Physician's decisionmaking process in prescribing anticoagulants in frail, older patients : a comparison between Belgium and the Netherlands and between general practitioners and cardiologists

Vervoort Siemen, KU Leuven

Promotor: Prof. Dr. Bert Vaes, KU Leuven

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1. Abstract

1.1 Abstract in English

Background
In recent years, direct oral anticoagulants (DOACs) have become the go-to treatment for atrial fibrillation (AF), pulmonary embolism and deep vein thrombosis. In the frail population however, the risk of major bleeding is higher. Moreover, the superiority of DOACs over vitamin K antagonists (VKAs) has not been convincingly proven in this population. This study aims to analyse the decision-making process of healthcare practioners behind prescribing anticoagulants in the frail older population.

Methods
A survey was sent to health care practioners involved in the treatment of geriatric patients (General practioners, cardiologists and geriatricians) in Belgium and the Netherlands. This questionnaire contained questions about the respondent's demographics, anticoagulant management and elements influencing anticoagulant choice. A descriptive statitistical analysis was performed on these data, focusing on differences between general practioners and specialists and between Belgium and the Netherlands.

Results
A total of 355 healthcare professionals completed the survey. Overall, DOACs were the preferred anticoagulant for older and frail patients with atrial fibrillation. For patients aged >80 years, 95% of Belgian versus 88% of Dutch respondents preferred a DOAC ($p=0.002$), with similar findings for frail patients (95% vs. 88%, $p=0.020$). Most respondents agreed that evidence for DOAC use in frail patients remains limited (83% in both countries). Belgian healthcare professionals more frequently reported actively switching frail patients from VKAs to DOACs (65% vs. 26% of Dutch respondents, $p<0.001$). General practitioners more often considered frailty when prescribing anticoagulants than cardiologists (66% vs. 38%, $p=0.005$).

Conclusion
DOACs were still the number one anticoagulant in general. Even in the frail population this was the case. A significant portion of, mostly Belgian HCPs and cardiologists, still actively switch frail patients stable on VKA to DOACs. HCPs indicate the need for clear and practical guidelines regarding this topic. Further research is needed to provide said guidelines.

1.2 Abstract in het Nederlands

Achtergrond
Deze studie heeft als doel het denkproces van zorgverleners te analyseren bij het voorschrijven van anticoagulantia in de kwetsbare oudere populatie. In de afgelopen jaren zijn directe orale anticoagulantia (DOAC's) de voorkeursbehandeling geworden voor voorkamerfibrillatie, longembolie en diepe veneuze trombose. In de kwetsbare populatie is het risico op ernstige bloedingen echter hoger. De superioriteit van DOAC's ten opzichte van vitamine K-antagonisten (VKA's) is in deze populatie nog niet overtuigend aangetoond.

Methoden
Er werd een vragenlijst verspreid onder zorgverleners die betrokken zijn bij de behandeling van geriatrische patiënten (huisartsen, cardiologen en geriaters) in België en Nederland. De enquête bevatte vragen over de demografische kenmerken van de respondenten, het managen van anticoagulantiatherapie en factoren die de keuze voor een anticoagulans beïnvloeden. De verzamelde gegevens werden onderworpen aan een beschrijvende statistische analyse, waarbij de nadruk lag op verschillen tussen huisartsen en medisch specialisten, evenals tussen België en Nederland.

Resultaten
355 zorgverleners voltooiden de enquête. Over de hele lijn zijn DOAC's het voorkeursanticoagulans voor oudere en fraile patiënten met VKF. Bij patiënten ouder dan 80, verkiezen 95% van de Belgische tegenover 88% van de Nederlandse respondenten een DOAC. Exact hetzelfde resultaat werd bekomen voor fraile patiënten. De meeste respondenten (83% in beide landen) gaan akkoord dat de evidence rondom DOAC-gebruik in fraile patiënten eerder beperkt is. Belgische zorgverleners switchen meer actief van VKA naar DOAC tegenover Nederlandse zorgverleners (65% versus 26%, p <0,001). Huisartsen houden vaker rekening met frailty bij het voorschrijven van een anticoagulans dan cardiologen (66% versus 26%, p=0,005).

Conclusie
DOAC's bleven het voorkeursanticoagulans, ook bij kwetsbare oudere patiënten. Een aanzienlijk deel van de zorgverleners, voornamelijk Belgische artsen en cardiologen, gaf aan stabiele VKA-gebruikers actief om te schakelen naar een DOAC. Daarnaast bestaat er een duidelijke behoefte aan praktische richtlijnen, waarvoor verder onderzoek noodzakelijk is.

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2. Preface

Writing this master's thesis proved to be a demanding task and required more time and effort than I had initially anticipated. Combining this endeavour with my professional duties as a general practioner trainee, alongside seminars and coursework, was challenging. Without the support of several individuals, I would not have been able to complete this thesis. I therefore wish to express my sincere gratitude to them.

First and foremost, I would like to thank my supervisors, Prof. Dr. Bert Vaes (my promotor) and Prof. Dr. Fabienne Magdelijns, for their constructive feedback, patience, and encouraging guidance.

Secondly, I wish to express my appreciation to postdoctoral researcher Dr. Willem Raat for performing the statistical analysis used in this thesis, as well as his valuable feedback.

Thirdly, I would like to express my gratitude to Dr. Jasper Batselier (PHD researcher on the DOAC frail trial) for his valuable feedback.

I would also like to extend my thanks to all health care practitioners who completed the questionnaire.

Lastly, I would like to express my gratitude to my wife, Flore Helsen, for her patience and support throughout this demanding period.

3. Introduction

Population ageing is a widespread issue and presents numerous challenges. Over recent decades, the global population is growing exponentially and there is a relatively rapid increase in life expectancy (1). Demographic trends in Europe indicate that the proportion of older adults (aged 60 and above), by the year 2030, will rise to one in six of the total population, an increase of 35% compared with 2017 (2). An increase in life expectancy is accompanied by a higher likelihood of frailty. Frailty is observed in 3.9% of individuals aged 65 to 74, and in 25% of those aged 85 and older (3).

Frailty is a syndrome defined by a substantial decline across physiological and psychological systems, which results in an individual's decline in resistance to stressors. Patients with frailty are more susceptible to illness and complications. In individuals with cardiovascular diseases as well, frailty is associated with increased morbidity and mortality (3, 4).

In Belgium and the Netherlands, Direct Oral Anticoagulants (DOACs) have in recent years become the first-line therapy for conditions such as atrial fibrillation (AF), pulmonary embolism, and deep vein thrombosis (DVT). For newly diagnosed patients, DOACs are preferred over vitamin K antagonists (VKAs) in the non-frail population because they have been shown to carry a lower bleeding risk (5). Among frail patients, however, the risk of major bleeding is higher. One study reported a relative risk of 2.5 for both DOACs and VKAs (4). Belgian data indicate that DOACs are prescribed more frequently by cardiologists and to older patients overall (6).

Although DOACs are generally favored in clinical guidelines, evidence supporting their superiority in frail patients remains inconclusive, mostly because this population is underrepresented in major randomized trials (4). Instead, frailty is frequently inferred from proxy variables rather than assessed directly, for example, polypharmacy may be used as a surrogate measure for frailty (4). Although observational studies do address frailty in relation to anticoagulant effectiveness, such studies are susceptible to confounding bias. In clinical practice, physicians integrate numerous patient-specific factors when determining optimal treatment. Adequately adjusting for these in observational research is extremely challenging (4).

Cardiovascular diseases are associated with a higher prevalence of frailty. Screening for frailty before initiating anticoagulation therefore appears beneficial, particularly since such screening is relatively simple to perform (4). A recent randomized controlled trial (2024) demonstrated that DOACs may not be superior to VKAs regarding bleeding related complications. In this study, patients already receiving VKAs for AF were switched to a DOAC (7).

In a landmark nationwide Belgian cohort study covering 2013–2019, Grymonprez et al. (2023) investigated how the use of DOACs evolved across different patient groups and prescribing clinicians, providing valuable real-world insight into changing anticoagulation practices. Although the number of patients newly starting oral anticoagulation remained fairly stable over time, the overall use of anticoagulants

increased by almost one third. This rise was driven almost entirely by the rapid uptake of DOACs, which by 2019 accounted for approximately 92% of new prescriptions and 81% of all anticoagulant users. Apixaban became the most frequently prescribed agent, with edoxaban gaining ground as well (8). The study showed that older age, multimorbidity, higher frailty scores, and prescriptions issued by cardiologists were all independently associated with receiving a DOAC. In contrast, renal, hepatic, and vascular comorbidities, as well as female sex, were associated with lower odds of DOAC initiation. Notably, the widening gap in DOAC use between men and women, particularly among younger women in primary care, raises concerns about potential inequities in access or prescribing patterns. (8)

Seelig et al. (2020) provided a comparative analysis of anticoagulation practices between the Netherlands and Belgium using data from the multinational GARFIELD-AF registry. Despite comparable baseline characteristics such as age, sex distribution, and stroke and bleeding risk profiles, the two countries displayed divergent management strategies. Dutch patients were predominantly treated with vitamin K antagonists (roughly 72 %), reflecting a more conservative approach and a historically entrenched VKA monitoring infrastructure. In contrast, Belgian clinicians demonstrated earlier adoption of DOACs, which accounted for roughly two-thirds of initial anticoagulant prescriptions. The therapeutic intensity also differed: the mean international normalized ratio (INR) among VKA users was higher in the Netherlands (+/- 2.9) than in Belgium (+/- 2.4), consistent with national guidance favoring tighter anticoagulation control in Dutch practice. Over two years of follow-up, these strategic contrasts did not translate into statistically significant differences in mortality or thromboembolic outcomes, although major bleeding occurred somewhat more frequently (33% but numbers were low) in the Netherlands. These findings highlight how system-level factors shape anticoagulation patterns as much as individual patient risk (9).

These emerging insights have prompted our interest in the prescribing practices of physicians in the Netherlands and Belgium (general practitioners, geriatricians, and cardiologists) within this context. A systematic review (8) described the challenges clinicians face in adhering to guideline-recommended prescribing of oral anticoagulants for atrial fibrillation. Physicians often try to prevent stroke more than they try to prevent bleeding complications, particularly in complex cases encountered in primary care or in emergency departments (10). Prescribing behaviour is also influenced by subjective judgments regarding treatment adherence, the patient's social context, fear of causing harm, and evolving evidence. The review further highlights differences in prescribing practices between primary care and emergency settings: primary care physicians tend to consider social context to a greater extent, whereas secondary care clinicians more frequently focus on treating the medical condition itself without incorporating these contextual factors. This indicates a need for improved communication and coordination between primary and secondary care (10). Furthermore, a Danish literature review (11) argued for adjusting for prescriber types as a confounder (e.g. general practitioners vs specialists) in future research, or at least to be aware of it. These researchers also conducted a cohort study, in which they divided prescribers in three categories: general practioner (GP), hospital physicians and 'unknown'. These physicians treated patients with DOACs or warfarin. They performed a regression analysis to identify potential confounders on the association

between anticoagulant use and ischaemic stroke risk. They found that prescriber type was a risk factor for stroke, where hospital prescribers had a higher risk than GPs.

With the present study, we aim to deepen our understanding of these issues. Specifically, we seek to explore differences in anticoagulant prescribing practices between primary and secondary care and the differences between Belgium and the Netherlands.

4. Methods

Study design and participants

This cross-sectional study invited general practitioners, cardiologists, geriatricians, elderly care physicians, and physician assistants from the Netherlands and Belgium to complete an online questionnaire investigating their prescribing practices regarding oral anticoagulants in frail older patients. The survey was available in both Dutch and French and was distributed between April 2024 and January 2025. Participants were recruited through email invitations and newsletters distributed by the participating professional medical associations.

The study protocol was reviewed by the Medical Ethics Committee (METC) of Maastricht University Medical Centre+ (MUMC+). The committee concluded that, due to the observational nature of the study, the research did not fall within the scope of the Dutch Medical Research Involving Human Subjects Act (WMO) (METC number 2024-0052).

Questionnaire development and data collection

The questionnaire was developed by the research team using existing literature, previous research experience, clinical expertise, and findings from earlier DOAC-FRAIL studies. A secure web-based platform (Qualtrics XM) was used to design, distribute, and manage the questionnaire and the collected data.

The survey aimed to evaluate healthcare professionals' prescribing behaviour, management and monitoring of direct oral anticoagulants (DOACs), and their perceived knowledge of the available evidence and guideline recommendations regarding DOAC use in frail older patients.

Survey content

The questionnaire consisted of 27 items divided into three sections.

The first section included five questions addressing respondent demographics.

The second section comprised sixteen statements assessing prescribing behaviour and perceptions regarding anticoagulant therapy in frail older patients. Healthcare professionals rated each statement using a five-point Likert scale, with response options ranging from always to never or from strongly agree to strongly disagree, depending on the statement.

The third section contained six multiple-choice questions focusing on anticoagulant prescribing, particularly the use of DOACs in frail older patients. Three clinical case scenarios were included in this section to evaluate decision-making in everyday clinical practice. The complete case descriptions are provided in the Addendum (Section 9).

The questionnaire evaluated four main themes:

1. Factors influencing the choice of anticoagulant (DOAC, VKA, or LMWH)

2. Management strategies for DOAC therapy

3. The need for and use of DOAC plasma level measurements

4. Awareness of guideline recommendations and the available evidence regarding DOAC use in frail older patients.

Respondents were also given the opportunity to provide additional comments at the end of the questionnaire. (12)

STATISTICS

Questionnaires were collected in Qualtrics XM and exported to IBM Statistical Package for Social Sciences (SPSS) version 28 for analysis. Descriptive statistics were applied to all quantitative results. The open-text comments were analyzed, categorized and textually summarized. Pearson's Chi-squared test was used to check whether the differences between the chosen contrast groups were significant or not.

5. Results

Respondents demographics

In total, 355 health care practinioners (HCPs) filled out our survey. Most HCPs worked in a hospital (54.0%), followed by 24.2% working in general practice settings and 19.2% working in a nursing home. The respondents were geriatricians (26.2%), general practitioners (22.5%), elderly care phycicians (16.6%) and cardiologists (16.3%). The majority (49.3%) of the respondents fitted into the 30-44 years of age range. Work experience varied greatly among respondents (Table 1).

Table 1

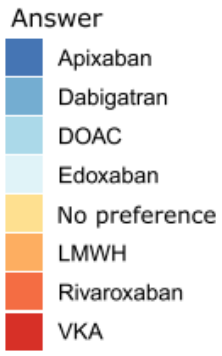
Respondents demographics: medical specialty, healthcare facility, age group and working experience

Medical specialty:	
Geriatrician	**93 (26.2%), in training 19 (5.4%)**
Cardiologist	**58 (16.3%), in training 10 (2.8%)**
Elderly care physician	**59 (16.6%), in training 16 (4.5%)**
General practitioner	**80 (22.5%), in training 5 (1.4%)**
Physician assistant	**10 (2.8%)**
Other**	**5 (1.4%)**
Healthcare facility:	
University hospital	58 (16.3%)
Peripheral hospital	134 (37.7%)
Nursing home	68 (19.2%)
General practice	86 (24.2%)
Other***	6 (1.7%)
Age group:	
25-29 years	32 (9.0%)
30-34 years	70 (19.7%)
35-39 years	66 (18.6%)

40-44 years	39 (11.0%)
45-49 years	30 (8.5%)
50-54 years	40 (11.3%)
55-59 years	34 (9.6%)
60-64 years	24 (6.8%)
65-70 years	10 (2.8%)
Other****	10 (2.8%)
Work experience:	
0-5 years	83 (23.4%)
6-10 years	83 (23.4%)
11-15 years	59 (16.6%)
≥ 16 years	129 (36.3%)
***** Gastroenterologist, cardiac surgeon and clinical pharmacologist***	
****** Private clinic and rehabilitation center***	
******* Age was not specified in additional remarks***	

Multiple choice questions

Regarding patients older than 80, healthcare professionals (HCPs) clearly showed a preference towards DOACs over VKAs.In Belgium, 95% of HCPs chose for DOACs, compared with 88% in the Netherlands (p-value 0,002) (Figure 1). A higher proportion of cardiologists (97%) preferred DOACs compared with general practitioners (91%) (p-value 0,165) (Figure 2). For patients scoring 5 or higher on the Clinical Frailty Scale, more Belgian (95%) than Dutch (88%) HCPs used a DOAC (p-value 0,02) (Figure 3). Cardiologists chose DOAC over VKA only in 2 percent of the cases more than general practitioners (p-value 0,743) (Figure 4). Nine percent more Belgian (92%) than Dutch (83%) HCPs believed DOACs have a lower bleeding risk than VKAs (p-value 0,014) (Figure 5). A higher percentage of general practitioners (15%) compared to cardiologists (7.6%) believed VKAs have a lower bleeding risk (p value 0,148) (Figure 6). Looking at which specific DOAC is the anticoagulation of choice in a frail older patient, Apixaban was the preferred DOAC for Dutch (66%) and Belgian (49%) HCPs (p-value <0,001) (Figure 7). Apixaban was the preferred DOAC as well for general practitioners (33%) and cardiologists (56%) (p-value 0,014) (Figure 8).



LEGEND FIGURES 1-8

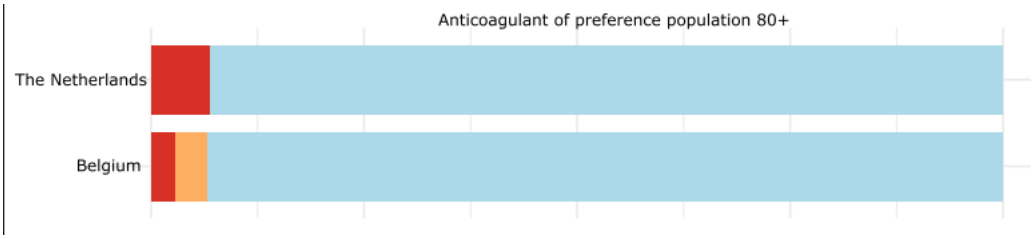


FIGURE 1

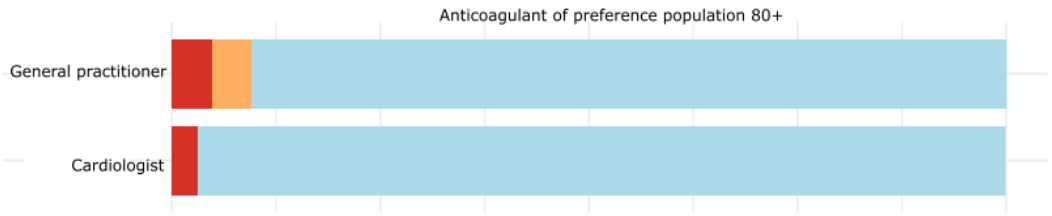


FIGURE 2

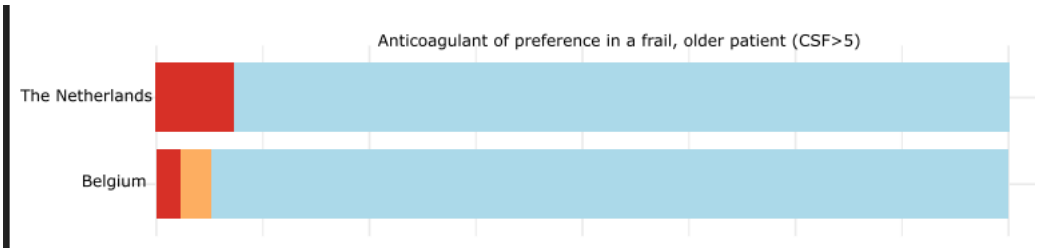


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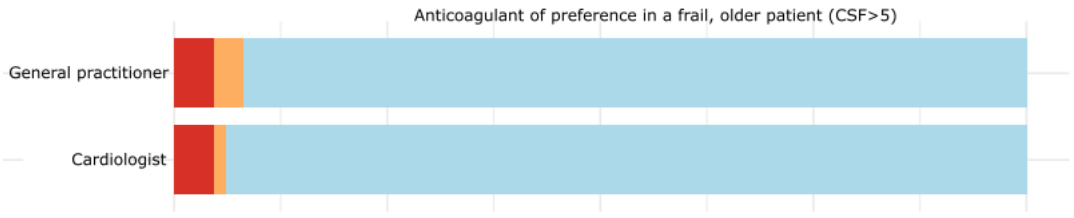


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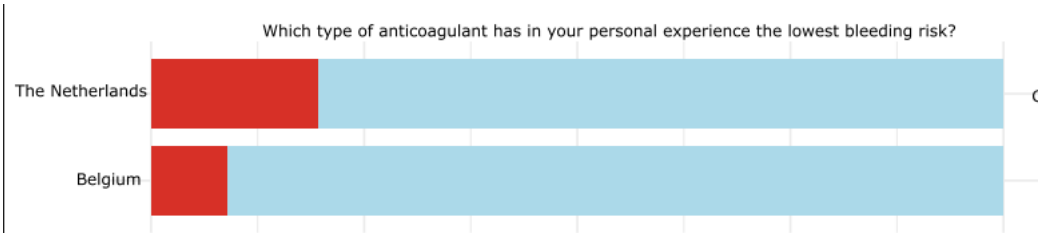


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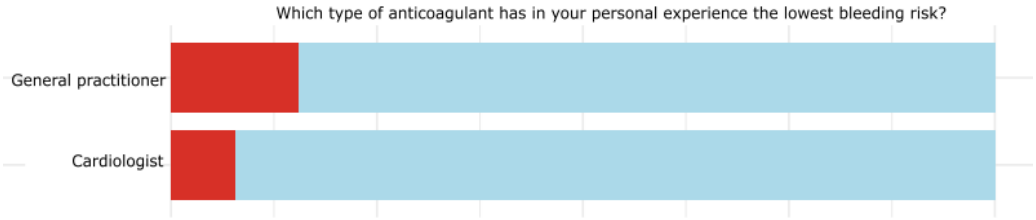


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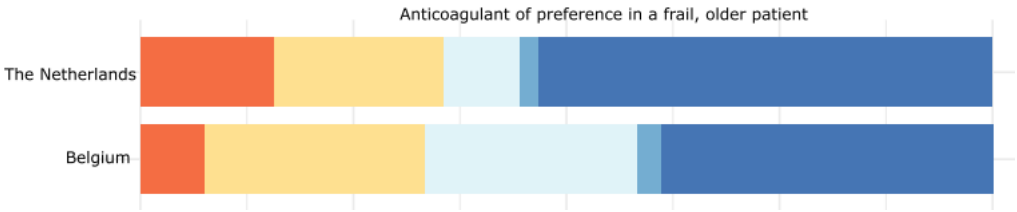


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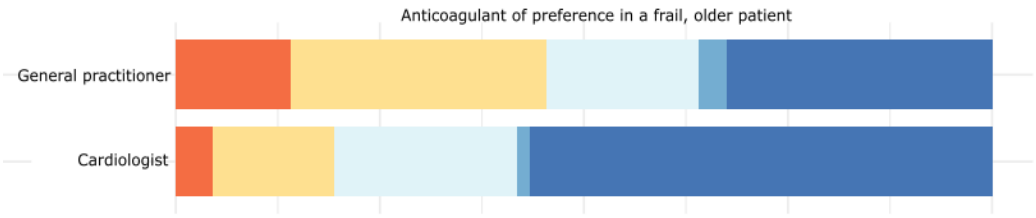


FIGURE 8

Agree/Disagree statements

A substantial portion of HCPs agreed that DOACs have a significant practical advantage over their VKA and LMWH counterparts (Belgian and Dutch HCPs 67%, general practitioners 84% and cardiologists 76%) (p-values respectively 0,934 and 0,461) (Figures 9 and 10). In contrast HCPs seemed to strongly agree that there is a lack of evidence regarding DOACs in the frail population, with 83% (41% agree + 42% strongly agree) agreeing Belgian HCPs and 83% (53% agree + 30 strongly agree) agreeing Dutch HCPs (Figure 11). Stratifying for specialty, 82% (37% agree + 45% strongly agree) of GPs agreed and 86% (60% agree + 26% strongly agree) of cardiologists agreed (p-value 0,072) (Figure 12). A significantly smaller portion of HCPs thought there should be a clear guideluine regarding DOACs in the frail population. In contrast to their responses recorded in figures 11 and 12, 56% (disagree 45% + strongly disagree 11%) of Belgian HCPs and 38,6% of Dutch HCPs (35%

disagree + 3,6% strongly disagree) disagree with the statement ‘there should be clearer guidelines regarding DOACs in the frail population’ (p-vale 0,002) (Figure 13) . Stratifying for specialty, showed 44,5% (41% disagree + 3,5% strongly disagree) disagreeing GPs and 53,4% (46% disagree + 7,4% strongly disagree) disagreeing cardiologists (p-value 0,176) (Figure 14).



LEGEND FIGURES 9-14

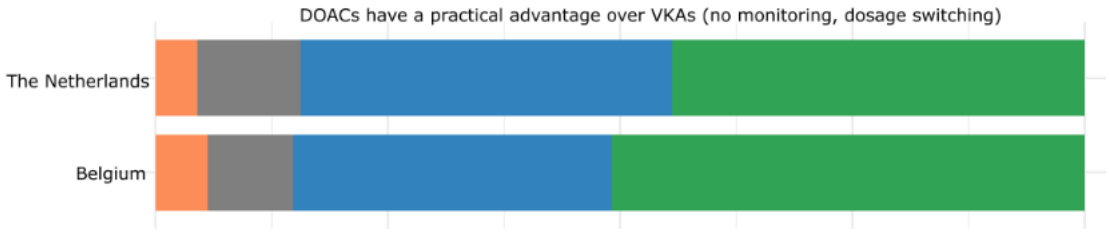


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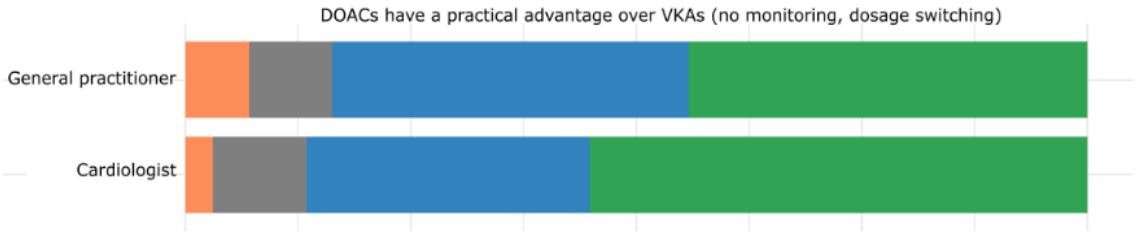


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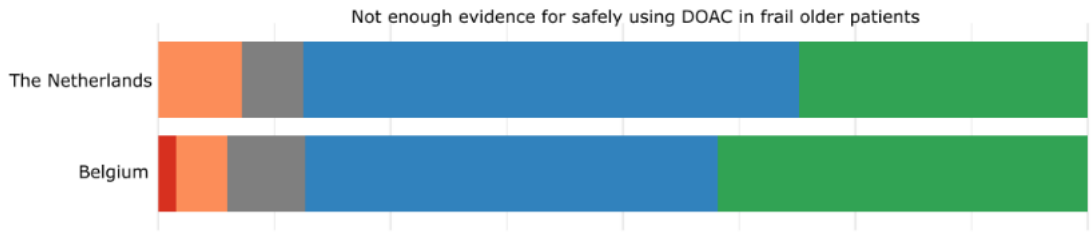


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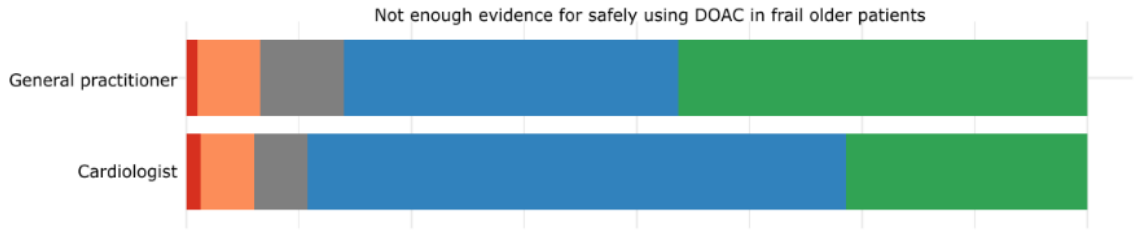


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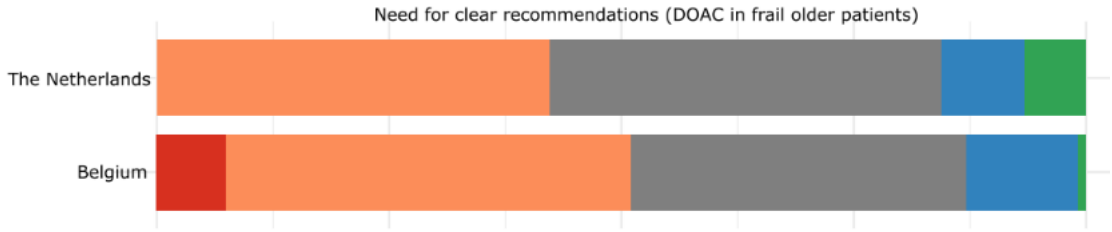


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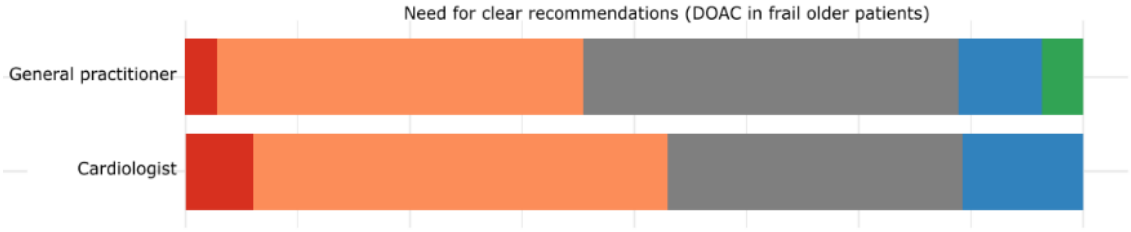


FIGURE 14

Case Questions

Case 1: 72 year old male with a medical history of rectumcarcinoma treated curatively, a gastric ulcer, Angina Pectoris (stable) and hypertensia. More Dutch respondents compared to Belgian respondents (20% vs 9,7%, p-value 0,009) would choose a VKA over a NOAC in this case (Figure 15).

Case 2: A 92 year old, frail (Clinical Frailty Scale 6), woman. In this case, in all 4 categories of respondents the proportion of VKA went up. Significantly more Dutch (32%) than Belgian (10%) HCPs (p-value<0,001) and more general practitioners (20%) than cardiologists (15%) (p-value 0,393) would treat with a VKA (Figures 17 and 18).

Case 3: An 82 year old man with a medical history of alcoholabusus, hypertension and recurring thrombophlebitis. Significantly more Belgian HCPs (46% vs 18%, p-value <0,001) and cardiologists (29% vs 14%, p-value 0,019) would switch to a DOAC in this case (Figures 19 and 20).



LEGEND FIGURES 15-20

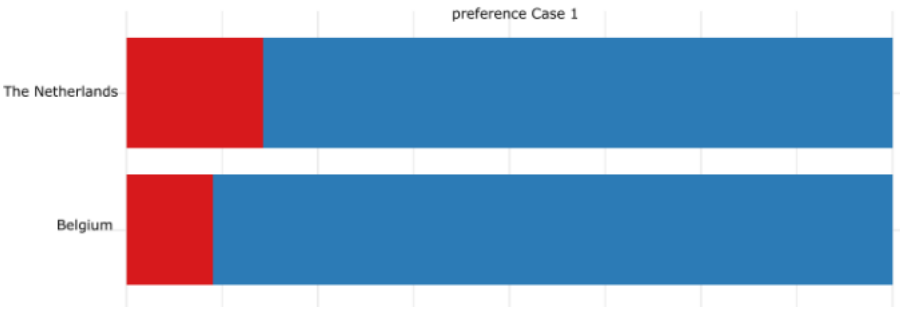


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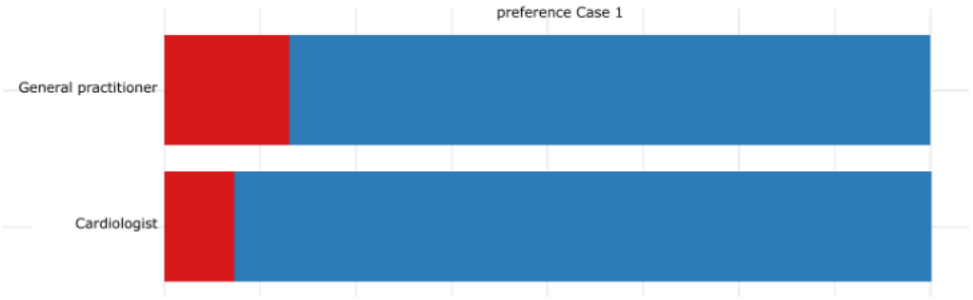


FIGURE 16

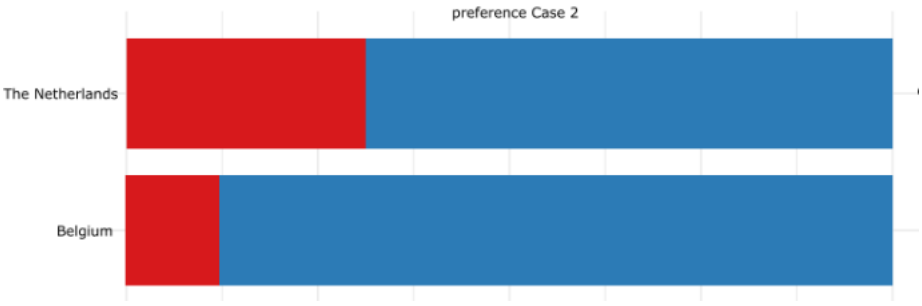


FIGURE 17



FIGURE 18



FIGURE 19

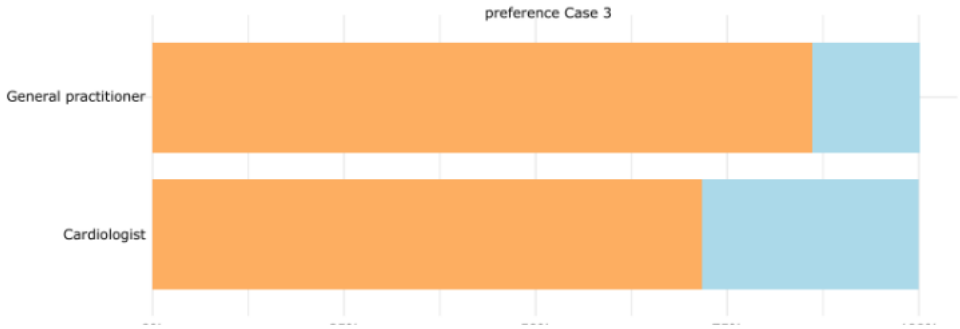


FIGURE 20

Frequency statements

All HCPs often prescribed DOACs in frail older patients (Belgian HCPs 74 %, Dutch HCPs 83%, general practitioners 70%, cardiologists 82%) (p-values respectively <0,001 and 0,810) (Figures 21 and 22).

The next couple of graphs show that an almost equal amount of Dutch and Belgian HCPs (Belgian often+always = 58% Dutch often+always = 56%) considered frailty in their decision which type of anticoagulant to prescribe (p-value 0,398). Significantly more general practitioners than cardiologists (GPs often + always =66%, cardiologists often + always = 38%) considered frailty in their prescribing decision making (p-value 0,005) (Figures 23 and 24).

When we just looked at the factor 'age', results were distributed in a more heterogenic way over all possible answers among all HCPs (Belgian, Dutch, GP, cardiologist). Significantly more general practitioners than cardiologists (GPs often + always = 45%

cardiologists often + always = 31%) factored in age in their anticoagulant decision making (p-value 0,002) (Figures 25 and 26).

Considering fall riks, we found no significant differences between Belgium and the Netherlands (p-value 0,235). Between cardiologists and general practitioners there was a significant difference, more specifically being that cardiologists took fall risk less into account (GPs often + always = 57% vs cardiologists often + always = 40%) (p-value 0,049) (Figures 27 and 28).

We did observe a considerable difference looking at whether or not HCPs actively switched therapy in frail patients from VKA to DOAC (Belgian HCPs often + always = 65% vs Dutch HCPs often + always=26,2%) (p-value <0,001). We noted almost equal results between general practitioners and cardiologists (p-value 0,810) (Figures 29 and 30).

A large proportion of HCPs seemed to trust in the DOAC blood level without monitoring, without a clear difference between HCPs (Neutral-often-always -> Belgium 88%, The Netherlands 89%, GPs 87%, cardiologists 89%) (p-values respectively 0,990 and 0,566) (Figures 31 and 32).

Looking at the last couple of graphs, we noted no significant differences between Dutch and Belgian HCPs concerning whether or not they would lower DOAC dosages regardless of renal function or weight (p-value 0,477). More cardiologists would never or rarely lower the dosage regardless of aforementioned factors than general practitioners (cardiologists 65 % vs GPs 55 %) (p-value 0,040) (Figures 33 and 34).



LEGEND FIGURES 21-34

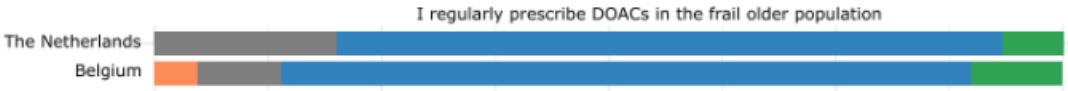


FIGURE 21



FIGURE 22

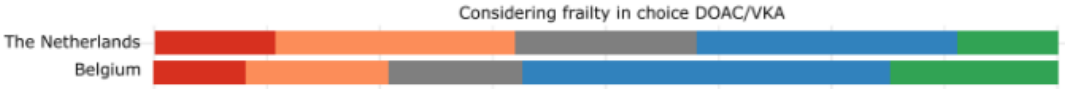


FIGURE 23

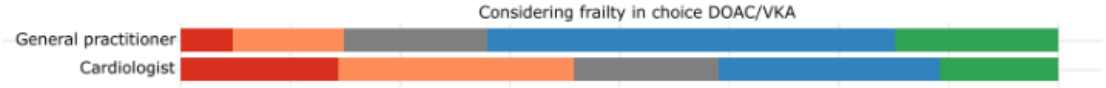


FIGURE 24

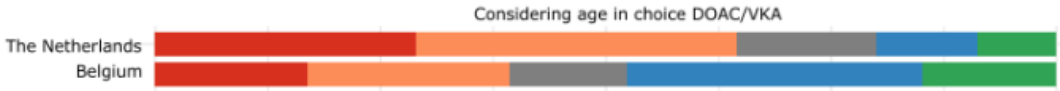


FIGURE 25

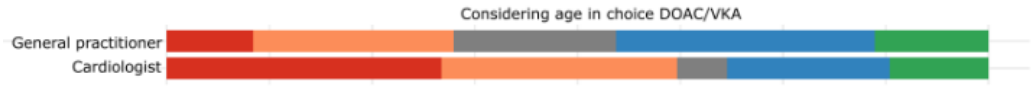


FIGURE 26

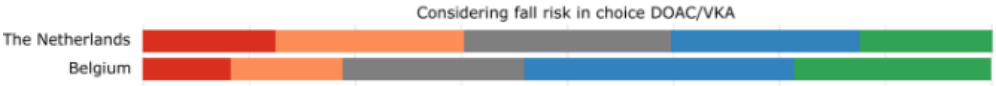


FIGURE 27

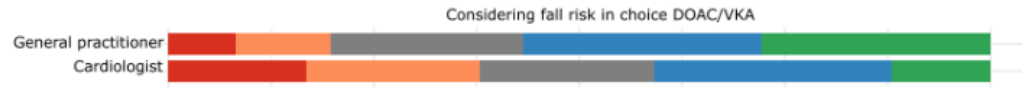


FIGURE 28

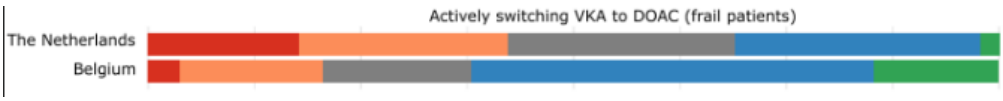


FIGURE 29

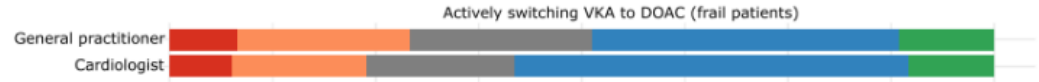


FIGURE 30

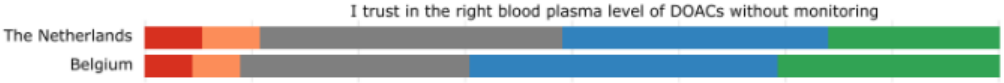


FIGURE 31

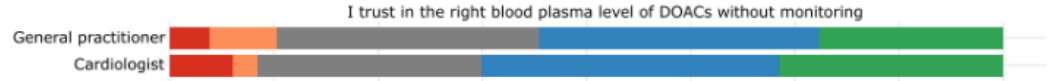


FIGURE 32

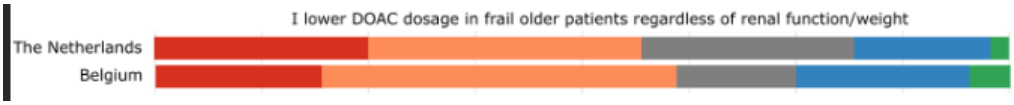


FIGURE 33

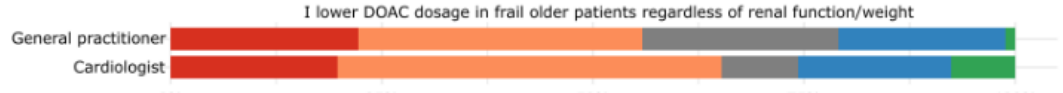


FIGURE 34

6. Discussion

The management of anticoagulation in frail older patients remains a complex clinical challenge, requiring healthcare professionals to balance the benefits of stroke prevention against the increased risk of bleeding while considering frailty, comorbidities, polypharmacy, and patient-specific characteristics. Although direct oral anticoagulants (DOACs) have become the preferred anticoagulants for most clinical indications because of their favourable efficacy, safety profile, and practical advantages, uncertainty persists regarding their optimal use in frail patients.

Previous research has demonstrated that effective stroke prevention in patients with atrial fibrillation can be achieved through different national treatment strategies, provided that anticoagulation intensity is adequately maintained and patients are appropriately monitored (8). Nevertheless, further research is warranted to strengthen the evidence base regarding the safe and effective use of anticoagulants in frail older patients. Although recent studies and updated guidelines have provided valuable direction, strong evidence and comprehensive recommendations for this vulnerable population remain limited. Expanding this evidence base will be essential to reduce variation in clinical practice, support evidence-based decision-making, and optimise anticoagulant therapy for frail older patients.

The most notable findings of this study were as follows:

1. Although DOACs were prescribed more frequently overall, Dutch physicians showed a greater tendency to prescribe VKAs than their Belgian counterparts. This pattern was observed both in the general population and, more specifically, in frail patients. Furthermore, cardiologists generally demonstrated a stronger preference for DOACs than general practitioners.

2. Physicians appeared to agree that the current evidence regarding the use of DOACs in frail patients remains limited, despite acknowledging the practical advantages of DOACs over VKAs.

3. Belgian healthcare professionals and cardiologists reported switching frail patients from VKAs to DOACs significantly more often than Dutch healthcare professionals and general practitioners, respectively.

As discussed previously, DOACs have become the anticoagulants of choice for numerous clinical indications. This preference is reflected in the survey results, which showed that DOACs were the most frequently prescribed anticoagulants, even among the frail population.

These findings are in line with previous observational studies showing increasing DOAC use in clinical practice and suggesting that DOACs are at least as effective as VKAs, with similar or improved safety outcomes in older patients with atrial fibrillation. However, evidence specifically concerning frail older adults remains limited, as frailty has often been assessed using proxy measures or subgroup analyses rather than as

a primary study population. The uncertainty reflected in the responses of healthcare professionals in this survey therefore mirrors the current evidence gap and underscores the need for high-quality studies specifically evaluating anticoagulant therapy in frail older adults.

The findings also indicate that healthcare professionals recognise the practical advantages of DOACs while acknowledging the limited evidence supporting their use in frail older patients. The observed differences in prescribing practices may partly be explained by the publication of the FRAIL-AF study (7) and the subsequent update of the European Association for Cardio-Thoracic Surgery guidelines, which recommend that frail patients with polypharmacy who are stable on VKA therapy should remain on a VKA rather than be switched to a DOAC. As these recommendations were published almost simultaneously with the distribution of the survey, their implementation in routine clinical practice was likely still evolving at the time of data collection. Changes in clinical practice often require time to become widely implemented (14,15). In this context, Dutch physicians appear to adhere more closely to these recommentdations.

Several factors may also account for the differences observed between general practitioners and cardiologists. Cardiologists typically manage patients with more complex cardiovascular conditions and a higher baseline risk, which may contribute to a greater preference for DOACs. In contrast, general practitioners generally have more frequent and longitudinal contact with their patients, allowing them to adopt a more holistic approach to care. Moreover, cardiologists have access to more advanced diagnostic modalities, such as echocardiography and Holter monitoring, which may influence treatment decisions and increase their willingness to prescribe therapies associated with a different balance of risks and benefits.

7.1 future perspectives

This study has provided new insights into the decision-making processes underlying anticoagulant prescribing in frail older patients. Overall, the findings confirm that DOACs remain the preferred anticoagulants among healthcare professionals for most clinical indications.

Previous research has demonstrated that effective stroke prevention in patients with atrial fibrillation can be achieved through different national treatment strategies, provided that anticoagulation intensity is adequately maintained and patients are appropriately monitored (8).

Until more robust evidence becomes available, physicians should continue to individualize anticoagulant therapy by carefully balancing thromboembolic and bleeding risks while incorporating frailty into clinical decision-making. The observed differences in prescribing preferences between Belgian and Dutch physicians do not necessarily indicate inappropriate practice, but they may reflect variations in national guidelines, healthcare systems, or interpretation of the available evidence. Nevertheless, reducing unwarranted practice variation through greater international consensus would be beneficial.

The results also highlight the importance of targeted education for healthcare professionals on the assessment of frailty and its implications for anticoagulant prescribing. Educational initiatives, together with practical decision-support tools, may increase clinicians' confidence in managing frail patients while awaiting more specific evidence-based recommendations. Future guideline updates should aim to provide clearer, practical guidance on anticoagulation in frail older adults to promote consistent and evidence-based care.

7.2 Strengths and limitations

The present study has several notable strengths. First, the questionnaire specifically focused on DOAC treatment in frail older patients and targeted a broad range of HCPs, including professionals working in university and general hospitals, nursing homes and general practice settings. Second, this study is part of the first study to offer insight into the use of DOAC level measurements in routine clinical practice by HCPs and to explore the need for tailored guidelines for the frail older population. A total of 355 HCPs completed the survey, a relatively large sample size. One limitation of the study is the inability to calculate the response rate due to several factors: (1) no data were available on the exact number of members who received the newsletter from the relevant professional associations, (2) HCPs may have received the survey through multiple associations, and (3) distribution of the survey via peer-to-peer channels was permitted. Another limitation may be the fact that a new guideline regarding this topic was almost simultaneously released as the survey was sent. Finally, the study design and survey distribution method may restrict the transferability of the findings to other healthcare systems beyond Belgium and the Netherlands(12).

7. Conclusion

In conclusion, this study throws light on the complex decisionmaking process HCPs go through while prescribing anticoagulants. DOACs are still the preferred anticoagulant, even in frail patients. A significant portion of HCPs still actively switches frail patients stable on VKA, to DOACs. HCPs consider many factors while prescribing anticoagulants, but a clear guideline remains required. Further research on this topic, seems necessary.

This study demonstrated that DOACs are the most frequently prescribed anticoagulants among both Belgian and Dutch healthcare professionals, including in the frail patient population. Nevertheless, significant differences in prescribing behaviour were observed between the two countries and between medical specialties. Dutch physicians reported prescribing vitamin K antagonists (VKAs) more frequently than their Belgian counterparts, particularly in frail patients, whereas cardiologists generally showed a stronger preference for DOACs than general practitioners. Furthermore, Belgian healthcare professionals and cardiologists reported switching frail patients from VKAs to DOACs significantly more often than Dutch healthcare professionals and general practitioners, respectively. These findings suggest that anticoagulant prescribing is influenced not only by the available scientific evidence, but also by national practice patterns, physician specialty, and the implementation of evolving clinical guidelines.

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9. Acknowledgements

Artificial intelligence has been used, in the form ChatGPT, as language assistant, to alter small parts of texts used.

10. Addendum

a. Cases

*Case 1: 72 year old male with a medical history of rectumcarcinoma treated curatively, a gastric ulcer, Angina Pectoris (stable) and hypertensia.
He recently got diagnosed with atrium fibrillation. We asked the respondents whether to treat
with a NOAC or VKA.

*Case 2: A 92 year old, frail (Clinical Frailty Scale 6), woman with a medical history of vascular dementia, type 2 diabetes, CNI 29/ml/min/1.73m².
After a recurring DVT of her right leg, she's eligible for anticoagult treatment.

*Case 3: An 82 year old man with a medical history of alcoholabusus, hypertensia and recurring thrombophlebitis. He gets treated with acenocoumarol for atriumfibrillation.
Because of general discomfort, one decides to switch treatment to a DOAC.
We asked respondents if they would switch treatment too.

b. Link to full questionnaire

https://maastrichtuniversity.eu.qualtrics.com/jfe/form/SV_6A0MEF3I4rJwGy2