

Original Research

# Health literacy and knowledge in a cohort of Australian patients taking warfarin

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Received (first version): 2-Aug-2017

Accepted: 17-Feb-2018

Published online: 24-Mar-2018

## Abstract

**Objectives:** To 1) characterise older patients taking warfarin, 2) assess these patients' level of warfarin knowledge, and 3) describe their strengths and limitations in health literacy, and 4) explore relationships between participants' characteristics, warfarin knowledge and health literacy.

**Methods:** A warfarin knowledge questionnaire and Health Literacy Questionnaire (HLQ) were administered to older patients (aged >65 years, N=34) taking warfarin in an Australian general practice setting.

**Results:** Key gaps in participant knowledge pertained to the consequences of an international normalized ratio (INR) being below the target INR range and safety issues such as when to seek medical attention. A limitation for participants with a lower level of health literacy was the ability to appraise health information. Patients who needed assistance in completing the HLQs had significantly lower warfarin knowledge scores ( $p=0.03$ ). Overseas-born participants and those taking 5 or more long-term medications had lower HLQ scores for specific scales ( $p<0.05$ ).

**Conclusion:** In this study warfarin knowledge gaps and a limitation of health literacy amongst a small sample of older patients were identified. The findings suggest that education and resources may need to be tailored to the needs of older patients taking warfarin and their carers to address these knowledge gaps and limitations in health literacy. Patients who may need greater support include those that need assistance in completing the HLQ, are overseas-born, or are taking 5 or more long-term medications.

## Keywords

Patient Medication Knowledge; Warfarin; Aged; Health Literacy; Patient Education as Topic; Surveys and Questionnaires; Australia

## INTRODUCTION

As the use of oral anticoagulants continues to rise, more attention is being paid to how well patients are being supported in their management of these treatment regimens. This is particularly the case in older persons who are high users of these medications for long-term indications, including stroke prevention in atrial fibrillation.<sup>1,2</sup> Older people are vulnerable to experiencing harm from so-called 'high alert' medicines, such as warfarin (traditional anticoagulant).<sup>3</sup> Therefore, patient education regarding adverse effects (i.e., bleeding), dietary Vitamin K consumption, potential drug interactions, need for regular monitoring, and actions around missed doses, is paramount<sup>4</sup> especially during transitions of care between hospital and primary care settings.<sup>5</sup> Despite the advent of direct oral anticoagulants (DOACs), warfarin and warfarin education may still be needed in certain patient populations who are not good candidates for DOACs, such as those patients who have: mechanical heart valves<sup>6</sup>; a creatinine clearance of <30mL/minute (calculated by the Cockcroft-Gault equation); haemodialysis<sup>7</sup>; other specific contraindications; and/or who cannot afford the relatively higher costs of the newer agents (depending on the medication subsidies available in each country).<sup>8</sup>

The education of older persons regarding warfarin has, however, been suboptimal, contributing to poor therapeutic outcomes, such as sub- or supra-therapeutic INRs, adverse events (e.g., bleeds), or an increase in hospitalisations.<sup>9</sup> Educational challenges are more pronounced in older patients due to changing cognition, function, and psychological wellbeing, as well as lower health literacy.<sup>10,11</sup> Regarding the latter, the World Health Organisation (WHO) defines health literacy as 'the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health' and 'implies the achievement of a level of knowledge, personal skills and confidence to take action to improve personal and community health by changing personal lifestyles and living conditions'.<sup>12</sup> In Australia, almost 60% of adults (15 to 74 years) have low health literacy<sup>13</sup>, and it has been shown that older age is associated with lower health literacy scores.<sup>14</sup>

Health literacy has been recognized as a multi-dimensional concept and newer tools are now available to measure health literacy across several different domains.<sup>15</sup> In patients taking warfarin, low health literacy has been associated with deficits in warfarin knowledge.<sup>16</sup> Recognition of this is critical to developing effective educational interventions or resources to better support patients taking oral anticoagulants. To our knowledge in Australia, there have been no studies that have assessed both warfarin knowledge and the health literacy of older persons who are taking oral anticoagulants in a primary care setting. This is important given the increasing use of anticoagulation, and that warfarin therapy remains a

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primary therapy, despite the increasing availability of alternative agents.

Therefore, the objectives of this descriptive pilot study were to: (1) report the characteristics of older patients taking warfarin in the local Australian primary care setting; 2) assess these patients' level of knowledge about warfarin; 3) describe their strengths and limitations in health literacy, and 4) explore relationships between participants' characteristics, warfarin knowledge and health literacy.

## METHODS

### Study Design

A descriptive, questionnaire-based pilot study was conducted in an Australian general practice (primary care) setting between September 2015 and January 2016. Approval to conduct this study was granted by the Human Research Ethics Committee of the University of Technology of Sydney (Project number: 201 4000 863).

### Setting

A general practice medical centre in The Hills Shire (Greater Western Sydney, New South Wales, Australia) was the primary location for this study due to its ageing population<sup>17</sup> and therefore the high prevalence of warfarin users being treated for atrial fibrillation.

### Participants and recruitment

The study participants comprised older patients who were:

- ≥ 65 years of age
- taking warfarin therapy for a long-term indication (regardless of when the medication was initiated)
- cognitively intact (based on the clinician's confirmed assessment and knowledge of the patient during the screening process)
- able to communicate in English
- able to provide informed consent

For patients who were unable to fulfill the last three inclusion criteria, the primary carer who was responsible for managing their warfarin therapy was invited to participate instead. The carer was asked to complete the surveys based on their own knowledge and health literacy.

To recruit participants, the medical centre staff (5 general practitioners, and one on-site cardiologist) screened their electronic patient records to identify 87 potential participants (80 patients and 7 carers) that met study criteria. 36 participants agreed to participate in the study, however, 2 participants dropped out during the study due to a lack of time to complete the questionnaires and provide feedback. Fifty one participants declined to participate in the study. The target sample size was based on an estimate of the proportion of participants likely to attain correct answers to the brief warfarin knowledge questionnaire. Using a point-estimate of effect of 65% (proportion of patients likely to get at least half the answers correct<sup>18</sup>, with 90% confidence and 10% precision, the target sample size was 34 participants.

A medical receptionist then sent (via postal mail) each patient a generic letter informing them about the study and inviting them to contact the main researcher (AY). Non-responders received a once-only telephone call from the medical centre to follow up on the invitation (one week post first mail out). On contacting the researcher, the person's eligibility (per inclusion criteria) was confirmed and consent to participate in the study was obtained.

### Data collection

Data collection occurred during scheduled face-to-face appointments with the researcher at the medical centre, or via the telephone. A set of questionnaires was used:

- purpose-designed questionnaire to record participants' medical history, medication history, history of warfarin use, previous education received about warfarin
- customised brief Warfarin Knowledge Questionnaire
- Health Literacy Questionnaire (HLQ).<sup>19</sup>

### Warfarin Knowledge Questionnaire

To assess participants' knowledge about basic aspects of warfarin therapy, a brief customised 10-item questionnaire was developed. The questionnaire comprised a selection of open-ended and closed-ended questions (e.g., multiple choice answer-style questions), comprising nine questions used in previous studies<sup>20-22</sup> and one additional question (question 8) designed by the authors (online Appendix). This shorter customised questionnaire was used instead of others (e.g., Oral Anticoagulation Knowledge test (OAK), Anticoagulation Knowledge Assessment (AKA), Anticoagulation Knowledge Test (AKT)) to enable time-efficient knowledge assessment via a researcher-administered questionnaire, and to allow open-ended responses in this target older patient population.<sup>20,23,24</sup> The responses provided to the open-ended questions were categorised thematically and coded to enable quantitative analysis of data. Responses to all questions were given a score of 1 for a correct answer being given; each question had equal weighting. The participant's overall level of basic warfarin knowledge was reported as a total score out of ten, where a score 5 or greater out of 10 was considered as high or good knowledge. A score less than 5 out of 10 was considered as low or poor knowledge, as adapted from a previous study.<sup>25</sup>

Within this descriptive study, no further validation of the shortened questionnaire was undertaken beyond checking of face validity and pilot-testing among the researchers.

### Health Literacy Questionnaire (HLQ)

The HLQ was chosen to determine health literacy after consideration of other studied health literacy measures such as the Newest Vital Sign<sup>26</sup>, shortened version of the Test of Functional Health Literacy in Adults (S-TOFHLA)<sup>26</sup>, shortened version of the Test of Functional Health Literacy in Adults (S-TOFHLA)<sup>27</sup>, Rapid Estimate of Adult Literacy in Medicine- Short Form (REALM-SF)<sup>28</sup> and the Short Assessment of Health Literacy-English (SAHL-E).<sup>29</sup> The latter tools only focus on reading ability, comprehension and numeracy, and some also have substantive psychometric weaknesses, drawing different conclusions when applied

Table 1. Characteristics of participants (N=34)

Participant characteristics	Patients (n=30) (% in subgroup)	Carers (n=4) (% in subgroup)	Warfarin knowledge score (N=34)		p-value*
			Mean (SD)	Median (IQR)	
Median age (years), IQR	81.0, 11.0	61.0, 35.5	N/A	N/A	N/A
Age range (years)	67.0 to 99.0	43.0 to 85.0	N/A	N/A	N/A
Age Group (years)					P =0.37
<80 years	12 (40.0)	3 (75.0)	8.3 (1.8)	9.0 (0.8)	
≥80 years	18 (60.0)	1 (25.0)	8.1 (1.4)	8.0 (2.3)	
Gender					P=0.76
Male	24 (80.0)	1 (25.0)	8.1 (1.7)	8.0 (1.5)	
Country of birth					P=0.47
Born in Australia	21 (70.0)	1 (25.0)	8.2 (1.1)	8.0 (2.0)	
Born from overseas †	9 (30.0)	3 (75.0)	8.0 (2.2)	9.0 (3.3)	
English spoken at home	30 (100.0)	3 (75.0)	8.1 (1.6)	9.0 (2.0)	P=0.71
Aboriginal	1 (3.3)	0	N/A	N/A	P=0.77
Education and schooling					P=0.25
Primary school or less	1 (3.3)	0	N/A	N/A	
High school-partial completion	8 (26.7)	2 (50.0)	8.3 (1.2)	8.0 (2.3)	
High school (completed)	5 (16.7)	0	8.4 (1.9)	9.0 (2.5)	
TAFE or Trade	8 (26.7)	0	7.8 (1.2)	8.0 (2.3)	
University	8 (26.7)	2 (50.0)	8.4 (2.1)	9.0 (0.8)	
Private health insurance	25 (83.3)	3 (75.0)	8.2 (1.5)	8.5 (1.8)	P=0.95
Assistance required †† for the completion of the HLQ questionnaire	9 (30.0)	0	7.4 (1.1)	7.0 (2.0)	P=0.03
Lives alone	10 (33.3)	0	8.5 (1.5)	9.0 (2.5)	P=0.38

\* Comparison of warfarin knowledge scores across subgroups using Mann-Whitney test.  
† Born in countries including Germany, Taiwan, Philippines, New Zealand, United Kingdom and Malaysia.  
†† Assistance refers to explaining questions, statements and responses to the participant.  
Abbreviations: SD=standard deviation; IQR =Interquartile range; N/A: not applicable; TAFE: Technical And Further Education

concurrently, and providing limited guidance on how to improve health literacy.<sup>14,19</sup>

The HLQ uses a multidimensional health literacy profile which provides better insight into the health literacy strengths and limitations of both individuals and populations.<sup>19</sup> This tool may better reflect the overall health literacy of an individual, as it captures the broad components that contribute to it<sup>30</sup> and key elements from the perspective of the general population, practitioners and policymakers.<sup>19</sup> The HLQ scales have strong to very strong psychometric properties and provide unique insights across nine independent indicators of health literacy.<sup>19</sup> The HLQ comprises of 44 questions which can be administered quickly (reported average of 7 to 30 minutes) in 14 different languages.<sup>31</sup>

The validated HLQ measures health literacy and comprises 44 items spread across 9 scales.<sup>15</sup> For each item, participants were asked to respond as follows (Table 3):

- for scales 1 to 5: Strongly Disagree=1, Disagree=2, Agree=3, Strongly agree=4.
- for scales 6 to 9: Cannot do =1, Very Difficult=2, Quite Difficult =3, Quite Easy =4, Very easy =5.

To determine the overall scale scores, item scores were added and the sum divided by the number of items in that specific scale.<sup>15</sup> Using these scale scores, participants with a lower level of health literacy for a particular scale were defined as those having a:

- mean scale score of <3 for scales 1 to 5. That is, they on average “strongly disagree” or “disagree” with the item statement  
OR

- mean scale score of < 4 for scales 6 to 9. That is, they on average “cannot do” or find it “very difficult” or “quite difficult” to do those tasks listed in the item statements.

Conversely, participants with a higher level of health literacy for a particular scale were defined as having a:

- mean scale score of 3 or more for scales 1 to 5. That is, they on average “strongly agree” or “agree” with the item statements  
OR
- mean scale score of ≥4 for scales 6 to 9. That is, they on average found it “quite easy” or “very easy” to do the tasks listed in the item statements.

#### Data Analysis

Quantitative data were analysed using the software program IBM SPSS version 23.0 (SPSS Inc., Chicago, IL, USA), and Microsoft Excel. Descriptive statistics, such as measures of central tendency (e.g., means, medians), were used to summarise the characteristics of the participants and responses to survey questions. Categorical variables were expressed as frequencies and percentages, and continuous variables were presented as medians (interquartile range). Inferential statistics (non-parametric tests, e.g., chi-square test, Mann-Whitney U test, Spearman correlation test) were used to explore differences in characteristics and responses between patient sub-groups, and to explore the relationship between warfarin knowledge and health literacy. A significant difference was defined as p<0.05. The categorisation of HLQ scores into lower and higher literacy does not rely on an assumption of normality in the data, and hence mean cut-off scores were used to categorise data.

Warfarin use and information provision Number of participants (% in subgroup)	Patients who self-manage their warfarin (N=30)	Patients whose warfarin is managed by carers (N=4)	All participants (N=34)
<b>Duration of warfarin use</b>			
< 1 years	2 (6.7)	0	2 (5.9)
1 to 5 years	7 (23.3)	3 (75.0)	10 (29.4)
6 to 10 years	10 (33.3)	1 (25.0)	11 (32.4)
11 to 15 years	5 (16.7)	0	5 (14.7)
16 to 20 years	3 (10.0)	0	3 (8.8)
>20 years	3 (10.0)	0	3 (8.8)
<b>Indication for warfarin</b>			
Atrial Fibrillation (AF)	19 (63.3)	2 (50.0)	21(61.8)
Stroke or transient ischaemic attack	2 (6.7)	1 (25.0)	3 (8.8)
AF and stroke or transient ischaemic attack	2 (6.7)	0	2 (5.9)
Deep vein thrombosis or Pulmonary Embolism	5 (16.7)	0	5 (14.7)
Valve replacement	2 (6.7)	1 (25.0)	3 (8.8)
Chronic medical conditions (≥3)	28 (93.3)	4 (100.0)	32 (94.1)
<b>Types of medical conditions</b>			
Cardiovascular	30 (100)	4 (100)	34 (100)
Respiratory	15 (50.0)	1 (25.0)	16 (47.1)
Rheumatology	13 (43.3)	3 (75.0)	16 (47.1)
Endocrine	12 (40.0)	2 (50.0)	14 (41.2)
Other †	17 (56.7)	4 (100.0))	21 (61.8)
Gastrointestinal	13 (43.3)	1 (25.0)	14 (41.2)
Neurology	8 (26.7)	2 (50.0)	10 (29.4)
Liver or kidney	8 (26.7)	1 (25.0)	9 (26.5)
Psychotropic	4 (13.3)	4 (100.0)	8 (23.5)
Cancer	5 (16.7)	2 (50.0)	7 (20.6)
Stroke or transient ischaemic attack	4 (13.3)	1 (25.0)	5 (14.7)
<b>Polypharmacy (5 or more long term medications)</b>			
	26 (86.7)	4 (100)	30 (88.2)
<b>Number of patients taking long term medications in the following categories ‡ ‡</b>			
Antithrombotic	30	4 (100)	34 (100)
Cardiovascular	26	4 (100)	30 (88.2)
Herbs/vitamins	18	4 (100)	22 (64.7)
Gastrointestinal	15	4 (100)	19 (55.9)
Analgesics	13	1 (25)	14 (41.2)
Dermatological	12	1 (25)	13 (38.2)
Respiratory	12	0	12 (35.3)
Psychotropic	9	3 (75)	12 (35.3)
Endocrine	8	2 (50)	10 (29.4)
Rheumatology	8	0	8 (23.5)
Genitourinary	8	0	8 (23.5)
Ophthalmic	6	1 (25)	7 (20.6)
Neurological	4	1 (25)	5 (14.7)
Antimicrobial	3	0	3 (8.8)
Other‡‡‡	11	1 (25)	12 (35.3)
† Other conditions include; ophthalmology, dermatology, ear, genitourinary, peripheral neuropathy, restless legs syndrome, obesity, bone marrow disorder and shingles. ‡‡ Patient's records may have reported more than one long term medication. ‡‡‡ Other long term medications include; ear ointment, antifungal, iron chelator, non-cytotoxic antineoplastic, intranasal corticosteroid spray and somatostatin analogue. ‡‡‡‡ Primary care settings include; General Practice Medical Centre, Community Pharmacy and Specialist's office. Abbreviations: AF = atrial fibrillation; NA= Not Applicable.			

## RESULTS

### Participant characteristics

Among the study's 34 participants, 30 were patients taking warfarin and 4 were carers of patients taking warfarin (Table 1). The median age for patients was 81.0 years, 80.0% were male, and 30.0% were born overseas. The highest level of education attained by the majority of patients was: University (26.7%), Technical and Further Education or Trade (26.7%) and partial high schooling (26.7%). The median age of carers was 61.0 years (range 43 to 85 years), with three being overseas-born females. Two carers completed partial schooling and the other two carers were university educated.

Approximately 94.1% of patients (n=32) had multimorbidity (i.e., co-occurrence of 3 or more chronic conditions<sup>32</sup>) and 88.2% (n=30) used polypharmacy (i.e. 5 or more medications<sup>33</sup>) (Table 2). Aside from cardiovascular issues, the most common chronic medical conditions were: respiratory (47.1%) and rheumatological (47.1%) (Table 2). The most common number of long-term medications used were: antithrombotics (100%) cardiovascular (88.2%) and complementary and alternative medicines (CAMs) including herbs or vitamins (64.7%) (Table 2).

The prevailing indication for warfarin was stroke prevention in atrial fibrillation (61.8%). Most patients had been taking warfarin for between 6 to 10 years (32.4%) and recalled

Table 2. (cont.) Patients' history of warfarin use, medical conditions and medications			
Warfarin use and information provision Number of participants (% in subgroup)	Patients who self-manage their warfarin (N=30)	Patients whose warfarin is managed by carers (N=4)	All participants (N=34)
Time since information about warfarin was last received			
0 to 1 years	4 (13.3)	0	4 (11.8)
1 to 5 years	9 (30)	3 (75.0)	12 (35.3)
6 to 10 years	9 (30)	0	9 (26.5)
11 to 15 years	2 (6.7)	0	2 (5.9)
16 to 20 years	2 (6.7)	0	2 (5.9)
>20 years	3 (10.0)	0	3 (8.8)
Not sure	1 (3.3)	1 (25.0)	2 (5.9)
Main provider or warfarin education / information when warfarin was initiated			
General Practitioner/Specialist	23 (76.7)	3 (75)	26 (76.5)
Pharmacist	2 (6.7)	0	2 (5.9)
General Practitioner/Specialist and Nurse	4 (13.3)	0	4 (11.8)
Not sure	1 (3.3)	0	1 (2.9)
No one	0	1 (25)	1 (2.9)
Location of education:			
Primary care setting <sup>####</sup>	15 (50.0)	0	15 (44.1)
Hospital setting	12 (40.0)	2 (50)	14 (41.2)
Primary care and hospital settings	3 (10.0)	0	3 (8.8)
Not sure	0	1 (25)	1 (2.9)
Patient self-reported nil counselling received	0	1 (25)	1 (2.9)
‡	Other conditions include; ophthalmology, dermatology, ear, genitourinary, peripheral neuropathy, restless legs syndrome, obesity, bone marrow disorder and shingles.		
‡‡	Patient's records may have reported more than one long term medication.		
‡‡‡	Other long term medications include; ear ointment, antifungal, iron chelator, non-cytotoxic antineoplastic, intranasal corticosteroid spray and somatostatin analogue.		
‡‡‡‡	Primary care settings include; General Practice Medical Centre, Community Pharmacy and Specialist's office.		
Abbreviations: AF = atrial fibrillation; NA= Not Applicable.			

receiving warfarin education from their general practitioner or specialist doctor (76.5%). The location of their warfarin education was most commonly a primary care setting (44.1%). The time since the participant last recalled receiving information about warfarin was 1 to 5 years (35.3%) for most patients. One carer reported never receiving any formal warfarin education.

#### Assessment of Warfarin Knowledge

Across the 34 participants, the mean warfarin score out of 10 was 8.3, indicating a good level of knowledge about the basic aspects of warfarin use. The questions that received the highest proportion of correct responses (Figure 1) were:

- question 1 (97.1%): "Reason for taking warfarin"
- question 8 (97.1%): "Informing other health care providers"
- question 3 (88.2%): "What to do if you miss a dose of warfarin"

The questions that received the lowest proportion of correct responses were:

- question 6: "The importance of a consistent diet" (58.8%)
- question 10: "When to seek urgent medical attention" (67.6%) and
- question 5: "What happens if an INR value is below the target INR range" (73.5%)

The mean warfarin knowledge score was the same for face-to-face and telephone interviews.

#### Assessment of Health Literacy

Table 3 summarises the median scores for each HLQ scale. The strengths and limitations for the sample population can be explained in terms of the number of participants with a lower or higher level of health literacy for each scale. The scale with the largest number of participants demonstrating a lower level of health literacy (N=17) was scale 5 ("Appraisal of health information"), i.e., many more participants indicated that they did not consistently appraise the quality and reliability of health information.

The scales with the most participants with a higher level of literacy was scale 1 ("Feeling understood and supported by healthcare providers") (N=32) and scale 6 ("Ability to actively engage with healthcare providers") (N=30).

There were no significant differences between the participants' warfarin knowledge scores and gender, country of birth, Aboriginal or Torres Strait Islander status, whether English spoken at home, number of chronic medical conditions, number of long-term medications, age, private health insurance status, duration of warfarin therapy, and the time since they last were educated about warfarin.

Patients who needed assistance in completing the HLQ had significantly lower warfarin knowledge scores compared to those patients who did not need assistance (p=0.03). Participants born overseas had significantly lower HLQ scores for scale 1 (Feeling understood and supported by healthcare providers) compared to those born in Australia (p=0.01). Participants who took 5 or more long-term medications had lower HLQ scores for scale 9, (Understand health information enough to know what to do) compared to those who took less than 5 medications (p=0.04). There



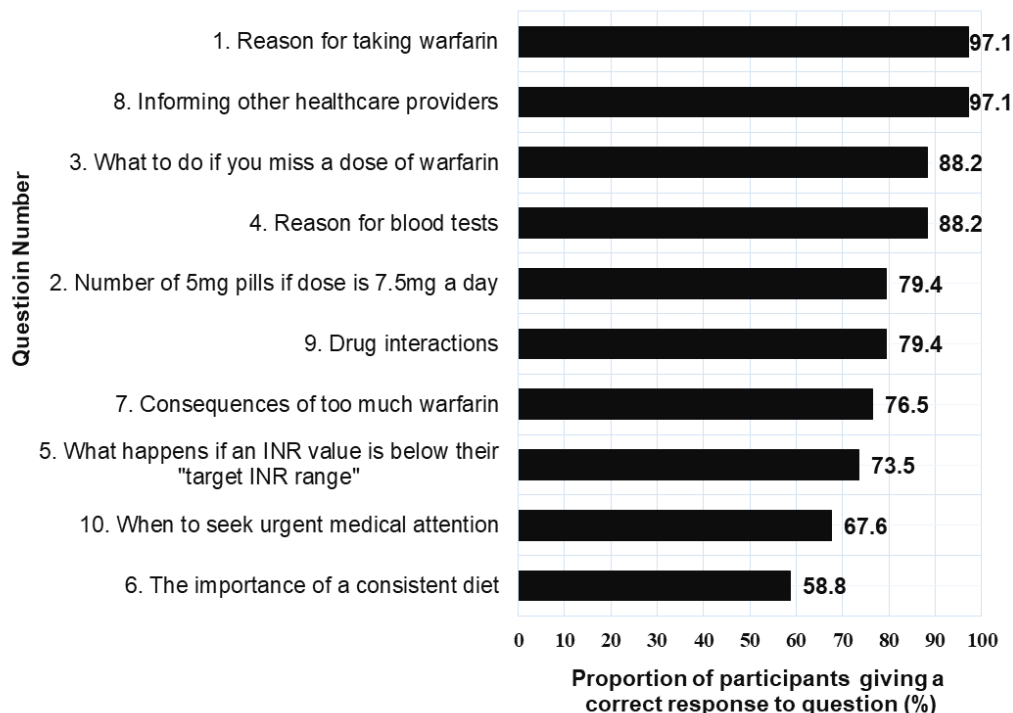


Figure 1. Proportion of participants correctly answering specific questions on Warfarin Knowledge Questionnaire

was no significant association between other characteristics, warfarin knowledge scores and HLQ scores.

## DISCUSSION

This study has described the level of warfarin knowledge and assessed the health literacy amongst an older population taking warfarin and a few carers in the local Australian primary care setting.

The majority of participants in our study had several characteristics that highlight why the management of this

older population can be complex. Older age has been associated with a lack of warfarin knowledge, low literacy<sup>16</sup> comorbidities<sup>34</sup>, polypharmacy and drug interactions.<sup>35</sup> Polypharmacy has been also associated with increased mortality, stroke and major bleeding for patients with atrial fibrillation.<sup>35</sup> Consequently, the need for carer assistance in the management of warfarin for older patients may be required.

The gaps in warfarin knowledge encountered in this study primarily related to medication safety issues and self-management strategies with respect to a consistent diet, recognising when to seek medical attention and actions to

Table 3. Health Literacy Questionnaire (HLQ) scores for all participants (N=34)

HLQ Scale	Median score (IQR) for all participants	Number of participants with a lower level of health literacy <sup>§</sup> within individual scale
	Range 1 (lowest score) - 4 (highest score) <sup>§§</sup>	
1. Feeling understood and supported by healthcare providers (N= 4 items)	3.5 (0.8)	2 (5.9%)
2. Having sufficient information to manage my health (N= 4 items)	3.0 (0.3)	7 (20.6%)
3. Actively managing my health (N= 5 items)	3.0 (0.7)	12 (35.3%)
4. Social support for health (N= 5 items)	3.1 (0.7)	8 (23.5%)
5. Appraisal of health information (N= 5 items)	2.9 (0.7)	17 (50.0%)
	Range 1 (lowest score) - 5 (highest score) <sup>§§§</sup>	
6. Ability to actively engage with healthcare professionals (N= 5 items)	4.2 (0.6)	4 (11.8)
7. Navigating the healthcare system (N= 6 items)	4.1 (0.5)	7 (20.6)
8. Ability to find good health information (N= 5 items)	4.0 (0.5)	12 (35.3)
9. Understand health information enough to know what to do (N= 5 items)	4.1 (0.8)	10 (29.4)

§ Lower level of health literacy was defined as a mean scale score of less than 3 for scales 1 to 5 and a mean scale score of less than 4 for scales 6 to 9.

§ § Mean Scale scores range between 1 and 4 for the first 5 scales. Items asked from how strongly the participant disagrees (lowest score of 1) to strongly agrees (highest score of 4).

§ § § Mean Scale scores range between 1 and 5 for scales 6 to 9. Items asked how difficult or easy the following tasks are for you now from cannot do (lowest score of 1) to very easy (highest score of 5).

Abbreviations: HLQ, Health Literacy Questionnaire; IQR, interquartile range.

Table 4. Recommended Communication Strategies for healthcare providers to use when caring for people with lower health literacy
<ul style="list-style-type: none"> <li>• Prioritise the educational domains, standardise the educational content and deliver the content efficiently.<sup>39</sup></li> </ul>
<ul style="list-style-type: none"> <li>• For leaflets use simple, clear statements in lay terminology that are easy to follow. Use simple and familiar icons and simple list formatting. Ensure patients are able to find information and take the appropriate actions.<sup>57</sup></li> </ul>
<ul style="list-style-type: none"> <li>• Work with consumers for the development of simple and clear drug information.<sup>57</sup></li> </ul>
<ul style="list-style-type: none"> <li>• Supplement written information with other modes of delivery such as verbal information, multidisciplinary programs involving doctors, nurses, dieticians and pharmacists, DVD, booklets, audiovisual resources depicting real-life scenarios, brown bag medication reviews, and visual aids.<sup>58</sup></li> </ul>
<ul style="list-style-type: none"> <li>• Involve the carer and family members when doing patient education to older patients.<sup>9,38</sup></li> </ul>
<ul style="list-style-type: none"> <li>• Use the teach back method for patients with low literacy to confirm comprehension.<sup>58</sup></li> </ul>
<ul style="list-style-type: none"> <li>• Help patients to ask questions. For example, ask, "What are your questions?"<sup>58</sup></li> </ul>
<ul style="list-style-type: none"> <li>• Help patients make decisions about their care. Communicate risks and benefits of information in a balanced and transparent way.<sup>59</sup></li> </ul>

take when the international normalised ratio (INR) readings are outside the desired target range.

A particularly significant finding here is the gap in knowledge regarding knowing when to seek help; in the context of high-risk anticoagulant therapy, patients and their carers must be acutely aware of the signs and symptoms of potentially life-threatening adverse effects from warfarin (e.g., haemorrhage) which require urgent medical attention. Increasing patient's knowledge about these will help to reduce their risk of major complications and poor treatment outcomes (including death).<sup>36,37</sup> These findings are similar to those reported by other studies in the literature, and highlight ongoing problems with respect to patient's understanding of these key points.<sup>9,38</sup> In addition to gaps in warfarin knowledge, the majority of our study participants had not received updated warfarin counselling in more than 1 to 5 years. These results highlight a need for effective and ongoing education with regular follow-up to address the knowledge gaps.

To overcome these knowledge gaps warfarin patient education needs to be standardised<sup>39</sup> and more targeted to topics relating to patient safety and actions required. In this study, most participants were educated by their general practitioners or physicians in the primary care setting, at the time of warfarin commencement. In our study, despite being long-term users of warfarin, the majority of participants had not had a warfarin 'refresher' in the previous one to five year period, nor had they received warfarin education by pharmacists. This is important as knowledge retention on some aspects of warfarin is as short as 28 to 56 days.<sup>40</sup> General practitioners or specialists may not have sufficient time to educate and follow-up on the patients about warfarin.<sup>25</sup> To address this barrier, a multidisciplinary approach, involving doctors, pharmacists, nurses and nutritionists<sup>36</sup>, is suggested to facilitate patient follow-up and re-education. The beneficial role of pharmacists in supporting patients receiving anticoagulants in the hospital, community and general practice settings, has been particularly highlighted in the literature.<sup>40-42</sup>

In considering approaches to patient education (Table 4), it is important to note that around half of the study participants had a lower level of health literacy for scale 5 ("Appraisal of information"). These participants could not understand most health information and could become confused when there is conflicting information.<sup>19</sup> A unique finding was that patients who needed assistance in completing the health literacy questionnaire had significantly lower warfarin knowledge scores, suggesting they may also need specific assistance with understanding information about warfarin. Health care providers may

need to communicate information about warfarin in appropriate formats so that these patients can understand the key messages and improve their knowledge. Although the literature identifies that health literacy must be assessed and addressed for effective patient education, there is limited research specifically reporting on successful interventions in the context of anticoagulation management. More broadly, one method of educating patients with limited health literacy includes pharmacist counselling about warfarin supported by a written information booklet.<sup>40</sup> In addition, the literature has suggested specific communication techniques to support patients with limited health literacy in understanding their medications, including: the Indian Health Service model (i.e., 3 key questions are asked to assess a patient's baseline knowledge: What were you told this medication is for?, How were you told to use it?, and What were you told to expect?)<sup>43,44</sup>; 'Teach-back'<sup>45</sup>; 'Ask-tell-ask' methods to confirm understanding<sup>30</sup>; "Ask Me 3" method (i.e., patients ask themselves: 1) What is my main problem?, 2) What do I need to do?, and 3) Why is it important for me to do this?)<sup>46</sup>; or use of a digitised colour menus of warfarin tablets to confirm regimen dosage concordance.<sup>47</sup> Other techniques include using slow speech, limiting the number of key points discussed to three or less<sup>48</sup>, reinforcing messages using pictures or graphs<sup>48</sup>, using plain language, assessing health information, and involving consumers in the process of developing information through focus groups, online surveys and telephone interviews, and using shared-decision making tools to communicate risk information about treatment options.<sup>30</sup> Regardless of the techniques that may be used, there is a need to implement specific policies in practice to guide the assessment of health literacy in patients and ensure it is appropriately addressed. In our local setting, these study findings have prompted the development of a warfarin action plan (written information leaflet) that considers the principles espoused in many of the communication techniques listed above. This warfarin action plan will be subsequently evaluated as a resource in the education of patients with limited health literacy, particularly older persons and their carers.

Other notable study findings included the lower level of health literacy identified in participants who were born overseas or who took five or more long-term medications. In our study, participants who were born overseas found it difficult to feel understood and supported by healthcare providers. Participants who took 5 or more long-term medications had difficulty in understanding health information to enable them to know what actions to take. Previous studies have reported similar findings<sup>15</sup>, including

that patients using polypharmacy and who have inadequate health literacy also have low understanding of pre-admission medications such as the frequency and dosing of their medications.<sup>49</sup> Polypharmacy has been associated with increased mortality, stroke and major bleeding for patients with atrial fibrillation.<sup>35</sup> Consequently, vulnerable patients who are at risk of poor medication understanding (due to factors such as polypharmacy and low literacy) may need more intensive medication reconciliation, educational counselling and follow-up to prevent post-discharge adverse drug events.<sup>49</sup>

Culturally and linguistically diverse (CALD) patients may not be able to fully engage with doctors and other healthcare providers about anticoagulant therapy due to language barriers and cultural beliefs.<sup>50,51</sup> To address this, education about warfarin may need to involve the patient's family, friends or carers, accredited interpreters and/or a health care provider that can speak the same language. Further research is required to evaluate the use and impact of medical interpreters on improving knowledge in CALD patients.

To date, there has been limited research focusing on supporting older patients taking oral anticoagulants through the use of carers. For this reason, we included a small number of carers in our study. The role of the carer in shared decision-making has been noted in a previous qualitative study.<sup>52</sup> However, whilst we know the challenges around managing older patients, we also need to consider the challenges of supporting the carers of older persons, who are often older persons themselves (e.g., spouses, partners, adult children). In our study, the mean age of carers was 61 years; this signals a need to assess the warfarin knowledge and health literacy of carers as well as the patients themselves.

Whilst this study provides insights into the medication management challenges of high-risk patients in the local setting, this study has several limitations. First, the generalisability of the findings may be limited by: the relatively small sample size as this was a pilot study, the number of general practitioners agreeing to recruit patients, the number of participants agreeing to do the study, and by the specific characteristics of our study sample, i.e., 27% were university-educated with a median age of 80, were not culturally diverse nor warfarin-naïve, which may have influenced the level of warfarin knowledge. Furthermore, our patients were recruited from one specific setting (one medical centre).

The patients in this study may not represent the preferences and perspectives of the thousands of patients encountered in other practice settings, whether in Australia or more globally. Second, the medical staff was involved in identifying potential participants so this may have introduced some selection bias. Third, having the participants answer the questionnaire via the telephone

may have adversely influenced their experience, compared to those who answered in person. Fourth, the shortened questionnaire was not specifically validated for use in this setting. Fifth, due to the small sample size, the data from both patients and carer was combined and precludes an exploration of whether any patient characteristics may have affected patient preferences. Nevertheless, the study provides some useful insights into the local Australian practice setting, identifying gaps that need to be filled.

Future research should focus on involving a greater number of participants and their carers from different cultural backgrounds, using the multi-dimensional HLQ tool to assess health literacy and a validated questionnaire to assess knowledge about oral anticoagulants (warfarin and the DOACs) in the community and hospital settings. In addition, health outcomes of health literacy, knowledge and health impact of self-managed patients versus carer-managed patients taking oral anticoagulants could be explored. Furthermore, although there have been some studies involving pharmacist education to older persons<sup>40,42,53</sup> and those with limited literacy<sup>40</sup>, there is a need for pharmacists to develop interventions to support CALD patients about warfarin. Several studies in the literature have highlighted the need for medicines information among CALD patients.<sup>54-56</sup> Pharmacists have an important role in addressing this need for medicines information as they are easily accessible and are conveniently located in several health care settings (i.e. hospital, community and home).

## CONCLUSIONS

This study provides insights regarding the challenges of managing warfarin in older persons due to their characteristics, and highlights the ongoing knowledge gaps about warfarin, the limitations of health literacy, and the importance of involving carers of the older persons during education. Participants born overseas and those using polypharmacy may require more support with tailored education and follow-up to improve their health literacy and warfarin knowledge.

## ACKNOWLEDGEMENT

The authors thank Dr. Alison Beauchamp for her assistance with the Health Literacy Questionnaire.

## CONFLICT OF INTEREST

No financial support or relationships that pose a conflict of interest.

## FUNDING

None.

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