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Challenges of Older Patients' Knowledge About Warfarin Therapy

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Abstract

Objective: To review the challenges of warfarin education for older patients (aged 65 years or older) in terms of knowledge, access to warfarin education, and education resources. Methods: A quasi-systematic review of the literature was performed via electronic database searches (eg, Medline, Embase, Cumulative Index to Nursing and Allied Health Literature, International Pharmaceutical Abstracts, Meditext, and Google Scholar) from 1990 to May 2011. Results: The 62 articles reviewed found that improved patient knowledge results in better anticoagulation control. The review also found that between 50% and 80% of older patients have inadequate knowledge about the basic aspects of warfarin therapy (eg, action, benefits and risks, interactions with other drugs or foods, international normalized ratio management). Demographic factors, such as advancing age, lower family income, and limited health literacy, were found to inversely affect patients' warfarin knowledge, and access to warfarin education and information resources were often suboptimal in different practice settings. Finally, a number of educational strategies and resources that could be readily incorporated to improve the effectiveness of current warfarin education programs were extracted from the review. Conclusion: This comprehensive review highlights that education about warfarin in older patients is currently suboptimal and may in part contribute to poor therapeutic outcomes. This review article also acknowledges the need to identify, target, and develop educational strategies and resources to further improve older patients' knowledge about their warfarin therapy.

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Abstract [Word count: 211, Limit 250]

Objective: To review the challenges in warfarin education for older patients (aged 65 years or more) in terms of knowledge, access to warfarin education and education resources.

Methods: A quasi-systematic review of the literature was performed via electronic database searches (e.g., Medline, Embase, CINAHL, International Pharmaceutical Abstracts (IPA), Meditext and Google Scholar) from 1990 to May 2011.

Results: The 62 articles reviewed found that improved patient knowledge results in better anticoagulation control, however between 50-80% of older patients have inadequate knowledge about the basic aspects of warfarin therapy (e.g., action, benefits and risks, interactions with drugs or foods, INR management). Demographic factors, such as advancing age, lower family income, limited health literacy, were found to inversely affect patients' warfarin knowledge and access to warfarin education and information resources was often suboptimal in different practice settings. Finally, a number of educational strategies and resources which could be readily incorporated to improve the effectiveness of current warfarin education programmes were extracted from the review.

Conclusion: This comprehensive review highlights that education about warfarin in older patients is currently suboptimal and may in part contribute to poor therapeutic outcomes. This review paper also acknowledges the need to identify, target and develop educational strategies and resources to improve older patients' knowledge about their warfarin therapy.

Keywords: warfarin, oral anticoagulant, patient education, patient counselling, medicine information, patient knowledge

Introduction [Word count: 4,935; Limit 5,000]

Warfarin is currently the most widely prescribed oral anticoagulant in the world.[1] Whilst alternative agents have recently become available for the management of thromboembolic complications, they are not without risks and are associated with significant treatment costs[1-3] which is why warfarin will remain a primary therapeutic option.[4] The continued use of warfarin is challenged by its complex pharmacology and inherent risk of adverse outcomes, which mandates that routine therapeutic drug monitoring is undertaken to ensure safe and effective therapy.[5-8]

Individuals most likely to benefit from warfarin therapy are generally older patients with chronic risk factors for thromboembolism requiring long-term or indefinite oral anticoagulation therapy (OAT), for instance in the management of atrial fibrillation.[9, 10] Despite abundant evidence to support its use, various studies have reported that warfarin therapy remains underutilised in this group of patients.[6, 7, 11-16] Some of the most frequently cited, barriers to warfarin use by physicians include uncertainty of patient compliance with monitoring, dietary implications and fear of hemorrhagic complications. Experts suggest that the use of oral anticoagulants can be promoted by increasing both patient and physician education about the potential barriers.[10]

Warfarin is a major contributor to potentially preventable drug-related adverse events,[17, 18] partly due to inadequate patient knowledge.[19] Older individuals are particularly at greater risk of experiencing serious adverse events from oral anticoagulation therapy, highlighting the critical balance between risk and benefit.[1] Clinicians have previously cited a reluctance to prescribe warfarin due to its impact on diet, drug interactions and need for monitoring,[16]

all of which relies on patient adherence and treatment instructions, and which is therefore dependent on effective patient education.[20, 21]

This paper cites important issues in the published literature relating to older patients' (aged 65 years or more) knowledge about warfarin and their access to warfarin education. It highlights the importance of older patients' knowledge about warfarin in relation to therapeutic outcomes; the level of their knowledge about warfarin therapy; the demographic factors which may influence their knowledge about warfarin; older patients' access to warfarin education in different practice settings, as well as education strategies and their impact on therapy outcomes.

Methods

Data sources

A 'quasi-systematic' review (i.e., a review that often attends to some details of a truly systematic review but misses the essential spirit of critical analysis[22]) of the recent literature regarding patient education about warfarin therapy was performed on the following electronic databases Medline via OvidSP (1950 - present), Embase (1966 - present), Cumulative Index to Nursing and Allied Health Literature-CINAHL via Ebsco (1982 - present), International Pharmaceutical Abstracts-IPA via OvidSP (1950 - present), Meditext via Informit online (1995 - present) and Google Scholar were searched to retrieve original articles, review papers and other publications. A time span of approximately 20 years (1990- May 2011) was selected because it was during this time that many pivotal studies relating to patient education, therapeutic benefits and economic analyses of warfarin use in different settings were conducted.[23-31] Being a quasi-systematic

review, the time was considered sufficient by the authors to include a comprehensive pool of contemporary publications.

Search strategies

A two-tiered search strategy was initially developed for the database searches. A generalised search was employed during Tier-1 using the keywords/MeSH headings 'warfarin' and 'oral anticoagulant'. More specific searches were then performed in Tier-2 using a number of relevant keywords/MeSH headings such as 'health information', 'medicine information', 'patient education', 'patient counseling', 'medication counseling' 'health education', 'patient information needs', 'information seeking behaviour', 'access to information', 'source of information', 'patient knowledge' and 'health knowledge'. Both 'warfarin' and 'oral anticoagulant' were used as search terms, however, only papers relating to warfarin were included for review. Other oral anticoagulants were not included in the review. The search was restricted to the English language, studies involving human subjects, patients aged 65 years or more, as well as original articles and review papers. In regard to the handling of review papers, which included both critical/narrative and systematic reviews, only the inferences drawn by the authors of the review were taken into account. Studies covering both simple and more complex interventions, e.g., information provision plus self-management were included in the review. Reference lists of papers included in this critical review were also searched for potentially missed articles. For all the selected papers, full texts were retrieved and were verified following the review objectives. The literature search, data extraction and evaluation were principally conducted by the research pharmacist. However, the review procedure was verified by two co-researchers to ensure the reliability and accuracy of the search process.

Results

Literature retrieval and characteristics of patient population

A total of 62 articles were reviewed and the relevant data extracted. A more detailed schematic representation of the article selection is indicated in **Figure 1.**

[insert Figure 1 here]

Within the 55 original patient intervention studies reviewed, 36 were conducted in community settings and the other 19 in hospital-based settings. A total of 14,541 older patients were identified as study participants, comprising 51.4% (n=7,470) from community settings and 48.6% (n=7,071) from hospital settings. Two studies pertaining to evaluations of patient information resources did not include human subjects but rather assessed warfarin information brochures only, hence these were not taken into account when calculating the total patient numbers.

Importance of knowledge about warfarin in relation to effective therapeutic outcomes

There is a general consensus in the literature that improved patient knowledge about warfarin therapy improves therapeutic outcomes.[8, 11, 32-41] Kagansky et al.[8] showed that older patients (N=323) with better knowledge about their warfarin therapy (measured by a non-validated warfarin knowledge-testing questionnaire) had 45% of their INR values within the therapeutic range, as compared with patients with poorer knowledge (35%); $p<0.001$. Tang et al.,[35] also reported a weak but positive correlation between patients' knowledge of warfarin therapy and the number of INR values that were within the target range ($p=0.024$). These findings were supported by another study[11], which reported that older patients (N=125) who possessed a better understanding of warfarin therapy spent about 70% of the time within the therapeutic INR range, as compared to those with a

poorer understanding (63%). The results of this latter study however, were not statistically significant, reflecting the large amount of variability (e.g., in concordance, and in perceived benefits and barriers of warfarin therapy) within each group and also possibly due to the limited number of patients included. Interestingly, evidence from other studies, such as Davis et al., (N=52),[42] The Newcastle Anticoagulation Study Group (N=242),[43] Arnsten et al., (N=132),[44] Fang et al. (N=179)[45] and Baker et al.,(N=260)[46] suggested no association between patients' warfarin knowledge and anticoagulation control. Results of these latter studies, however, cannot be generalised because of their use of small sample sizes,[42, 44, 45] retrospective and/or cross-sectional data evaluation techniques,[42-45] limited number of variables relating to patient knowledge measured[42] and use of non-standardised data collection techniques.[46]

Another important issue with regard to warfarin knowledge and therapeutic outcomes identified in this review was the inverse relationship between individual patient's level of knowledge about warfarin and the rate of adverse outcomes.[8, 35, 47-49] In relation to adverse events, specifically haemorrhage, Pernod et al's study[48] reported significantly less bleeding events (n=3, 1.9%) in the patients who had better knowledge about warfarin compared to those patients who had a poor level of knowledge (n=12, 8.5%); p=0.01. Similarly, Kagansky et al.,[8] found that the rate of major bleeding events was highest amongst patients who had poor knowledge about warfarin , reporting 5.2 bleeding events/1000 patient-months, compared to only 0.5 bleeding events/1000 patient-months among the patients who had satisfactory knowledge ($p<0.001$). Beyth et al.,[50] also showed the positive effects of patient knowledge in clinical outcomes, reporting a reduction in hospitalisations among patients receiving structured warfarin education compared to those

in a control group (3 versus 9 hospitalisations, respectively out of a total of 12 hospitalisations; p=0.08).

Deficiencies in patient knowledge about basic aspects of warfarin therapy

Evidence from the review suggests older patients' knowledge about their warfarin therapy is generally poor, with between 50-80% of patients having little knowledge about important basic aspects.[19, 34, 35, 37, 38, 42, 43, 47, 49, 51-57] It is important, however, to highlight that non-validated and purpose-built warfarin knowledge-testing instruments were used in many of the studies [37, 47, 49, 52, 54, 56, 58-60] when assessing patient knowledge about warfarin, unlike the recent studies conducted by Winans et al. (2010)[61] and Baker et al. (2011)[46].

A United Kingdom (UK) study[54] revealed that as many as 81% of patients (n=93) receiving warfarin therapy had no knowledge about its benefits with regard to the treatment of their medical condition. Further, evidence from this review indicates that between 45% and 70% of older patients on warfarin therapy had insufficient knowledge about the potential risks associated with their treatment.[49, 54, 58-60, 62] Other studies highlighted that only between 15% and 57% of the older patients knew their own INR targets or therapeutic ranges.[47, 54, 63] Also, Lane et al.,[54] found that approximately 63% of them were unaware of factors such as other medications and diet, which could affect their INR levels.

This review also found that older patients' knowledge about potential drug/food interactions with warfarin was poor, with as many as 60-80% of the patients being unaware that such interactions could occur.[37, 42, 47, 63] Notably, between 22% and 49% of

older patients receiving warfarin therapy were unaware of the restrictions of alcohol use required when taking warfarin.[49, 52, 56]

Interestingly, Baker et al.,[46] in a single centre, cross-sectional study showed that 74% (N=185) of patients receiving long-term warfarin therapy had achieved a good warfarin knowledge score (78%) based on the validated 29-point Anticoagulation Knowledge Assessment (AKA) instrument. They did however, suggest that the score may have been inflated because of the self-completed questionnaire completed at home with possible assistance from others.

Demographic factors influencing patients' knowledge about warfarin

According to the evidence in this review, it appears that increasing age negatively impacts upon both knowledge about warfarin therapy[35, 47] and the retention of warfarin information over time.[36, 64] In their study, Tang et al.,[35] found that the mean warfarin knowledge scores (out of a possible total score of 1.0) declined with advancing age; <65 years olds scored 0.47; 65-74 year olds scored 0.44; and >75year olds scored 0.39. Similarly, McCabe et al.,[47] found that patients aged between 65-74 years had knowledge scores of 26.6 (out of a possible 50), as compared to 19.1 for those aged between 75-94 years; p=0.001.

Unlike gender, which was not found to influence patients' knowledge about their warfarin therapy,[34, 35, 47] various socio-demographic factors such as lower family income, limited health literacy, unemployment status and lower education levels appeared to negatively influence patients' knowledge.[34, 35, 45, 47, 53, 58-60, 65, 66] Hu et al.[34], reported that patients who had an annual family income of less than US$25,000 achieved significantly lower

knowledge scores compared to patients who had higher family incomes (knowledge score 13.1 vs. 14.7 out of a total of 20; p=0.007).

There is very limited data regarding the influence of ethnicity on knowledge about warfarin. A small number of studies[59, 60, 66] highlighted that knowledge about warfarin is suboptimal among ethnic patients who are immigrants in English-speaking countries; however, older age and low educational status (contributing to low health literacy) appear to be more significant influences on knowledge than ethnicity per se in these patients. A key issue arising from studies involving ethnically diverse patient groups is a perceived lack of engagement in decision-making processes regarding warfarin therapy because patients are unable to fully comprehend the information (due to language barriers) provided verbally during health consultations.[59, 66]

Access to warfarin education for patients in different clinical practice settings

The review found that provision of warfarin education and/or information in both community and hospital settings was inadequate, i.e., a small proportion of patients received warfarin education[8, 19, 35, 67] or unsatisfactory warfarin education (i.e., a lack of appropriate information or a lack of clarity of the information) for those older patients who had received information about warfarin.[8, 53]

Access to warfarin education for patients in the community settings

Overall, the provision of warfarin education for patients in community settings is generally considered to be inadequate in terms of accessibility to both information sources and resources.[16, 35, 49, 52] This review found that the majority (between 45% to 88%) of older patients in community settings regarded their treating physicians as the main sources

of information about their warfarin therapy,[35, 52, 63] This is supported by a recent Australian study[18] which found that only 39% (n=36) of GPs considered that it was their responsibility to deliver warfarin education to their patients. The review also found that a comparatively small proportion of patients indicated pharmacists (0.8-27%)[17, 35, 52, 68] and nurses (1.6-50%)[35, 52, 68] as their major sources of information about warfarin therapy. This represents an underutilization of the available resources of warfarin educators because patients often have limited access to their GP, who may not have prioritised discussing warfarin therapy during their consultations times.[53]

Currently, many older patients in community settings are being treated by anticoagulation services, which provide a wide range of services such as INR monitoring, warfarin dosage adjustment and, supposedly, ongoing education about their warfarin therapy.[11, 35] Despite the common perception, that these patients receive superior education about their warfarin therapy,[60] between 17% and 35% of them still do not receive any education about basic aspects of their warfarin therapy.[49, 69]

Factors that may contribute to inadequate patient education for older patients about warfarin in the community setting include time constraints, availability of resources and cognitive decline in old age. Other factors are beyond the control of healthcare providers, such as: poor patient recall, learning difficulties of older patients due to age-related cognitive impairments and patient complacency may have contributed to information deficits in this setting or, for that matter, any other setting.[16, 60]

Access to warfarin education for hospital in-patients

This review also suggests that patient education about warfarin in the hospital setting is also inadequate.[16, 57, 69] Kagansky et al.,[8] and Cheah et al.,[19] identified that between 16% and 61% of hospital in-patients reported not having received any warfarin education during their hospital stay. On discharge from hospital, only 30-57% of patients reported having received any type of warfarin information from hospital-based health professionals (including doctors).[19, 70] Kagansky et al.,[8] found that only 21% of patients who received in-hospital warfarin education considered it to have been 'satisfactory'. The factors contributing to the satisfaction with the warfarin education were mostly related to the amount, content, clarity and usefulness of information provided to patients.[8, 67]

Education strategies for improving older patients' knowledge about warfarin

In recognition of the reported knowledge deficits, several structured and interventional education strategies (e.g., individualised face-to-face verbal consultations, group-based patient education and other) about warfarin have been evaluated and reported in the literature.[11, 38, 50, 54, 64, 67, 71] These strategies are described as follows:

Individual face-to-face patient education session

Interventions and strategies to improve the education of patients taking warfarin have, to date, largely focussed on providing individual face-to-face counselling by key healthcare professionals within their respective practice settings, e.g., GPs counselling patients in their surgeries or community pharmacists counselling their customers in their pharmacies.[35, 48, 54, 67] This mode of education is most often used because it is convenient, easy to deliver and allows the educator to target the patient's individual needs.[36, 38, 71]

Group-based warfarin education session

In resource-limited and time-poor health care systems and environments, e.g., anticoagulation clinics and hospital settings, where provision of individual face-to-face education sessions is difficult, practical and sustainable alternative modes of education may be considered. These alternative modes may include group-based sessions, rather than individual-based sessions, as well as the use of pre-recorded information sessions, such as videos.[64, 71] Group-based education sessions have been successfully implemented in environments where it is feasible to convene a group of patients, such as in a hospital and/or in anticoagulation clinics.[11, 38, 71] In addition to the time-saving advantage of group-based education approaches, other advantages include patient-peer support and the opportunity to learn from their peers about alternative aspects of their therapy.[16] However, it is also important to consider the limitations of group-based education sessions which include the difficulty in scheduling the group session and inability to meet individual information needs.[71]

Written information for warfarin education

The review identified that written warfarin information resources, available as both printed materials and via the internet, could not be read or understood by between 50% to 88% of the older patient population.[58, 72] Bajorek et al.,[16] further reported that both health professionals and patients perceived existing written information materials to be suboptimal in terms of content regarding day-to-day warfarin management issues, e.g., interactions with other drugs or foods. Given the suboptimal nature of existing warfarin-related written information materials,[16] various strategies have been suggested in the reviewed literature to improve the comprehensibility and usability of these materials.

The use of specially designed written materials that contain relevant figures or images, pictograms, larger font or page size and other formatting elements which could improve the comprehensibility of written materials, especially for older patients, have all been proposed in the literature.[35, 48, 72] The use of cue cards that contain short but important pieces of information was similarly suggested.[55] This approach may help deliver lengthy and time-consuming information more efficiently and may also provide patients with ample time to process the information during an education session.[16, 55] Although these could help in tailoring written materials for older patients receiving warfarin therapy, to date, no information about the practical uses of these different strategies has been found in the literature.

Audiovisual resources for warfarin education

Audiovisual media that portray the healthcare professional 'talking' to the patient about their warfarin therapy are sometimes used as a lateral extension of conventional patient education interventions.[64] This pre-recorded, multi-media face-to-face counselling disseminates information to patients in any treatment setting, including their own homes. As an added advantage, this mode of patient education can be repeated at the patient's convenience without burdening the healthcare professional. The flexibility and resource-efficiency offered by this approach is obvious.[64] The wider use of video-based patient education resources may be restricted by the need for specific equipment to play the videos/DVDs and/or operational skills, suggesting the need for exploring other audiovisual media such as public television (given its effectiveness in other areas of medicine).[16, 64] The potential of this media as a resource is acknowledged in an Australian study,[16] where healthcare professionals involved in the management of warfarin therapy

recommended the use of television campaigns for educating patients, particularly regarding the prevalent misconceptions regarding warfarin therapy.

Basic aspects in warfarin education programmes

Integral to effective warfarin education programmes is the inclusion of a minimum set of basic aspects targeting patient knowledge and understanding about warfarin therapy, irrespective of who is providing the education (e.g. doctor, pharmacist, nurse).[71, 73] These basic aspects include: the name of the medicine, mode of action, adverse events, interactions with other drugs or foods, issues related to INR monitoring, the importance of good adherence, lifestyle behavioural adjustments and managing emergency situations such as missed or under/over doses and recognising signs of bleeding complications.[11, 35, 38, 48, 50, 54, 67, 71] Importantly, while some of the reviewed education programmes have included a majority of these aspects,[38, 48, 67] others focused primarily on just a few.[35, 50, 71] In most cases, the selection and inclusion of the basic information about warfarin within patient education programmes was primarily decided by the healthcare personnel providing the education.[35, 50, 64, 67, 71] It is noteworthy that generally the selection and inclusion of the basic aspects of warfarin within the education programmes is inconsistent and varies from one program to another.

Effects of education interventions on the level of control of therapy and outcomes by improving patient knowledge

Various interventions[11, 48, 54, 63, 64, 71] have been developed and trialled on patients in order to evaluate their impact on the level of control of therapy and outcomes through improved warfarin education for patients. In a UK-based study,[54] patients who received a structured education session had significant knowledge gains particularly regarding understanding

INR targets (67% patients vs. 56% at baseline, p=0.001) and factors affecting INR values (58% patients vs. 37% at baseline, p=0.014) when compared with their baseline knowledge status. In this study, patients from an anticoagulation clinic received individualised, face-to-face education from their treating doctors along with a purpose-designed warfarin booklet. Further, in a multi-centre study,[48] patients from both community and hospital settings who received a specifically-designed individualised education programme (including face-to-face verbal consultation from members of a multidisciplinary team, a picture book describing the disease and treatment and a specific booklet summarizing the information) achieved higher mean warfarin knowledge scores (13.9 out of a total score of 20), when compared to the control group (mean score 12.4), who received unstructured warfarin counselling sessions(p=0.08). The latter study[48] also reported a statistically significant (p<0.01) cumulative risk reduction in major bleeding events in the experimental group who had received warfarin education.

In a United States (USA)-based study,[71] 180 anticoagulation, clinic-based patients were educated in groups of 15 by either a pharmacist or a nurse via an hour-long slide presentation. The study showed that significantly more patients had better knowledge about the important aspects of warfarin therapy after the intervention, particularly about the importance of the INR test (91% patients vs. 36% at baseline; p<0.001) and effects of vitamin K on the therapy (96% patients vs. 49% at baseline; p<0.001), as compared to their baseline knowledge about warfarin. Further, Khan et al.,[11] demonstrated a significant decline in the INR SD (standard deviation) by 0.26 (p<0.0001) in the group receiving education alone, 0.24 (p<0.0001) in the group allocated to education and self-monitoring, and 0.16 (p=0.003) in the control group who had received usual care. However, intergroup comparisons showed no statistically significant difference in the decline of INR SD

(intervention groups 0.25 vs. control group 0.16; p=0.12), which may be because of firstly, the large amount of variability within each group (e.g., in concordance and in perceived benefits and barriers of warfarin therapy) and secondly, possibly due to the limited number of patients that were studied.

Mazor et al.,[64] showed that 317 intervention patients (56% of whom were aged 65 years and older) who received and watched mailed copies of videos in their homes, depicting a virtual face-to-face patient education session about warfarin management (unknown length and duration), had significant knowledge gains measured by knowledge-testing questionnaires (68% correct answers of the total 22 questions) when compared to the control group (57% correct answers; $p<0.001$) who received the usual, unstructured education.

Discussion

The main focus of this review paper was to highlight the level of, and access to, warfarin education/information and the effects of existing warfarin education interventions on patient knowledge and therapeutic outcomes.

The complexity of warfarin therapy is such that the patients' command of anticoagulation-related knowledge is a very important component in maintaining optimal control of the therapy and reducing related adverse events.[74] This review highlights that a significant proportion of older patients have deficits in their knowledge regarding warfarin, although it is generally accepted that patients on warfarin therapy receive more comprehensive warfarin information from their health professionals when compared to patients taking other types of regular medications.[62] Nevertheless, the apparent lack of adequate

knowledge has considerable clinical importance as it diminishes therapeutic outcomes in OAT, especially in the more vulnerable, older patient population. Due to the use of non-validated and purpose-built knowledge testing tools reported in the reviewed literature, it is difficult to judge the actual prevalence of knowledge deficits among patients receiving warfarin therapy. Although two validated knowledge-testing tools[33, 75] have been identified in the literature, for reasons not stated, these have not been used in the reviewed articles, apart from being described as pilot studies. The authors suggest further investigation is warranted to determine the characteristics and actual prevalence of older patients' knowledge deficits about warfarin by using validated and standard knowledge-evaluation methods.

Patients' age[35, 47] and other demographic factors such as poor family income, limited health literacy, unemployment, lower education levels[34, 35, 45, 47, 53, 58-60, 65, 66] and, potentially, ethnicity to some extent[59, 60, 66] have been found to negatively impact on patient knowledge about warfarin. The provision of additional resources such as audiovisual/multimedia resources (when available), pictograms, drawings and/or cue cards, could also be recommended to help improve their warfarin knowledge and understanding. These flexible delivery resources can be used to address the information needs of individual patients in the comfort of their own homes.

On commencement of warfarin therapy, patients generally receive an unstructured, verbal education session from their healthcare provider, which includes the basic aspects of their warfarin therapy.[38] In some circumstances, patients who are keen may also seek additional information from various other readily available sources, e.g., community pharmacist, nurses, the internet.[34, 35] This review, however, highlights the current lack of access or

availability of suitable warfarin education and/or information resources in both community and hospital settings. In addition, an underutilisation of the available resources of warfarin education by patients is also apparent in this review. Inadequate provision of warfarin education in the hospital settings is a concern since a large proportion of patients commence warfarin therapy in hospitals and are at a tenfold risk of bleeding within the first month of therapy, post-discharge.[19] Lack of inadequate access to warfarin education is a major concern for older patients who are prescribed warfarin therapy for chronic conditions such as atrial fibrillation, given their susceptibility to warfarin-related adverse events which are further potentiated by poor knowledge about their warfarin therapy.[16] It is, therefore, imperative that older patients in particular should be provided with appropriate warfarin education and/or information sessions, reinforcement and follow-up[76, 77] to ensure that they retain the information provided.[36, 64]

The time or resource constraints of healthcare providers, which have the potential to impact upon the availability and the quality of education provided,[17, 18, 21] are real and are often cited as a major barrier to patient education in the busy treatment settings (e.g., hospitals) of many developed countries such as Australia and the USA.[78] For other developed countries (e.g., European countries), the resource implications and needs may be different, however this review's exclusion criteria (i.e., non-English language) may have precluded access to this relevant information. A multidisciplinary approach inclusive of pharmacists, nurses, and dieticians could be helpful in educating patients about their warfarin therapy in the busy treatment settings.[17]

For warfarin education to be effective it is generally agreed by patients and/or their carers that both verbal and written patient information are equally important.[16] Interestingly,

even though this review highlighted the importance of providing simple and easy to read written information about warfarin, which to date appears to be generally unavailable, it did not identify any findings about the use of appropriate verbal communications skills when speaking to older patients. Given that evidence from other research[79-81] has emphasized that effective verbal communication between health practitioners and patients can be achieved by incorporating simple strategies such as using simple language, speaking slowly, repeating and reinforcing key points by incorporating the 'teach-back' method, whereby the patient is asked to repeat back what they have heard and what it means to them and encouraging them to ask questions and not to give too many directives which may overwhelm them. It seems that this would be an important area for future research, especially with regard to incorporating such strategies into effective education programmes.

The review found that both individual and group-based education sessions could effectively educate older patients**.** Given the need to offer older patients reinforcement and follow-up, offering group-based education in addition to individual education would be beneficial, particularly in resource-poor settings, such as hospital settings. In the reviewed literature, methodological issues arose relating to the design and mode of implementation of educational interventions which will require improvements. Also, given the wide variability of basic aspects, e.g., action, benefits and risks, interactions with other drugs or foods and INR management, in the existing education programmes, it is important to ensure that these aspects are carefully selected and included in future education programmes in order to inform older patients more effectively and appropriately.

The review encounters several limitations. Although every effort was made to include a comprehensive pool of relevant literature, the quasi-systematic review method may have excluded some potential papers from being included and the exclusion of non-English language papers may also have been a limitation. Further, following from the objectives of the review, other important issues relevant to anticoagulation management, e.g., self-management or monitoring by patients, medication adherence and anticoagulation control, have only been either discussed very briefly or excluded to keep focus on the scope of the review.

Practice Implications

Patient education and relevant resources are currently applied in an ad hoc manner in all facets of education about warfarin. It is, however, timely and important now to identify, target and develop (where appropriate) effective educational materials and resources and to incorporate them into an educational strategy that improves knowledge and therapeutic outcomes in warfarin therapy, especially amongst the older patient population. Based on the literature reviewed, a number of practice points have been outlined (**Box 1**), to help practitioners improve the education of older persons about their warfarin.

[insert Box 1 here]

Conclusion

Overall, older patients' knowledge about the basic aspects of warfarin therapy is inadequate, which is compounded by limited access to existing warfarin education services in both community and hospital settings. The provision of more structured warfarin education (both individual and group sessions) with additional resources, such as web-based audio-visual aides, could be used to improve warfarin knowledge and understanding amongst older patients.

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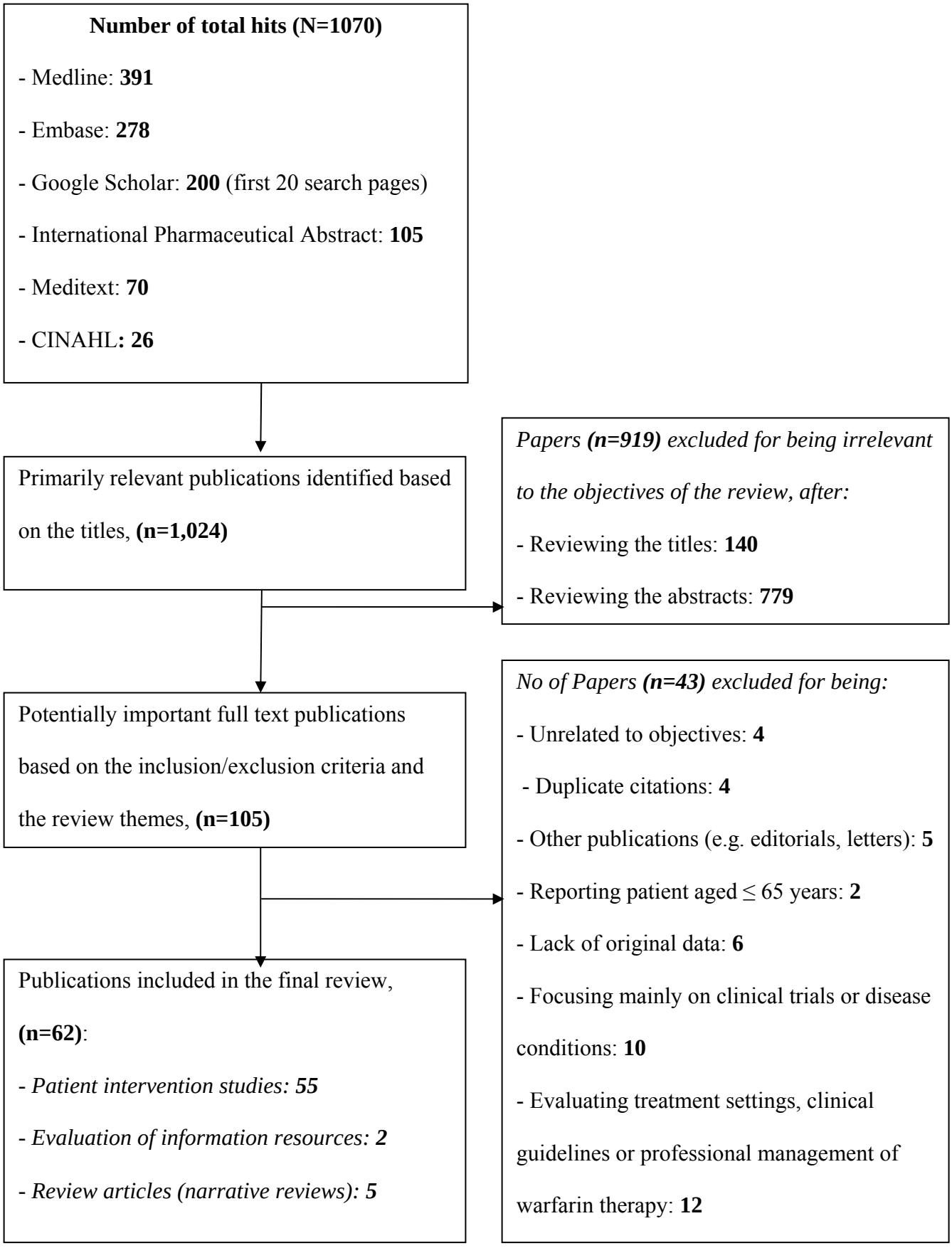
Figure 1: Schematic presentation for the selection of potential articles included in the review



Box 1: Potential practice points that may help practitioners improve the education of older patients about warfarin

- Socio-demographic factors, which can negatively impact on warfarin knowledge and understanding, need to be taken into consideration when developing warfarin education programmes. These factors include older patients, low income, unemployment status, low education levels, poor health literacy skills and, possibly, ethnicity.

- Provision of adequate and appropriate warfarin education services to patients may require coordinated efforts from all health professionals, e.g., doctors, pharmacists, nurses, to ensure that patient education is provided consistently and in a structured format. Also, all patients commenced on warfarin therapy, in particular hospital in-patients, should have access to follow-up services within the community.

- Warfarin education programmes, both individual and group-based), need to be comprehensive and systematically cover the key aspects of warfarin therapy. These key aspects should consist of; name of the medicine, purpose of the therapy (including the risks versus benefits), mode of action, adverse events, interactions with other drugs or foods, issues related to INR monitoring, the importance of good adherence, lifestyle behavioural adjustments and management of emergency situations, e.g., missed or under/over doses and recognising signs of bleeding complications.

- Warfarin education resources may be most effective when they include simple and easy to understand written information, taking into account readability of the information, as well as presentation, as a supplement to verbal counselling, and purpose-designed additional communication tools such as cue cards, audiovisual resources depicting real-life scenarios and/or socio-culturally appropriate images/figures, e.g., pictograms/drawings, video tapes/DVDs, online videos, podcasts, television programmes, internet sites.