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RESEARCH ARTICLE

Patient satisfaction with community pharmacist-led anticoagulation management services and its relationship with patient characteristics in New Zealand

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Abstract

Background Community pharmacist-led anticoagulation management service (CPAMS) offers international normalised ratio point-of-care testing of warfarin in a community pharmacy setting. It has now expanded with 7,344 patients enrolled in the service across 164 pharmacies in New Zealand. The clinical benefit of CPAMS has been shown to be superior, but patient satisfaction with the service has not been fully explored. *Objective* To develop a questionnaire to assess patient satisfaction with CPAMS and evaluate its psychometric properties. Additionally, to determine the level of patient satisfaction with CPAMS and identify determinants of satisfaction with CPAMS. *Settings* 1071 patients enrolled in CPAMS across New Zealand invited to take part in the study. *Main outcome measure* Satisfaction with CPAMS service. *Methods* Adult patients taking warfarin and currently enrolled in CPAMS were recruited through the national international normalised ratio online system and invited to complete a 36-item survey assessing satisfaction with CPAMS. To identify the most important dimensions of patient satisfaction, exploratory factor analysis was used. Multivariate linear regression models were used to examine the effect of independent variables on patient satisfaction. *Results* A total of 305 patients completed the survey. The mean overall satisfaction score was 94.5% ± 13.1 out of maximum possible points. Five dimensions of patient satisfaction were identified by factor analysis: patient-centred communication, confidence in pharmacist competence, patient-pharmacist relationship, confidence in CPAMS, and pharmacy environment. Being older and more frequent visits to a pharmacy were positively associated with patient satisfaction. Living more than 1 km away from a pharmacy, and 'poor' self-perceived health status were negative predictors of patient satisfaction. Being Māori or of other ethnic minority was also associated with lower satisfaction scores, exploratory analysis suggests patient-pharmacist relationship is an important driver of these differences. *Conclusions* The high level of patient satisfaction further supports the effectiveness of CPAMS as a delivery model. Patient satisfaction is affected by age, frequency of pharmacy visits, ethnicity, travel distance to pharmacy, and perceived health status. Policy makers and practitioners should consider the characteristics of patients with low levels of satisfaction to improve and enhance CPAMS engagement.

Keywords Anticoagulation management · Community pharmacy · New zealand · Patient satisfaction · Pharmacy services · Warfarin

Impacts on practice

- Efforts to further improve satisfaction with CPAMS should pay attention to patients with poor perceived-health, ethnic minorities, younger patients, and those who live far from pharmacies and less frequently visit pharmacies.

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- Given high patient satisfaction with CPAMS, expanding the availability of the service is an option worthy of consideration.
- CPAMS is a service that patients are enrolled in for a long time thus a longitudinal study is required to explore patient satisfaction throughout their enrolment in CPAMS and if/how their satisfaction impacts long-term clinical and economic outcomes.

Introduction

Although warfarin is a highly effective anticoagulant, it has a higher potential for adverse events due to its narrow therapeutic index [1]. Maintaining warfarin doses within the therapeutic range is challenging in clinical practice due to intra- and inter-patient variability, and the susceptibility of warfarin to pharmacokinetic changes due to drug or food interaction, poor medication adherence or various disease states [2].

In New Zealand (NZ), most patients on warfarin are generally managed by their family doctor (or general practitioners—GPs) [3]. In this model of care, patients visit a laboratory where a venous blood sample is collected and results are relayed, often electronically, to the general practice. The patient is contacted by telephone or contacts the practice themselves to receive INR results, information about warfarin dose adjustments, and the date of their next blood test. As there is not a consistent standardised way for patients to receive their INR results, some patients do not adjust their warfarin in time and /or do not receive consistent INR monitoring. This model of care is thought to cause fragmentation of the service [4]. Additionally, this model of care puts a considerable burden on both patients and GPs, especially since warfarin therapy can be lifelong once initiated [4].

To address some of the problems with the current GP-led warfarin management system, and to improve the safety and efficacy of warfarin treatment, a community pharmacist-led anticoagulation management service (CPAMS) was introduced in NZ in 2013. In the CPAMS model, community pharmacists provide point-of-care INR testing (with a Coaguchek XS Plus or Pro device) using a capillary blood sample and adjust warfarin doses as needed using a decision support system, INR Online (http:// www.inronline.net). The test results are available within minutes to patients. Pharmacists providing CPAMS are accredited by attending the New Zealand Pharmaceutical Society prescribed training and operate under a Standing Order agreement between them and local GPs. The GP retains overall responsibility for a patient's management and can intervene at any time. The pharmacist is also able to consult with the GP regarding any abnormal or sudden changes in results. All INR test results are sent to the GPs computer system so that they always have a clear picture of the treatment progress. CPAMS is funded by District Health Boards (DHBs). The payment to pharmacy for the CPAMS service is NZ $45 (€26) per month per patient. The price assumes an average testing frequency of 1.7 tests per month and includes the cost of pharmacist time, consumables, and the Clinical Decision Support software. Over 7,300 patients are currently enrolled in CPAMS across 164 community pharmacies nationwide [5].

The clinical benefits of CPAMS are evident [3, 6] but what is unknown is how patients perceive the service. To date, there has only been one pilot study published that has explored satisfaction with CPAMS [4]. The pilot study participants reported improved accessibility and convenience, and also commented that the more streamlined process has reduced potential delays and miscommunications. They also felt more involved with their treatment and had a better understanding of their health issues.

As CPAMS expands, there is a need to meet the diverse needs of the population of warfarin users. To achieve this, there is a need to assess and understand patient satisfaction and its influencing factors to ensure the long-term success of CPAMS. Evidence shows that satisfied patients maintain good relationships with their pharmacists [7]. This will enhance patient adherence to treatment regimens, ultimately leading to improved health outcomes.

Aim of the study

This study aimed to develop a questionnaire to assess patient satisfaction with CPAMS and evaluate its psychometric properties. Additionally, the level of patient satisfaction with CPAMS across NZ were evaluated, and the relationship between patient characteristics and satisfaction with CPAMS were examined.

Ethics approval

The study was approved by the University of Auckland Human Participants Ethics Committee (Ref no. 023597).

Methods

Study design and sample size

We performed a cross-sectional study using a self-administered online survey to assess patient satisfaction with CPAMS. Exploratory factor analysis (EFA) and multivariable linear regression were the main statistical procedures used. A minimum of 200 participants [8] or 5–10 participants per item [9, 10] are recommended for EFA. A

minimum of 10 participants per predictor variable is required for linear regression analysis [11]. Six separate multivariate linear regression models were used in this study (see data analysis below) and 14 predictor variables were included in each of these models. Hence, a minimum sample size of 220 was required to conduct a robust statistical analysis using EFA and linear regression (see supplementary file for details on sample size calculation).

Survey participants

The study population included patients who were enrolled in CPAMS across NZ. The INR Online system is a computerised anticoagulant management system that offers automated dosing and a recommended date for the next test [12]. This system was used to assist with recruitment by providing a list of all community pharmacies providing CPAMS and a comprehensive record of patients who were enrolled in CPAMS. Firstly, an invitation email was sent to all pharmacies providing CPAMS asking for permission to contact their patients. Then, an invitation email containing the online survey link was sent to all patients from consenting pharmacies.

Survey instrument

As there was no established measure of satisfaction with CPAMS, a new questionnaire was developed based on available literature on patient satisfaction with pharmacy services [4, 13–17] and the research team experience. Five members of the research team (NSTB, RBT, EM, SN and NW) conducted a literature search on MEDLINE, Embase, and International Pharmaceutical Abstracts, using keywords "patient satisfaction", "community pharmacist-led services", and anticoagulants." Only articles measuring patient satisfaction with a pharmacist-led service were reviewed. Likert-scale items were used to explore multiple aspects of CPAMS, such as the patient-pharmacist relationship, confidence in CPAMS, convenience and accessibility, and pharmacy setting in recognition of the complexity of determinants of satisfaction. Each Likert item was rated on a five-point scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree) with a higher positive score indicating higher satisfaction with CPAMS. Four Likert items were worded negatively to control for acquiescence, which is the tendency for participants to agree with any statement regardless of the content. Participants were also asked to indicate their level of overall satisfaction with CPAMS, using a visual analogue scale (0–100% score). Additionally, participants were asked to provide a single item rating of their overall health (excellent, very good, good, fair, or poor). These response options were merged into two categories for data analysis: "good health" (excellent, very good, and good) and "poor health" (fair, poor) to obtain more statistical power. Participants were also asked for the exact number of times they had visited their pharmacist in the three months prior to the survey, and the number of different medications they were taking at the time of the survey. Sociodemographic characteristics were also collected, such as age, gender, ethnicity, level of education, and annual household income. Finally, participants were asked the approximate distance they must travel in order to access CPAMS service. The questionnaire was designed to be self-administered, and all responses were voluntary.

To establish content validity, the questionnaires were reviewed by two experts specialising in pharmacy practice research. The experts were asked to provide written feedback about the clarity, quality, and scope of the questionnaire. After the experts' feedback had been considered and incorporated, the questionnaires were piloted on 25 individuals selected from the general public, using a 'think-aloud' protocol [18], to ensure content and face validity. The pilot participants went through the survey with a member of the research team (NSTB, RBT, EM, SN, or NW) and were asked to comment on the clarity, format, language, and any other issues observed. Structured probes were used to uncover how pilot participants interpreted questions to verify the understanding and readability. Example probes included: "Tell me in your own words what this question is asking," and "How did you decide on your answer to this question?" Based on participants' feedback, the survey was revised.

Survey procedure

An invitation email was sent to all CPAMS users in participating pharmacies along with a link to a website where the participants could access the survey questionnaires. The survey was created and hosted using Qualtrics survey platform (Qualtrics, Provo, UT). Administration of the survey began on August 28, 2019, and a reminder e-mail was sent to non-responders two weeks after the first e-mail to solicit additional responses. After eight weeks, the survey was closed to new participants.

Data analysis

The data were analysed using SPSS v25 (IBM, Armonk, NY, USA). Descriptive statistics were used to summarise survey participant characteristics. We performed an EFA with a principal axis factoring method [19] to identify specific dimensions of patient satisfaction. The Kaiser–Meyer–Olkin measure of sampling adequacy (KMO Index) [20] and Bartlett's sphericity test [21] were used to evaluate the appropriateness of the data for factor analysis. The KMO index ranges from 0 to 1, with index > 0.50 considered suitable for factor analysis [19]. The Bartlett's sphericity test should be significant ($p < 0.05$) for factor analysis to be suitable

[22]. Before running a factor analysis, a correlations matrix of the Likert items was used to identify and remove highly correlated (> 0.90) items from the analysis [8]. Cronbach's alpha was calculated for coherent variables within each factor to determine their internal consistency, and an alpha value greater than 0.70 was considered as adequately reliable [8]. The number of factors identified was based on their interpretability, having an eigenvalue > 1 [20], and the shape of the scree plot [23]. A Promax rotation (a type of oblique rotation) was employed to simplify and clarify the factor structures [19, 22]. A factor loading ≥ 0.4 was considered acceptable [24]. Finally, all the items which had ≥ 0.40 loadings on a particular factor were combined to form a composite mean score (subscale) to represent dimensions/constructs of patient satisfaction with CPAMS. All negatively worded items were reverse scored before composite scores were created. The composite scores were scored from 1 to 5, with higher scores indicating greater satisfaction. The distribution of responses was examined to determine potential floor and ceiling effect (i.e., people responding at lowest and highest ends of the Likert scales for each item). There were only two missing values for the Likert items. As levels of missing data were minimal and missingness was completely at random, the Expectation Maximisation method was used to impute missing data [8].

Six separate multivariate linear regression models were developed to examine the association between patient characteristics and satisfaction with CPAMS. There were six dependent variables: one overall satisfaction score and five subscales (composite mean scores) measuring specific dimensions of patient satisfaction. The same number of independent variables were included in each of the linear regression models. These were perceived general health status, frequency of pharmacy visits in three months prior to the survey, number of current medications, age, gender, ethnicity, level of education, annual household income, and travel distance from pharmacy. In all models, a two-tailed $p < 0.05$ was considered statistically significant.

Results

Participants' characteristics

A total of 164 community pharmacies were invited to take part in the study. Of these, 33 provided consent for their patients to be contacted for recruitment between the 5th of August and the 3rd of September 2019. The online survey link was then emailed to the 1071 patients receiving CPAMS in the consenting pharmacies on the 28th of August 2019. The median duration of administration was nine minutes. Three hundred and five questionnaires completed by the study participants were received by the 27th of October 2019. As patients on warfarin enrolled in CPAMS may switch to other oral anticoagulant therapies (e.g. dabigatran and rivaroxaban) and therefore no longer use CPAMS, their information may still remain on the INR Online system. As such, the true response rate of the participants could not be calculated.

Most participants reported their health status to be good, very good or excellent (n = 226, 74.1%). Most participants (n = 254, 83.2%) had three or more visits to their pharmacy in three months prior to the survey, and over half of the participants were taking more than 5 medications a day (n = 156, 51.1%). Most participants were male (n = 172, 56.4%), over 65 years of age (n = 195, 63.9%), and identified themselves as NZ European (i.e. New Zealanders of European descent) (n = 227, 74.4%). Almost half of the participants (n = 149, 48.9%) attended tertiary education, and over a third of them had an annual household income of NZ $30,001 (€17,220) to NZ $70,000 (€40,175) (n = 118, 38.7%). Most (n = 259, 84.9%) were living more than 1 km away from their pharmacy (see Table 1).

Psychometric properties of the questionnaire

Content and face validity

The questionnaire items were drawn from the research team experience and published literature. The two experts agreed that the survey captured a wide range of factors that may impact CPAMS and suggested some changes. For example, they suggested to add a visual analogue scale to assess overall satisfaction with CPAMS. The pilot testing resulted in clarified terminology, removal or revision of unclear response options and questions. The initial questionnaire consisted of 30 Likert items assessing different aspects of patient satisfaction with CPAMS. After piloting and expert review, eight redundant Likert items were deleted, and several others were modified. The final survey contained 22 Likert items.

Construct validity and reliability

Table 2 displays the details of EFA of Likert items assessing patient satisfaction. A total of 305 participants provided valid responses for the 22 Likert items assessing patient satisfaction with CPAMS (13.9 cases per item). Thus, the sample size was adequate for factor analysis. All the Likert items were subjected to EFA. The KMO index was 0.911 and Bartlett's test of sphericity was significant ($p < 0.001$) providing support that the data were suitable for EFA. There were no very strong correlations (i.e. all correlations were < 0.9) between the Likert items. Two items were removed because their factor loadings were < 0.4. The remaining 20

Table 1 Characteristic of survey participants (N = 305)

Variables	N	%
Gender		
Male	172	56.4
Female	132	43.3
Missing	1	0.3
Age groups (in years)		
< 35 years	**6**	1.9
35 to 44 years	14	4.6
45 to 54 years	23	7.5
55 to 64 years	67	22.0
65 or older	195	63.9
Ethnic group		
NZ European	227	74.4
Other	78	25.6
What is the highest education level you have achieved so far?		
No schooling completed	5	1.6
Primary school	2	0.7
Secondary School (three years or less)	67	22.0
Secondary School (more than three years)	81	26.6
Tertiary education (polytechs, college, or university)	149	48.9
Missing	1	0.3
What was your total household income before taxes during the past 12 months?		
≤ $30,000	57	18.7
$30,001 – $70,000	118	38.7
> $70,000	128	41.9
Missing	2	0.7
At what approximate distance you are living from your current pharmacy?		
< 1 km	46	15.1
1–5 km	172	56.4
6–10 km	42	13.8
Over 10 km	45	14.8
In general, would you say your health is:		
Excellent	17	5.6
Very good	99	32.5
Good	110	36.1
Fair	62	20.3
Poor	17	5.6
How many different medications do you take each day?		
One	23	7.5
Two	35	11.5
Three	40	13.1
Four	51	16.7
≥ Five	156	51.1
How often did you visit your pharmacist for your warfarin treatment in the last 3 months?		
Once	10	3.3
Twice	32	10.5
Three times	107	35.1
Four times	29	9.5
Five times	39	12.8
Over five times	79	25.9
Missing	9	3.0

Table 2 Mean scores and factor loadings of the 20 items retained in the final EFA of patient satisfaction with CPAMS (N = 305)

Item[a]	Mean	Factors				
		1	2	3	4	5
My pharmacist provides clear explanations about my medications	4.71 ± 0.70	**0.793**	−0.047	0.036	−0.025	−0.023
My pharmacist listens to my health concerns	4.64 ± 0.75	**0.666**	0.221	−0.053	−0.073	0.035
My pharmacist involves me in making decisions about my medications	4.48 ± 0.90	**0.587**	0.061	0.099	0.131	−0.026
My pharmacist provides clear explanations about the results of my blood test	4.79 ± 0.62	**0.442**	0.318	−0.002	0.003	0.045
I am confident with my pharmacist's skills in managing my warfarin treatment	4.78 ± 0.64	0.036	**0.915**	−0.012	0.088	−0.080
I feel confident about my pharmacist's ability to accurately perform my blood test	4.83 ± 0.62	0.044	**0.644**	0.064	−0.014	−0.046
My pharmacist is aware of my medical history	4.31 ± 0.93	0.124	**0.550**	0.002	−0.056	0.027
My pharmacist keeps my family doctor informed about my warfarin testing	4.42 ± 0.97	0.038	**0.522**	0.016	0.017	0.017
I feel comfortable discussing my concerns with my pharmacist	4.74 ± 0.74	0.012	0.147	**0.896**	−0.042	−0.074
My pharmacist treats me with dignity and respect	4.84 ± 0.62	−0.054	0.049	**0.847**	0.056	0.026
My pharmacist has expressed genuine interest in my well-being	4.71 ± 0.74	0.292	−0.053	**0.639**	0.011	−0.010
My pharmacist DOES NOT spend enough time with me[b]	4.80 ± 0.68	0.287	−0.132	**0.469**	−0.044	0.088
I would rather have my blood taken by a finger-prick than by a needle in my arm	4.83 ± 0.61	−0.176	0.219	−0.050	**0.746**	−0.130
I prefer having my warfarin managed by my pharmacist rather than my family doctor	4.37 ± 0.97	0.201	−0.195	−0.002	**0.725**	−0.023
I believe other patients on warfarin would benefit from this service	4.80 ± 0.60	−0.007	−0.004	0.008	**0.686**	0.013
Having my warfarin tested at my pharmacy makes me feel more in control of my warfarin treatment	4.61 ± 0.80	−0.007	0.043	0.120	**0.430**	0.225
The waiting area of my pharmacy is adequate	4.45 ± 0.88	0.040	0.004	-0.103	-0.018	**0.889**
The pharmacy layout ensures my privacy	4.68 ± 0.74	0.055	0.093	−0.034	0.106	**0.589**
The waiting time at my pharmacy is too long[b]	4.36 ± 1.12	0.006	−0.112	0.047	−0.081	**0.480**
I find my pharmacy to be conveniently located	4.70 ± 0.71	−0.202	0.229	0.276	−0.043	**0.423**
Cronbach's alpha		0.8	0.8	0.9	0.8	0.7
Eigenvalue		8.47	1.56	1.23	1.05	1.00
% Variance explained by each factor		41.8	7.8	6.1	5.2	4.6
Total variance explained		65.6%				

Extraction Method: Principal Axis Factoring

Rotation Method: Promax with Kaiser Normalization

Strong factor loadings (> 0.4) are highlighted in bold

Mean Score = Mean (xi, xii, xiii, xiv, …); SD = standard deviation

[a]Responses for each item were presented on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree)

[b]Reverse scored items

Table 3 Factor correlation matrix showing correlation between satisfaction with CPAMS subscales

	Correlation				
	Satisfaction with CPAMS subscales				
	Patient-centred communication	Confidence in pharmacist competence	Patient-pharmacist relationship	Confidence in CPAMS	Pharmacy environment
Patient-centred communication	1.000				
Confidence in pharmacist competence	0.582	1.000			
Patient-pharmacist relationship	0.662	0.690	1.000		
Confidence in CPAMS	0.458	0.673	0.559	1.000	
pharmacy environment	0.536	0.642	0.597	0.573	1.000

CPAMS Community pharmacy-led anticoagulation management service

Table 4 Multivariate linear regression models examining the predictors of patient satisfaction with CPAMS (N = 291)

Variable	Patient-centred communication		Confidence in pharmacist competence		Patient-Pharmacist relationship		Confidence in CPAMS		Pharmacy environment		Overall satisfaction	
	β	*p* value	β	*p* value	β	*p* value	β	*p* value	β	*p* value	β	*p* value
Gender												
Female	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–
Male	−0.059	0.341	−0.092	0.139	−0.057	0.355	−0.082	0.187	−0.071	0.227	-0.026	0.669
Age group (in years)												
< 65	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–
≥ 65	0.009	0.898	0.095	0.157	0.058	0.386	0.126	0.060	0.168	**0.008**	0.065	0.331
Ethnic group												
NZ European	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–
Māori	−0.070	0.266	−0.007	0.915	−0.161	**0.011**	0.003	0.960	0.013	0.825	-0.040	0.522
Other	−0.008	0.891	−0.043	0.481	−0.100	0.099	0.007	0.905	−0.146	**0.012**	-0.083	0.169
Level of education												
Attended tertiary education	Ref.	–	Ref.	–	Ref.	–	Ref..	–	Ref.	–	Ref.	–
Didn't attend tertiary education	−0.020	0.741	0.046	0.442	−0.009	0.884	0.053	0.381	0.109	0.056	0.056	0.350
Annual household income (NZ $)												
≤ $30,000	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–
$30,001–$70,000	0.017	0.800	−0.026	0.690	0.008	0.904	−0.042	0.525	0.029	0.642	0.073	0.270
> $70,000	−0.065	0.359	−0.042	0.547	0.011	0.878	0.104	0.139	0.037	0.575	0.085	0.225
Travel distance to pharmacy												
< 1 km	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–
1–5 km	−0.015	0.866	0.076	0.383	0.065	0.454	−0.019	0.828	−0.199	**0.017**	0.042	0.630
> 5 km	0.033	0.711	0.041	0.642	0.020	0.815	−0.099	0.259	−0.176	**0.034**	-0.111	0.202
General health status												
Good	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–
Poor	−0.066	0.285	−0.149	**0.016**	−0.032	0.600	0.011	0.859	−0.078	0.180	-0.043	0.487
No. of current medications												
< Five	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–
≥ Five	0.026	0.676	0.066	0.288	−0.019	0.753	−0.033	0.593	0.060	0.308	-0.083	0.180
Frequency of pharmacy visit in 3 months												
< Three	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–	Ref.	–
Three	0.024	0.787	0.068	0.442	0.062	0.486	0.131	0.141	0.368	**< 0.001**	0.225	**0.012**
Four	0.000	0.995	−0.028	0.697	0.016	0.821	−0.084	0.244	0.090	0.190	0.060	0.400
Over four	0.223	**0.014**	0.177	**0.049**	0.220	**0.014**	0.170	0.059	0.354	**< 0.001**	0.177	**0.049**
% variance explained by regression model	6%		7%		8%		7.5%		17%		8%	

β Standardised coefficient beta

p value < 0.05 was considered statistically significant, and the corresponding confidence interval was 95%

items loaded on five factors, and these five factors explained 65.6% of the total variance.

Four items were loaded on the first factor. These items assessed the patient experience of patient-centred communication with pharmacists. Hence, this factor was labelled "patient-centred communication" and had a Cronbach's alpha coefficient of 0.8. The second factor consisted of four items with a Cronbach's alpha coefficient of 0.8. These items measured the patients' confidence in pharmacist clinical and medication management skills and labelled as "Confidence in pharmacist competence." The third factor comprised four high-loading items related to patient-pharmacist relationship and labelled as "patient-pharmacist relationship." The Cronbach's alpha coefficient for this factor was 0.9. The 4 items loaded on the fourth factor assessed patient's confidence in CPAMS service and if they would recommend the service to other people and was named "Confidence in CPAMS" and had a Cronbach's alpha coefficient of 0.8. The last factor consisted four items that asked participants to indicate the extent to which they agree with different statements describing the general pharmacy environment, such as privacy, convenience of location, layout and waiting time. This factor was labelled "pharmacy environment" with a Cronbach's alpha coefficient of 0.7.

Correlations between factors (subscales)

To assess how distinct each patient satisfaction subscale was from other subscales in the same matrix, the factor correlation matrix was examined (see Table 3). The results indicated that there were moderate correlations between factors, ranging from 0.458 between 'patient-centred communication' and 'confidence in CPAMS' to 0.690 between "confidence in pharmacist competence" and "patient-pharmacist relationship".

Level of patient satisfaction

The mean overall satisfaction score was $94.5\% \pm 13.1$ (range 3%–100%). The highest mean value (4.84 ± 0.619) was observed for the item "My pharmacist treats me with dignity and respect", whereas the lowest mean score value (4.31 ± 0.932) was for the item "My pharmacist is aware of my medical history." The minimum and maximum values were the same for all Likert items − 1 and 5, respectively (see Table 2). There were no floor effects, but ceiling effects were apparent for most questionnaire items.

Predictors of patient satisfaction with CPAMS

Predictors of individual dimensions of satisfaction Table 4 shows patient characteristics associated with satisfaction with CPAMS in multivariable linear regression analyses. Due to incomplete demographic data, 14 cases were excluded, and the linear regression analyses were completed using 291 cases. Māori had significantly lower satisfaction with their relationship with pharmacist than NZ Europeans ($p = 0.011$). Individuals who belong to non-Māori/non-NZ European ethnic groups had significantly lower satisfaction with pharmacy environment than did NZ Europeans ($p = 0.012$). Older patients had significantly higher satisfaction with pharmacy environment than younger patients ($p = 0.008$). Patients that lived between 1 and 5 km ($p = 0.017$) and over 5 km ($p = 0.034$) away from CPAMS providing pharmacy reported lower satisfaction with pharmacy environment than those living within 1 km from pharmacy. Patients with 'poor' perceived health reported significantly lower satisfaction with pharmacist competence in managing warfarin, compared to patients with 'good' perceived health ($p = 0.016$). Compared to those who visited a pharmacy twice or less, those who visited a pharmacy three times were more likely to have higher satisfaction scores for 'pharmacy environment' dimension ($p < 0.001$). Likewise, those who visited a pharmacy more than four times had higher satisfaction scores for dimensions of 'pharmacy environment' ($p < 0.001$), 'patient-pharmacist relationship' ($p = 0.014$), 'confidence in pharmacist competence' ($p = 0.049$) and 'patient centred communication' ($p = 0.014$) compared with patients who visited a pharmacy twice or less. No statistically significant association was found between patient satisfaction and gender, level of education, annual household income, and number of current medications.

Predictors of overall satisfaction: Those who visited a pharmacy three times ($p = 0.012$) and more than four times ($p = 0.049$) had higher overall satisfaction with CPAMS compared with those who visited a pharmacy twice or less. No other variables had significant association with overall satisfaction (see Table 4).

Discussion

Psychometric properties of the questionnaire

Our questionnaire demonstrated good validity and reliability. As there were no other validated tools for assessing satisfaction with CPAMS, criterion validity could not be established. Presence of moderate correlations between the factors (subscales), supported our initial assumption of using oblique (Promax) rotation [19]. A ceiling effect is often observed in patient satisfaction scales [25] as patients consistently tend to score their care in the mid-to-high range for most items. Our questionnaire is not an exception with this regard. This could be due to social desirability response

bias, where patients report greater satisfaction than they feel, believing positive responses will be more acceptable to the researcher [26]. Qualitative studies might help for in-depth exploration of patient satisfaction.

Extensive literature search, expert feedback, and the research team experience allowed for the selection of meaningful Likert items and constructs to measure satisfaction with CPAMS. The pilot study provided evidence for face validity as well as the understandability and readability of the questions. Our questionnaire may aid in conducting research to assess patient satisfaction with pharmacy-based anticoagulation services. However, as the healthcare system across countries vary greatly, this questionnaire may need adaption to local needs. As with all questionnaires, continuous testing and refinement is necessary.

Predictors of patient satisfaction with CPAMS

This study is the first to evaluate patients' satisfaction with CPAMS in NZ and identify predictors of patient satisfaction with CPAMS. Past studies have focused on investigating the association between overall satisfaction and patient characteristics [27–29]. However, overall measures of satisfaction are of limited use as they give little guidance as to how healthcare providers should respond to specific patient concerns [30]. To address this issue, our study examined predictors of specific dimensions of satisfaction as well as overall satisfaction score. Our findings support high patient satisfaction with pharmacist-led warfarin management services similar to that reported in prior research [4, 15, 31, 32]. We identified both modifiable and non-modifiable factors influencing satisfaction with CPAMS. Although the latter factors cannot be modified by intervention, they are useful to identify target groups for intervention.

Ethnicity although satisfaction with CPAMS was generally high, inequities across groups were seen. Māori were found to have lower satisfaction with their relationship with pharmacist, and non-Māori ethnic minority patients had significantly lower satisfaction scores for the dimension of 'pharmacy environment', compared with NZ Europeans. This finding is in line with previous studies where NZ Europeans report higher satisfaction with health services than other ethnic groups [33]. This could be due to the language or cultural barriers that ethnic minority groups experience within the current healthcare setting [34]. Thus, improving the structure of CPAMS to be more culturally appropriate may increase uptake by Māori patients and other minority groups. CPAMS operates on a predominantly medical model of health with minimal focus on the holistic care of patients. Incorporating the *Te Whare Tapa Whā*, a Māori model of health that includes spiritual, family, mental and physical health [35], into the current practice may help to maximise satisfaction and participation in CPAMS in Māori and other ethnic minorities. This model aims to reduce cultural barriers and promote culturally appropriate care.

Age this study also found that older patients have a higher degree of satisfaction with the 'pharmacy environment' dimension than younger patients, which is similar to findings from other studies on satisfaction with healthcare services [36–39]. This may be because older patients have lower or more realistic expectations from their pharmacists than younger patients rather than actual differences in the quality of service received by the two groups [40]. It has also been noted that individuals who lived longer and experienced significant hardships may be more accepting of inadequacies in the healthcare system than younger individuals [40, 41].

Perceived Health Status prior research indicated that a low health status leads to lower patient satisfaction scores [29, 38] which concurs with the findings of the present study. However, this finding requires cautious interpretation. As noted by Xiao and Barber, patients who perceive themselves to be in poor health may report lower patient satisfaction because they may attribute their poorer health with the healthcare they receive [38]. Furthermore, other personal characteristics unrelated to healthcare services may affect satisfaction. For example, patient dissatisfaction with the healthcare services could be a manifestation of dissatisfaction with life [42]. The present study only assessed the effect of general health status on satisfaction, further studies are needed to explore the independent contribution of self-reported physical and mental health to patient satisfaction with CPAMS.

Frequency of Pharmacy Visit in line with previous study [43] our study showed that participants with more frequent visits to the pharmacy had a higher level of satisfaction across the different dimensions of patient satisfaction. A possible explanation is that more frequent visits may allow for more engagement of pharmacists with patients, thus more opportunities for detection of medication-related issues, monitoring of treatment regimens, and identification of health complications that might compromise outcomes, all of which could lead to better patient satisfaction. Additionally, patients who frequently visit pharmacies are likely to know their pharmacist better and develop better relationships, which might have positive impact on satisfaction. However, the present study did not examine the nature and duration of pharmacist-patient encounters. The quality and length of pharmacist-patient encounters is likely to be more important predictor of patient satisfaction than the frequency of visits and requires further investigation. It should also be noted that it is difficult to establish the cause-effect relationship in cross-sectional survey. Participants might have visited the pharmacy more often because they were satisfied with it.

Travel Distance to Pharmacy travel distance to the pharmacy, specifically living more than 1 km from the pharmacy, was a significant predictor of lower satisfaction for

'pharmacy environment' dimension of patient satisfaction. This finding is expected considering that transportation barriers tend to increase with distance. Such problems as transportation costs, difficulties in finding convenient public transportation or parking spaces (in larger cities), and increased travel time may have an adverse effect on patient satisfaction. Most of the study participants were also older, thus travelling longer distances for appointments could be strenuous especially for the very old and those living in poverty. A limited number of pharmacies provide CPAMS, thus it is important to ensure people in high-need areas have adequate access to the service. CPAMS is particularly relevant in rural settings because of the relative lack of access to laboratory services, uneven distribution of general practises, and shortages of GPs in rural areas [4, 44]. Thus, priority funding to pharmacies in rural areas should be used to decrease barriers to access and improve patient outcomes as well as reducing pressure on already stretched general practice.

Strengths and limitations

This study has some limitations. First, although all 164 pharmacies providing CPAMS were invited to take part, only 33 consented (20.1% response rate), with a high proportion of participants from urban areas in North Island. Response rates from other parts of NZ in contrast were low. This limits the generalisability of the findings. However, the ethnic, gender, and age distribution of our sample was approximately equivalent to that of the general population of CPAMS users, where the majority of CPAMS users were NZ Europeans, male, and older than 65 years of age, according to 2018 estimates [5]. There is also a potential for CPAMS providers who have poor patient satisfaction to opt not of participating in this survey which could lead to response bias. Second, recruitment into this study was voluntary and therefore it is uncertain whether the sample was biased. Third, high patient satisfaction could have been reported due to social desirability bias or patients' hesitancy to negatively evaluate care providers [45]. Finally, a 'new' questionnaire was used to assess satisfaction with CPAMS due to lack of existing suitable measures. However, the questionnaire showed good internal consistency, and construct, content and face validity and could be used by future researchers. Unfortunately, as there is a lack of other validated methods to assess satisfaction with CPAMS, we could not assess criterion validity.

Despite the above limitations, this study is one of the few studies that explored patient satisfaction with CPAMS in NZ. Additionally, although the response rate in this study is low, our sample size is larger than many other similar studies [44, 46, 47]. The findings may contribute to informing policymakers and healthcare providers in improving the service going forward.

Conclusions

This study investigated patient satisfaction with CPAMS. We have developed a new questionnaire capable of assessing patient satisfaction with CPAMS, which has demonstrated good psychometric properties and a meaningful structure. The level of patient satisfaction with CPAMS was high. Older patients and those who had more frequent pharmacy visits exhibited greater satisfaction. Conversely, Māori and other ethnic minorities, individuals with poor perceived health status, and those who live more than 1 km away from CPAMS providing pharmacy had lower satisfaction. Health policy makers and pharmacy practitioners should consider the characteristics of these patients with low levels of satisfaction to improve and enhance CPAMS. CPAMS is a service that patients are enrolled in for a long time, thus a longitudinal study is needed to explore if/how patient satisfaction changes over time. Further studies should investigate additional modifiable and non-modifiable factors that may influence patient satisfaction with CPAMS to ensure that this innovative service is sustained, and more patients can benefit from the positive clinical outcomes seen with CPAMS.

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Conflicts of interest There are no competing interests to declare.

References

1. Wysowski DK, Nourjah P, Swartz L. Bleeding complications with warfarin use: a prevalent adverse effect resulting in regulatory action. Arch Intern Med. 2007;167:1414–9.
2. Ansell J, Hirsh J, Poller L, Bussey H, Jacobson A, Hylek E. The pharmacology and management of the vitamin K antagonists: the seventh ACCP Conference on Antithrombotic and Thrombolytic Therapy. Chest. 2004;126:204S–33S.
3. Harper P, McMichael I, Griffiths D, Harper J, Hill C. The community pharmacy-based anticoagulation management service achieves a consistently high standard of anticoagulant care. N Z Med J. 2015;128:31–41.
4. Shaw J, Harrison J, Harrison J. A community pharmacist-led anticoagulation management service: attitudes towards a new collaborative model of care in New Zealand. Int J Pharm Pract. 2014;22:397–406.
5. TAS Health. Community Pharmacy Anti-Coagulation Management Service Quality Report - July to December 2018. https://tas.health.nz/assets/Community-pharmacy/CPAMS-QReport-Jul-Dec-2018.pdf. Accessed 24 June 2020.
6. Harrison J, Shaw JP, Harrison JE. Anticoagulation management by community pharmacists in New Zealand: an evaluation of a collaborative model in primary care. Int J Pharm Pract. 2015;23:173–81.
7. Covinsky KE, Rosenthal GE, Chren M, Justice AC, Fortinsky RH, Palmer RM, et al. The relation between health status changes and

patient satisfaction in older hospitalized medical patients. J Gen Intern Med. 1998;13:223–9.
8. Tabachnick BG, Fidell LS. Using multivariate statistics. 5th ed. Boston: Allyn and Bacon; 2007 **ISBN 9780134790541**.
9. Everitt B. Multivariate analysis: the need for data, and other problems. Br J Psychiatry. 1975;126:237–40.
10. Kline R, Nunnally JC, Bernstein IH. Psychometric theory. J Psychoeduc Assess. 1994;1999(17):275–80.
11. Miller DE, Kunce JT. Prediction and statistical overkill revisited. Meas Eval Guide. 1973;6:157–63.
12. Harper P, Harper J, Hill C. An audit of anticoagulant management to assess anticoagulant control using decision support software. BMJ Open 2014;4(9):e005864-2014-005864.
13. Schommer JC, Kucukarslan SN. Measuring patient satisfaction with pharmaceutical services. Am J Health Syst Pharm. 1997;54:2721–32.
14. Al-Abri R, Al-Balushi A. Patient satisfaction survey as a tool towards quality improvement. Oman Med J. 2014;29:3–7.
15. Bishop L, Young S, Twells L, Dillon C, Hawboldt J. Patients' and physicians' satisfaction with a pharmacist managed anticoagulation program in a family medicine clinic. BMC Res Notes. 2015;8(1):233.
16. Willey ML, Chagan L, Sisca TS, Chapple KJ, Callahan AK, Crain JL, et al. A pharmacist-managed anticoagulation clinic: six-year assessment of patient outcomes. Am J Health Syst Pharm. 2003;60:1033–7.
17. Ingram SJ, Kirkdale CL, Williams S, Hartley E, Wintle S, Sefton V, et al. Moving anticoagulation initiation and monitoring services into the community: evaluation of the Brighton and Hove community pharmacy service. BMC Health Serv Res. 2018;18(1):91.
18. Fonteyn ME, Kuipers B, Grobe SJ. A description of think aloud method and protocol analysis. Qual Health Res. 1993;3:430–41.
19. Costello AB, Osborne JW. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. Pract Assess Res Eval. 2005;10:1–9.
20. Kaiser HF. The application of electronic computers to factor analysis. Educ Psychol Meas. 1960;20:141–51.
21. Bartlett MS. Tests of significance in factor analysis. Br J Math Stat Psychol. 1950;3:77–85.
22. Fabrigar LR, Wegener DT, MacCallum RC, Strahan EJ. Evaluating the use of exploratory factor analysis in psychological research. Psychol Methods. 1999;4:272–99.
23. Cattell RB. The scree test for the number of factors. Multivar Behav Res. 1966;1:245–76.
24. Kachigan SK. Multivariate statistical analysis: a conceptual introduction. 2nd ed. New York: Radius Press; 1991 **ISBN-13: 978-0942154917**.
25. Cappelleri JC, Gerber RA, Kourides IA, Gelfand RA. Development and factor analysis of a questionnaire to measure patient satisfaction with injected and inhaled insulin for type 1 diabetes. Diabetes Care. 2000;23:1799–803.
26. Biering P, Becker H, Calvin A, Grobe SJ. Casting light on the concept of patient satisfaction by studying the construct validity and the sensitivity of a questionnaire. Int J Health Care Qual Assur. 2006;19:246–58.
27. Kressin NR, Skinner K, Sullivan L, Miller DR, Frayne S, Kazis L, et al. Patient satisfaction with Department of Veterans Affairs health care: do women differ from men? Mil Med. 1999;164:283–8.
28. Al-Sakkak MA, Al-Nowaiser NA, Al-Khashan HI, Al-Abdrabulnabi AA, Jaber RM. Patient satisfaction with primary health care services in Riyadh. Saudi Med J. 2008;29(3):432.
29. Alberto Sánchez C, Javier Prado-Galbarro F, García-Pérez S, Sarría SA. Factors associated with patient satisfaction with primary care in Europe: results from the EUprimecare project. Qual Prim Care. 2014;22:147–55.
30. Carr-Hill RA. The measurement of patient satisfaction. J Public Health. 1992;14:236–49.
31. Garwood CL, Dumo P, Baringhaus SN, Laban KM. Quality of anticoagulation care in patients discharged from a pharmacist-managed anticoagulation clinic after stabilization of warfarin therapy. Pharmacotherapy. 2008;28:20–6.
32. Jackson SL, Peterson GM, House M, Bartlett T. Point-of-care monitoring of anticoagulant therapy by rural community pharmacists: description of successful outcomes. Aust J Rural Health. 2004;12:197–200.
33. Lee C, Sibley CG. Demographic and psychological correlates of satisfaction with healthcare access in New Zealand. N Z Med J. 2017;130:11–24.
34. Jansen P, Bacal K, Crengle S. He Ritenga Whakaaro: Māori experiences of health services. 2008. https://www.moh.govt.nz/notebook/nbbooks.nsf/0/2A6CAF401ABBEFB9CC2575F4000B6D0C/$file/He-Ritenga-Whakaaro.pdf Accessed 24 June 2020.
35. Durie M. Te Pae Mahutonga: A model for Maori health promotion. 1999. https://www.cph.co.nz/wp-content/uploads/TePaeMahutonga.pdf Accessed 24 June 2020.
36. Carmel S. Satisfaction with hospitalization: a comparative analysis of three types of services. Soc Sci Med. 1985;21:1243–9.
37. Tucker JL III, Kelley VA. The influence of patient sociodemographic characteristics on patient satisfaction. Mil Med. 2000;165:72–6.
38. Xiao H, Barber JP. The effect of perceived health status on patient satisfaction. Value Health. 2008;11:719–25.
39. Hall JA, Dornan MC. Patient sociodemographic characteristics as predictors of satisfaction with medical care: a meta-analysis. Soc Sci Med. 1990;30:811–8.
40. Cohen G. Age and health status in a patient satisfaction survey. Soc Sci Med. 1996;42:1085–93.
41. Goodsell CT. The contented older client of bureaucracy. Int J Aging Hum Dev. 1982;14:1–9.
42. Weiss GL. Patient satisfaction with primary medical care. Evaluation of sociodemographic and predispositional factors. Med Care. 1988;26:383–92.
43. Lee S, Godwin OP, Kim K, Lee E. Predictive factors of patient satisfaction with pharmacy services in South Korea: a cross-sectional study of national level data. PLoS ONE. 2015;10(11):e0142269.
44. Jackson S, Peterson G, Bereznicki L, Misan G, Jupe D, Vial J. Improving the outcomes of anticoagulation in rural Australia: an evaluation of pharmacist-assisted monitoring of warfarin therapy. J Clin Pharm Ther. 2005;30:345–53.
45. Ware JE Jr, Snyder MK, Wright WR, Davies AR. Defining and measuring patient satisfaction with medical care. Eval Program Plan. 1983;6:247–63.
46. Elewa H, AbdelSamad O, Elmubark A, Al-Taweel H, Mohamed A, Kheir N, et al. The first pharmacist-managed anticoagulation clinic under a collaborative practice agreement in Qatar: clinical and patient-oriented outcomes. J Clin Pharm Ther. 2016;41:403–8.
47. Lodwick AD, Sajbel TA. Patient and physician satisfaction with a pharmacist-managed anticoagulation clinic: implications for managed care organizations. Manag Care. 2000;9:47–50.