degrees, which may lead to

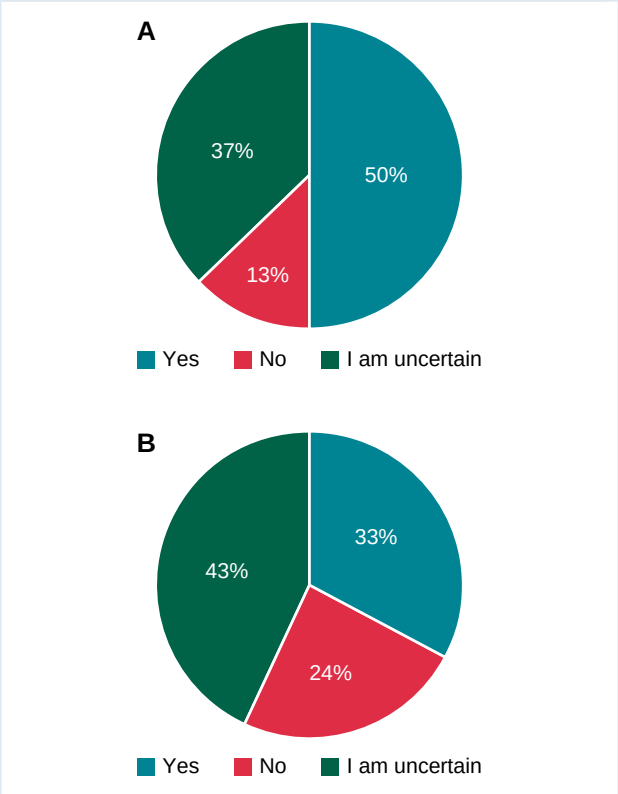



**Figure 3** Respondents' opinions on whether the effectiveness of catheter ablation of atrial fibrillation in patients with a history of cancer was similar to the general population (*A*), and if catheter ablation improved survival in those patients (*B*).

dangerous interactions with anticancer drugs and unacceptable increases in plasma concentrations. Therefore, coadministration of DOACs with certain commonly used anticancer agents, such as imatinib or sunitinib, should be avoided.[28]

These factors are well recognized and emphasized in both ESC and American Heart Association (AHA) guidelines, and should be carefully considered when determining the appropriate anticoagulation strategy.[5,9] It should be noted that both AF and cancer are generally related to higher risks of bleeding compared to the general population.[7] Somehow surprisingly, almost 50% of respondents considered LAAC a valid option in patients with cancer with high bleeding risk, despite limited supporting evidence and underlying pathophysiological concerns.[5,29–31] Nevertheless, a high degree of uncertainty was reported in this area—21%. The reasons behind these findings remain unclear, but they are consistent with the general uncertainty regarding the role of invasive treatments in cancer patients, as expressed by respondents in this survey.

Neither active cancer nor a history of cancer treatment prompted the implementation of active, long-term AF screening strategies. Instead, respondents favoured opportunistic screening, as recommended in the ESC guidelines.[1] A recent survey on the use of mobile or wearable digital devices in patients with active cancer reported that approximately one-third of respondents used such devices to detect AF in all of their patients, while another third did so only in selected cases.[32] Another survey, this time among cancer survivors, revealed a willingness as high as 95% to use wearable technologies for blood pressure or heart rate monitoring.[33] However, a lack of actual clinical data regarding AF screening in cancer patients was noted. To date, AF screening in populations with active cancer is not supported by robust evidence and is not recommended by current guidelines or expert consensus.[1,5,9,34,35]

The decision between rhythm and rate control in patients with active cancer depended on several factors, including the presence of symptoms, the patient's overall condition, cancer stage, and the recurrence of AF. Amiodarone and beta-blockers were considered the most valuable drugs in this population. Both medicines are CYP3A4 and *P*-gp inhibitors and therefore should be used with caution in coadministration with selected anticancer drugs.[36] A 2020 meta-analysis of randomized clinical trials did not report a correlation between amiodarone use and cancer-related deaths.[37] European and American guidelines acknowledge the complexities associated with active cancer and cancer-specific factors (e.g. drug–drug interactions), but generally recommend similar treatment strategies to those used in the broader AF population.[1,5,9,36] However, there is limited high-quality evidence regarding the effectiveness and safety of each strategy, specifically in patients with cancer.[16,21] Recent studies in the general AF population suggest that aggressive rhythm control may be superior to rate control in selected groups, particularly those with a higher disease burden.[15,38–40] A single population-wide analysis in cancer survivors appears to support this claim.[16] In terms of changing or ceasing treatment, 45% of respondents reported that patients were consulted in the decision-making and highlighting that this could be improved in line with ensuring a multi-disciplinary approach is used.[25,41]

Catheter ablation of AF or atrial tachycardia/flutter remains a cornerstone of rhythm control strategies.[1,15,42,43] This survey indicated that catheter ablation was considered a viable option in patients with active cancer. Published studies suggest ablation in such a population is feasible, although potentially associated with a higher risk of complications, particularly excessive bleeding.[17,19]

The influence of a history of cancer treatment on AF diagnosis and management was somewhat more ambiguous compared to active cancer, with approximately one-third of respondents reporting it as 'most probably' or 'possibly' influential. Nevertheless, the vast majority preferred DOACs for anticoagulation, which is consistent with current ESC recommendations.[5]

Respondents tended to favour rhythm control in this population (40%); however, about 30% did not take the history of cancer treatment into consideration. There appears to be general agreement that patients with a history of cancer should be managed with rate or rhythm control according to the same principles applied to the general AF population.[1,5,9] As noted above, current studies suggest that early rhythm control may be more beneficial than rate control for patients with a high burden of comorbidities, and this may also apply to patients with a history of cancer.[15,16,38–40] Antiarrhythmic drugs should be administered following the same guidelines as for the general population; however, there is a lack of specific evidence for patients with a history of cancer.[1,5,9,36]

AF ablation appears to lower the risk of stroke and, in patients with heart failure, improve overall survival.[15,44] Half of our respondents considered AF ablation in patients with a history of cancer to be similarly effective as in the general population, and about 30% believed it might improve overall survival in this group. However, there were high levels of uncertainty regarding both questions. The decision on the technical aspects of the procedure was influenced more by the type of AF than by any cancer-related considerations. The reported effectiveness of AF ablation in this population seems comparable to that in the general population.[17,18] The influence of anticancer therapy—whether chemotherapy, immunotherapy, or radiotherapy—on the development of left atrial fibrosis remains unclear. Studies analysing AF ablation outcomes in patients with a history of cancer have produced somewhat inconsistent results: favourable outcomes have been reported for cryoballoon ablation, whereas outcomes for radiofrequency ablation have been mixed.[45–47] Two studies assessed the extent of low-voltage areas in

the left atrium in patients with a history of chest radiotherapy but did not provide definitive conclusions.[47,48] Notably, only one of these—a small pilot study—used a contemporary standard for low-voltage area mapping employing dedicated multipolar catheters.[48]

Several areas of uncertainty were noted among respondents, especially concerning indications for invasive treatment. Just over 10% reported uncertainty about the interaction between cancer and the $CHA_2DS_2$-VA score. Although cancer is not formally included as a risk factor in this score, it may be considered when deciding on anticoagulation.[5] More than 20% were uncertain about the role of LAAC in the active cancer population, and nearly 20% were unsure about contraindications to AF catheter ablation in this group. Finally, about 40% of respondents expressed uncertainty regarding outcomes of AF ablation in patients with a history of cancer. These represent significant gaps in knowledge and areas for potential future research and support the development of a cardio-oncology core curriculum for physicians and allied professionals.[49,50]

# Limitations

This study has several limitations inherent to its design and execution, with selection bias being the most prominent. There was an apparent overrepresentation of electrophysiologists, which may have influenced the results towards more rhythm control-oriented strategies. However, general cardiologists and cardio-oncologists together accounted for nearly 50% of respondents. Respondents were primarily affiliated with university hospitals or specialized clinics located in Europe or North America; therefore, the results should be extrapolated to other categories of practitioners with appropriate caution. It should also be noted that the results reflect the views and opinions of the respondents rather than actual clinical data; therefore, no statistical comparisons or subgroup analyses were conducted.

# Conclusions

Contemporary treatment of AF in patients with active cancer or a history of cancer treatment tends to follow guidelines developed for the general AF population, including diagnosis, anticoagulation, and rhythm or rate control strategies, despite a predominant lack of evidence regarding their effectiveness and safety in these populations. Numerous knowledge gaps and areas of uncertainty in decision-making were identified, often related to the utility of invasive procedures.

# Supplementary material

Supplementary material is available at *Europace* online.

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**Conflict of interest:** none declared.

## Data availability

The data underlying this article might be shared on reasonable request to the corresponding author.

# References

1. Van Gelder IC, Rienstra M, Bunting KV, Casado-Arroyo R, Caso V, Crijns H *et al.* 2024 ESC Guidelines for the management of atrial fibrillation developed in collaboration with the European association for cardio-thoracic surgery (EACTS). *Eur Heart J* 2024;**45**:3314–414.
2. Cheng S, He J, Han Y, Han S, Li P, Liao H *et al.* Global burden of atrial fibrillation/atrial flutter and its attributable risk factors from 1990 to 2021. *Europace* 2024;**26**:euae195.
3. Chen Q, van Rein N, van der Hulle T, Heemelaar JC, Trines SA, Versteeg HH *et al.* Coexisting atrial fibrillation and cancer: time trends and associations with mortality in a nationwide Dutch study. *Eur Heart J* 2024;**45**:2201–13.
4. Guha A, Fradley MG, Dent SF, Weintraub NL, Lustberg MB, Alonso A *et al.* Incidence, risk factors, and mortality of atrial fibrillation in breast cancer: a SEER-medicare analysis. *Eur Heart J* 2022;**43**:300–12.
5. Lyon AR, López-Fernández T, Couch LS, Asteggiano R, Aznar MC, Bergler-Klein J *et al.* 2022 ESC Guidelines on cardio-oncology developed in collaboration with the European Hematology Association (EHA), the European Society for Therapeutic Radiology And Oncology (ESTRO) and the International Cardio-Oncology Society (IC-OS). *Euro Heart J* 2022;**43**:4229–361.
6. Yuan M, Zhang Z, Tse G, Feng X, Korantzopoulos P, Letsas KP *et al.* Association of cancer and the risk of developing atrial fibrillation: a systematic review and meta-analysis. *Cardiol Res Pract* 2019;**2019**:8985273.
7. Pastori D, Menichelli D, Di Rocco A, Farcomeni A, Sciacqua A, Pignatelli P *et al.* Bleeding and thrombotic events in atrial fibrillation patients with cancer: a systematic review and meta-analysis. *Intern Emerg Med* 2023;**18**:655–65.
8. Piserra López-Fernández De Heredia A, Ruiz Ortiz M, Torres Llergo J, Carrillo Bailen M, Sánchez De Castro M, Fernández De La Mata M *et al.* Clinical profile and cardiovascular events in patients with atrial fibrillation and hematologic malignancies with recent initiation of targeted therapy: real-life data from CANAC-FA registry. *Curr Probl Cardiol* 2025;**50**:102974.
9. Fradley MG, Beckie TM, Brown SA, Cheng RK, Dent SF, Nohria A *et al.* Recognition, prevention, and management of arrhythmias and autonomic disorders in cardio-oncology: a scientific statement from the American Heart Association. *Circulation* 2021;**144**:e41–55.
10. Leszek P, Klotzka A, Bartuś S, Burchardt P, Czarnecka AM, Długosz-Danecka M *et al.* A practical approach to the 2022 ESC cardio-oncology guidelines: comments by a team of experts - cardiologists and oncologists. *Kardiol Pol* 2023;**81**:1047–63.
11. Leader A, Mendelson Cohen N, Afek S, Jaschek R, Frajman A, Itzhaki Ben Zadok O *et al.* Arterial thromboembolism in patients with AF and CHA(2)DS(2)-VASc score 0-2 with and without cancer. *JACC CardioOncol* 2023;**5**:174–85.
12. Rienstra M, Tzeis S, Bunting KV, Caso V, Crijns H, De Potter TJR *et al.* Spotlight on the 2024 ESC/EACTS management of atrial fibrillation guidelines: 10 novel key aspects. *Europace* 2024;**26**:euae298.
13. Kirchhof P, Camm AJ, Goette A, Brandes A, Eckardt L, Elvan A *et al.* Early rhythm-control therapy in patients with atrial fibrillation. *N Engl J Med* 2020;**383**:1305–16.
14. Park J, Shim J, Lee JM, Park JK, Heo J, Chang Y *et al.* Risks and benefits of early rhythm control in patients with acute strokes and atrial fibrillation: a multicenter, prospective, randomized study (the RAFAS trial). *J Am Heart Assoc* 2022;**11**:e023391.
15. Providencia R, Ali H, Creta A, Barra S, Kanagaratnam P, Schilling RJ *et al.* Catheter ablation for atrial fibrillation and impact on clinical outcomes. *Eur Heart J Open* 2024;**4**:oeae058.
16. Han S, Lee SR, Choi EK, Kim B, Han KD, Choi J *et al.* Early rhythm control of atrial fibrillation in cancer survivors: a nationwide population-based study. *J Am Heart Assoc* 2025;**14**:e040908.
17. Agarwal S, Munir MB, Krishan S, Yang EH, Barac A, Asad ZUA. Outcomes and readmissions in patients with cancer undergoing catheter ablation for atrial fibrillation. *Europace* 2023;**25**:euad263.
18. Costa TA, Felix N, Clemente M, Teixeira L, Braga MAP, Silva LTM. Safety and efficacy of catheter ablation for atrial fibrillation in cancer survivors: a systematic review and meta-analysis. *J Interv Card Electrophysiol* 2023;**67**:211–9.
19. Ganatra S, Abraham S, Kumar A, Parikh R, Patel R, Khadke S *et al.* Efficacy and safety of catheter ablation for atrial fibrillation in patients with history of cancer. *Cardio-oncology (London, England)* 2023;**9**:19.
20. Peng X, He L, Liu N, Ruan Y, Zhao X, Guo X *et al.* Outcome of cancer patients after atrial fibrillation ablation: insights from the China-AF registry. *Pacing Clin Electrophysiol* 2023;**46**:1419–29.
21. Tisdale JE, Wroblewski HA, Wall DS, Rieger KM, Hammoud ZT, Young JV *et al.* A randomized trial evaluating amiodarone for prevention of atrial fibrillation after pulmonary resection. *Ann Thorac Surg* 2009;**88**:886–93. discussion 94-5.
22. Denlinger CS, Carlson RW, Are M, Baker KS, Davis E, Edge SB *et al.* Survivorship: introduction and definition. Clinical practice guidelines in oncology. *J Natl Compr Canc Netw* 2014;**12**:34–45.
23. Khorana AA, Noble S, Lee AYY, Soff G, Meyer G, O'Connell C *et al.* Role of direct oral anticoagulants in the treatment of cancer-associated venous thromboembolism: guidance from the SSC of the ISTH. *J Thromb Haemost* 2018;**16**:1891–4.

24. Boriani G, Lee G, Parrini I, Lopez-Fernandez T, Lyon AR, Suter T *et al.* Anticoagulation in patients with atrial fibrillation and active cancer: an international survey on patient management. *Eur J Prev Cardiol* 2021;**28**:611–21.
25. 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. *Europace* 2022;**24**:2004–14.
26. D'Souza M, Carlson N, Fosbøl E, Lamberts M, Smedegaard L, Nielsen D *et al.* CHA(2)DS(2)-VASc score and risk of thromboembolism and bleeding in patients with atrial fibrillation and recent cancer. *Eur J Prev Cardiol* 2018;**25**:651–8.
27. Fradley MG, Ellenberg K, Alomar M, Swanson J, Kharod A, Nguyen ATH *et al.* Patterns of anticoagulation use in patients with cancer with atrial fibrillation and/or atrial flutter. *JACC CardioOncol* 2020;**2**:747–54.
28. Steffel J, Collins R, Antz M, Cornu P, Desteghe L, Haeusler KG *et al.* 2021 European Heart Rhythm Association practical guide on the use of non-vitamin K antagonist oral anticoagulants in patients with atrial fibrillation. *Europace* 2021;**23**:1612–76.
29. Kumar S, Yoon S, Milioglou I, Tashtish N, Farmakis I, Dallan LAP *et al.* Left atrial appendage closure outcomes in patients with cancer at a single tertiary center. *Am J Cardiol* 2023;**202**:176–81.
30. Zweiker D, Bergler-Klein J, Fiedler L, Toth GG, Achleitner R, Schratter A *et al.* Left atrial appendage closure in atrial fibrillation patients with cancer. *J Clin Med* 2024;**13**:6514.
31. Potpara T, Grygier M, Hausler KG, Nielsen-Kudsk JE, Berti S, Genovesi S *et al.* Practical guide on left atrial appendage closure for the non-implanting physician: an international consensus paper. *Europace* 2024;**26**:euae035.
32. Boriani G, Imberti JF, Asteggiano R, Ameri P, Mei DA, Farkowski M *et al.* Mobile/wearable digital devices for care of active cancer patients: a survey from the ESC council of cardio-oncology. *Eur Heart J Digit Health* 2025;**6**:162–9.
33. Faro JM, Yue KL, Singh A, Soni A, Ding EY, Shi Q *et al.* Wearable device use and technology preferences in cancer survivors with or at risk for atrial fibrillation. *Cardiovasc Digit Health J* 2022;**3**:S23–s7.
34. Bao Y, Lee J, Thakur U, Ramkumar S, Marwick TH. Atrial fibrillation in cancer survivors - a systematic review and meta-analysis. *Cardio-oncology (London, England)* 2023;**9**:29.
35. Brandes A, Stavrakis S, Freedman B, Antoniou S, Boriani G, Camm AJ *et al.* Consumer-led screening for atrial fibrillation: frontier review of the AF-SCREEN international collaboration. *Circulation* 2022;**146**:1461–74.
36. Merino JL, Tamargo J, Blomstrom-Lundqvist C, Boriani G, Crijns H, Dobrev D *et al.* Practical compendium of antiarrhythmic drugs: a clinical consensus statement of the European Heart Rhythm Association of the European Society of Cardiology. *Europace* 2025;**27**:euaf076.
37. Siemers LA, MacGillivray J, Andrade JG, Turgeon RD. Chronic amiodarone use and the risk of cancer: a systematic review and meta-analysis. *CJC Open* 2021;**3**:109–14.
38. Dickow J, Kany S, Roth Cardoso V, Ellinor PT, Gkoutos GV, Van Houten HK *et al.* Outcomes of early rhythm control therapy in patients with atrial fibrillation and a high comorbidity burden in large real-world cohorts. *Circ Arrhythm Electrophysiol* 2023;**16**:e011585.
39. Rillig A, Borof K, Breithardt G, Camm AJ, Crijns H, Goette A *et al.* Early rhythm control in patients with atrial fibrillation and high comorbidity burden. *Circulation* 2022;**146**:836–47.
40. Zhu W, Wu Z, Dong Y, Lip GYH, Liu C. Effectiveness of early rhythm control in improving clinical outcomes in patients with atrial fibrillation: a systematic review and meta-analysis. *BMC Med* 2022;**20**:340.
41. Hendriks JM, Lee G. Shared decision-making: the patient on the forefront of care coordination. *Eur Heart J Qual Care Clin Outcomes* 2020;**6**:231–3.
42. Farkowski MM, Scherr D, Boriani G, Kazakiewicz D, Haim M, Huculeci R *et al.* Arrhythmia care in ESC member countries: the 2025 ESC-EHRA atlas on heart rhythm disorders. *Europace* 2025;**27**:euaf124.
43. Tzeis S, Gerstenfeld EP, Kalman J, Saad EB, Sepehri Shamloo A, Andrade JG *et al.* 2024 European Heart Rhythm Association/Heart Rhythm Society/Asia Pacific Heart Rhythm Society/Latin American heart rhythm society expert consensus statement on catheter and surgical ablation of atrial fibrillation. *Europace* 2024;**26**:euae043.
44. Providencia R, Ali H, Barra S, Creta A, Kukendrarajah K, Kanagaratnam P, *et al.* Ablation of atrial fibrillation and risk of stroke: a meta-analysis. *Heart Rhythm* 2025;**19**:S1547-5271(25)02445-2.
45. Eitel C, Sciacca V, Bartels N, Saraei R, Fink T, Keelani A *et al.* Safety and efficacy of cryoballoon based pulmonary vein isolation in patients with atrial fibrillation and a history of cancer. *J Clin Med* 2021;**10**:3669.
46. Haq IU, Akhiyat N, Anan AR, Alzubi H, Kowlgi GN, Lee HC *et al.* Mediastinal radiation therapy for breast cancer in female patients is an independent risk factor for atrial fibrillation recurrence post-catheter ablation. *J Interv Card Electrophysiol* 2022;**65**:751–6.
47. Hashiguchi N, Schenker N, Rottner L, Reißmann B, Rillig A, Maurer T *et al.* Absence of detectable effect of radiotherapy and chemotherapy for breast cancer on the presence of low voltage areas in patients receiving left atrial catheter ablation. *Acta Cardiol* 2021;**76**:1061–8.
48. Farkowski MM, Ciszewski J, Maciąg A, Jasek S, Zastawna I, Jędrychowski T *et al.* A pilot study of high-density mapping of left atrial scarring in patients with a history of cancer treatment undergoing ablation of arrhythmia: the pilot OncoLA study. *Kardiol Pol* 2024;**82**:537–9.
49. Lopez-Fernandez T, Farmakis D, Ameri P, Asteggiano R, de Azambuja E, Aznar M *et al.* European society of cardiology core curriculum for cardio-oncology. *Eur J Heart Fail* 2024;**26**:754–71.
50. Fadol A, Lee G, Shelton V, Schadler KC, Younus AM, Stuart M *et al.* Nursing knowledge in cardio-oncology: results of an international learning needs-assessment survey. *Cardio-oncology (London, England)* 2025;**11**:4.