

# A community pharmacist-led anticoagulation management service: attitudes towards a new collaborative model of care in New Zealand

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## Keywords

anticoagulants; community pharmacy services; interprofessional relations; patient acceptance of health care; point-of-care systems

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## Abstract

**Objective** To examine attitudes towards a new collaborative pharmacy-based model of care for management of warfarin treatment in the community. As background to the study, the New Zealand health authorities are encouraging greater clinical involvement of community pharmacists.

**Methods** Fifteen community pharmacies in New Zealand took part in a community pharmacist-led anticoagulation management service (CPAMS). Participants (patients, general practitioners, practice nurses, pharmacists) were surveyed on their views on accessibility, convenience, confidence in the service, impact on warfarin control, impact on workloads, effect on relationships and whether the service should be further implemented. A small number from each group was interviewed on the same topics.

**Key findings** Patients reported improved access, convenience, a preference for capillary testing, and the immediacy of the test result and dose changes. They indicated that they had a better understanding of their health problems. While sample sizes were small, the majority of general practitioners and practice nurses felt there were positive benefits for patients (convenience) and themselves (time saved) and expressed confidence in pharmacists' ability to provide the service. There were some concerns about potential loss of involvement in patient management. Pharmacists reported high levels of satisfaction with better use of their clinical knowledge in direct patient care and that their relationships with both patients and health professionals had improved.

**Conclusions** The new model of care was highly valued by patients and supported by primary care practitioners. Wider implementation of CPAMS was strongly supported. Pharmacists and general practitioners involved in CPAMS reported a pre-existing collaborative relationship, and this appears to be important in effective implementation.

## Introduction

Despite the recent introduction of new oral anticoagulants, warfarin retains an important place in the prevention and treatment of thromboembolism. It requires careful individual titration because the dose required varies from person to person and can alter over time, affected by factors such as changes to diet, alcohol intake, other medications or concurrent illness.<sup>[1]</sup> Too low a dose results in inadequate protection or treatment; too high a dose can lead to haemorrhagic complications. Regular blood tests to monitor the rate of blood clotting (reported as an international normalised ratio or

INR), and dose reviews are essential to ensure that the INR remains in range. Once initiated, therapy can be lifelong, and this requirement for close monitoring is known to place a considerable burden on both patients and health professionals.<sup>[2]</sup>

A number of different models of care have been developed for the management of patients treated with warfarin. In New Zealand, management for patients in the community is largely provided by general practices. Patients attend their local blood collection centre or medical practice where a venous blood sample is taken and sent to a centralised labora-

tory service for testing. The result is later reviewed at the practice and dose adjustments communicated to the patient by telephone. Responsibility for coordination is sometimes delegated to a practice nurse. This model of care is often somewhat fragmented, involving multiple parties and processes, a characteristic associated with suboptimal anticoagulation.<sup>[3]</sup>

Dedicated anticoagulation management services (AMSs), such as hospital-based anticoagulation clinics, aim to provide a systematic and coordinated model of care and are well established particularly in the UK, Canada and the USA.<sup>[4]</sup> Examples exist in New Zealand but are not widespread; this may be because of the relatively small and dispersed population (4.5 million). There is evidence to show that AMSs achieve better outcomes when compared with general practice management, both in terms of increased time in therapeutic range (TTR) and reduced incidence of adverse events.<sup>[4–7]</sup> However, these services are often based in secondary care facilities, meaning that accessibility and convenience for patients in the community can be less than ideal.

The role of pharmacists in secondary care AMS, particularly in North America, is well documented.<sup>[8–17]</sup> There are some published reports of community-based AMS involving pharmacists, but these typically describe pilot or small studies. They include hospital outreach services;<sup>[18]</sup> pharmacist-led clinics based at general practitioner (GP) surgeries or in primary care clinics;<sup>[19–22]</sup> and services based at, or involving, community pharmacies.<sup>[23–26]</sup> The reports indicate that potential benefits of community-based AMS involving pharmacists include improved accessibility and greater convenience for patients, improved anticoagulation control and a reduction of the burden on general practice. It is worth noting that while there has been limited deregulation of community pharmacy in New Zealand, the ownership regulations currently preclude the development of large chains of pharmacies and decisions about whether to participate in trials for extended services are likely to be made by individual pharmacy owners or managers.

This paper presents part of a larger study exploring a new community pharmacist-led anticoagulation management service (CPAMS), piloted in New Zealand between November 2010 and July 2011. The study was funded by Health Workforce New Zealand, a government agency that promotes the development of new and extended workforce roles, scopes of practice and models of care. The attitudes and perspectives of participants (patients, pharmacists, GPs and practice nurses) concerning this new model of care are reported here. A separate analysis, assessing the effect of the new model of care on the quality of anticoagulation control, is reported elsewhere. The main outcome measure in this evaluation was the TTR; the mean TTR for the 671 patients whose results were evaluated was 78.6%. All pharmacy sites achieved a mean TTR in excess of 70% (range 71.4% to 84.1%), well above the recommended target of 60%.

## Methods

### Design of the new model of care

Ethics approval for the pilot project was obtained from the New Zealand Multi-Region Ethics Committee (Ref: MEC/10/10/105). Expressions of interest were invited through an advertisement in a pharmacy journal that is distributed to all community pharmacies in New Zealand (approximately 900). Over 100 pharmacies expressed initial interest in participating and met the criteria, including pre-existing good relations with local GPs. Of these, 15 community pharmacies nationwide were selected to provide a mix of urban, suburban and rural populations and a variety of socio-demographic and ethnic profiles. Pharmacists underwent training and assessment before being accredited to provide warfarin management.

The pharmacists invited local GPs to join the project. In most instances, this was achieved by a presentation to the local practices. If a practitioner showed interest at this stage, he or she was provided with written material, including protocols, informed consent forms and standing order delegations. Informed consent for GP participants was obtained at this stage, and authority to perform INR testing, review results and implement warfarin dose adjustments was delegated to the pharmacists from the GPs by means of a standing order (a delegated authority from the GP). The GPs retained overall responsibility for their patients' management and could intervene at any time. Patients were recruited either at the pharmacies (and referred to their GP) or at the general practice. Informed consent from patients was obtained by the GPs at the time of recruitment into the study (patients were also provided with written material about the study), and a referral form was completed for each patient.

Patients had their INR checked at the pharmacy using a point-of-care testing device (CoaguChek XS Plus, supplied by Roche Diagnostics NZ, Auckland, New Zealand) and a capillary blood sample. Test results were available immediately, and dose adjustments were made by the pharmacist with the aid of an online decision support system (INR Online, <http://www.inronline.net>). All results and dosing information was sent electronically to the GP's patient management system.

A protocol specified when the pharmacist was required to discuss the patient's management with the GP, e.g. if the INR was above a certain threshold or if the patient reported significant bleeding. The pharmacist could request additional GP reviews at their discretion. A printed calendar was given to the patient at each visit, detailing the daily dose and the date of the next test. Pharmacists provided counselling as necessary and could show patients a graph of their INR control on the computer screen. The decision support software incorporated features to assist with tracking and scheduling of patients, such as lists of patients due or overdue for testing.

## Data management and analysis

### Questionnaires

Separate questionnaires were developed for patients, accredited pharmacists, GPs and practice nurses. They were designed to assess the accessibility and convenience of the service for patients, confidence in the service, confidence in pharmacists' ability to take on the extended role, impact on patients' anticoagulant control, impact on the workload of general practices, relationships between patients and pharmacists, professional relationships and whether the service should be continued and made more widely available.

The questionnaires comprised Likert-scaled statements (1 = strongly agree to 5 = strongly disagree). Some negatively phrased statements were included to guard against polarity bias. Additional space was provided for participants to record any other comments. Patient questionnaires were distributed via the pharmacies. Pharmacist (41), GP (115) and practice nurse (89) questionnaires were mailed directly to participants. Questionnaire responses were entered (with 10% double entry) into SPSS v20 (SPSS, Inc., Chicago, IL, USA). Results are presented as frequency distributions of responses; the 'agree' and 'strongly agree', and 'disagree' and 'strongly disagree' responses were aggregated to give an overall indication of agreement/disagreement with the statements.

### Interviews

A letter requesting GP, practice nurse and patient volunteers for telephone interviews was distributed with the questionnaires. A sample of respondents was selected with the aim of canvassing a range of opinions, in particular, from participants who expressed opinions contrary to the majority. Interviews were brief; participants were asked to expand on their responses to the questionnaire and give any additional feedback on the service that they felt was important.

### Pharmacy visits

Each pharmacy was visited by one of the researchers. A semi-structured interview was conducted with one or more of the accredited pharmacists at each pharmacy. The aim was to gather more detailed information about how the service had worked in practice and to identify changes that would be needed if the service were to be continued or expanded, as well as the impact on pharmacists' job satisfaction and on multidisciplinary team functioning. A thematic analysis of the responses was carried out for each participant group.

## Results

### Patients

Patients were predominantly male (62.4%), aged 65 or over (70.6%) and receiving warfarin for prevention of ischaemic stroke complicating atrial fibrillation (73.8%). A median of 47 patients were enrolled at each pharmacy (range 26 to 75). Completed questionnaires were returned by 430 of the 693 patients enrolled in the service, a response rate of 62%. Seven patients were interviewed; it was decided not to interview more as the interviews were not providing significant additional information. The questionnaire responses are shown in Table 1 and indicate a high level of satisfaction with the service. Some individual elements are featured, and selected quotations are used to illustrate the responses.

### Convenience and accessibility

The great majority of patients (96.9%) appreciated the convenience and accessibility of the service and felt that it saved them time (93.6%).

'I am very happy with service as there are no long queues waiting for blood to be taken and the pharmacists are very competent'.

'The pharmacy is in the shopping mall, helping me to get everything done in the same area, saving time and travel'.

### Method of testing

Almost all respondents (98.1%) preferred to have their blood sample obtained by capillary testing.

'I always had trouble with them trying to find a vein. Sometimes they had about four or five stabs before they found a vein, this is so much better'.

### Reduced fragmentation of care

A number of patients commented that the monitoring process had been streamlined and that the potential for delays and miscommunication had been reduced.

'The medical practice I attend is most efficient and helpful but at times it is extremely busy – results of tests can take time or get missed. My experience with the pharmacy has been brilliant for my needs'.

Nearly all respondents (93.9%) found it helpful to receive a printed dose calendar, and many liked being able to track their INR control on the computer screen. Many commented that they felt more involved with their treatment.

**Table 1** Patient questionnaire responses (*n* = 412)

I find it more convenient to have my blood test at the pharmacy.	Strongly agree	71.8%
	Agree	25.1%
	Neither agree nor disagree	2.2%
	Disagree	0.7%
	Strongly disagree	0.2%
I would rather have a finger-prick blood test than have blood taken from my arm using a needle.	Strongly agree	73.5%
	Agree	24.6%
	Neither agree nor disagree	1.7%
	Disagree	0.0%
	Strongly disagree	0.2%
I feel confident that the results from the pharmacy blood test are reliable.	Strongly agree	59.5%
	Agree	39.0%
	Neither agree nor disagree	1.0%
	Disagree	0.2%
	Strongly disagree	0.2%
I like knowing my test result and dose immediately rather than having to wait until later.	Strongly agree	72.6%
	Agree	26.7%
	Neither agree nor disagree	0.5%
	Disagree	0.2%
	Strongly disagree	0.0%
I find it useful to be able to discuss my warfarin treatment with the pharmacist when I go for my test.	Strongly agree	58.7%
	Agree	36.7%
	Neither agree nor disagree	4.1%
	Disagree	0.0%
	Strongly disagree	0.5%
I find it helpful to be given a calendar showing me what dose of warfarin to take.	Strongly agree	63.3%
	Agree	30.6%
	Neither agree nor disagree	5.4%
	Disagree	0.2%
	Strongly disagree	0.5%
I am not confident that the pharmacist can manage my warfarin treatment safely.	Strongly agree	8.0%
	Agree	9.0%
	Neither agree nor disagree	4.3%
	Disagree	38.8%
	Strongly disagree	39.8%
Using the warfarin service at the pharmacy has meant that the pharmacist has also been able to help me with other aspects of my health care.	Strongly agree	34.2%
	Agree	44.5%
	Neither agree nor disagree	17.4%
	Disagree	3.2%
	Strongly disagree	0.7%
I feel less in control of my warfarin treatment now that I go to the pharmacy for testing.	Strongly agree	5.6%
	Agree	5.8%
	Neither agree nor disagree	5.8%
	Disagree	47.6%
	Strongly disagree	35.2%
It saves me time having my warfarin managed by the pharmacist.	Strongly agree	58.4%
	Agree	35.2%
	Neither agree nor disagree	4.2%
	Disagree	1.7%
	Strongly disagree	0.5%
I would prefer to have my warfarin managed by my family doctor.	Strongly agree	2.8%
	Agree	5.1%
	Neither agree nor disagree	31.7%
	Disagree	45.2%
	Strongly disagree	15.2%
I would still want to use the warfarin service at the pharmacy even if I had to pay a fee.	Strongly agree	13.8%
	Agree	32.5%
	Neither agree nor disagree	24.5%
	Disagree	21.5%
	Strongly disagree	7.7%
Being involved in the pharmacy warfarin management service has changed my view on how the pharmacist can help people with their health care.	Yes	71.2%
	No	28.8%

‘It is nice to be able to talk and ask questions of the people involved with your treatment. Someone who understands what you are saying’.

‘Getting a printout showing dosage and INR record is good for my understanding of my progress’.

## Relationships

Many respondents felt that their views on the pharmacist had changed positively and that the pharmacist had been able to offer help and advice for other health problems they experienced.

‘I have come to understand my healthcare a lot better now after talking to the pharmacist and I am more at ease with my health problems’.

‘Lots of little problems along the way that are not worth going to the doctor for can be talked over and advice given’.

## Confidence in the service

Almost all respondents (98.5%) had confidence that test results were reliable. Many commented that the pharmacist was working closely with their GP, and this gave them confidence in the service.

‘The pharmacy and my doctor work together so I feel very happy that my treatment is well managed’.

‘I feel more comfortable knowing I can discuss my warfarin along with my medications and side-effects etc. with my pharmacist – anything contentious would also be discussed with my GP and I know my pharmacist would insist on it’.

## Patient concerns

A small proportion of patients indicated a preference for warfarin management by their family doctor (7.9%). Some commented that they were uncertain as to whether their GP was kept fully informed or were unhappy with the dose recommendations provided by the decision support system, and some commented on the pharmacist’s qualifications or motivation.

‘The pharmacist does not manage my warfarin treatment – a computer programme does (its decisions are relayed by the pharmacist). I am not confident of the programme’s decisions’.

‘The qualifications of, and trust in, the pharmacist in running these tests may need better development and

explanation. I trust my doctor; I am not sure about someone who is trying to sell me deodorant’.

## Pharmacists

Completed questionnaires were returned by 35 of the 41 pharmacists, a response rate of 85%. Face-to-face interviews were carried out with 24 pharmacists, at least one from each pharmacy. Questionnaire results are presented in Table 2, which shows that all aspects of the service were viewed very positively by the pharmacist respondents and 100% of pharmacist respondents wanted to continue to provide the service.

## Motivation for participating

All pharmacists felt their clinical skills were underutilised, and they wanted to see the profession continue to expand its role. Some believed there was a particular need for the service in their area, e.g. at one rural site, two of the GPs had recently left and had not yet been replaced.

## Relationship with patients

Pharmacists reported that some patients were initially unsure about joining the service, but all thought that their relationships with patients had improved. As a result, pharmacists had been able to discuss the effects of changes in diet, alcohol intake, missing doses or taking other medications on INR control, as well as identifying other health problems and offering treatment or referral to their GP.

## Relationship with general practitioners

The median number of practices per pharmacy was 3 (range 1 to 7), and the median number of patients per practice was 4 (range 1 to 64). Pharmacists reported a range of responses from GPs when the new service was proposed. Some were fully supportive from the start while others were more hesitant. The pharmacists worked to increase confidence by providing information sessions at practices. Some GPs declined to be involved. Reasons included having experienced serious problems with warfarin patients in the past or being prepared to allow the pharmacist to perform testing but not dose adjustment. Most pharmacists believed that their relationships with GPs had been strengthened. Several observed that they were now considered to be the ‘warfarin experts’ and that it was easier to get past the ‘gatekeeper’ receptionist when they needed to speak to the GP.

**Table 2** Pharmacist questionnaire responses (*n* = 34)

I find the CoaguChek XS Plus easy to use.	Strongly agree	65%
	Agree	35%
	Neither agree nor disagree	0%
	Disagree	0%
	Strongly disagree	0%
I often have to repeat tests with the CoaguChek XS Plus because there is an error message.	Strongly agree	0%
	Agree	0%
	Neither agree nor disagree	3%
	Disagree	44%
	Strongly disagree	53%
I usually find it easy to obtain a blood sample from the patient's finger.	Strongly agree	26%
	Agree	68%
	Neither agree nor disagree	3%
	Disagree	3%
	Strongly disagree	0%
I am confident that the INR results from the CoaguChek XS Plus are reliable.	Strongly agree	59%
	Agree	38%
	Neither agree nor disagree	0%
	Disagree	0%
	Strongly disagree	3%
I find it easy to use INR Online.	Strongly agree	59%
	Agree	38%
	Neither agree nor disagree	3%
	Disagree	0%
	Strongly disagree	0%
I am not confident that the dosing recommendations obtained from INR Online are appropriate.	Strongly agree	0%
	Agree	20%
	Neither agree nor disagree	15%
	Disagree	59%
	Strongly disagree	6%
I have enough information about my patients' medical history to enable me to provide them with appropriate management of their warfarin treatment.	Strongly agree	29%
	Agree	62%
	Neither agree nor disagree	6%
	Disagree	3%
	Strongly disagree	0%
I am confident that the review system I have in place with my GPs for INRs above 4.0 or below 1.5 is effective.	Strongly agree	29%
	Agree	62%
	Neither agree nor disagree	6%
	Disagree	3%
	Strongly disagree	0%
Providing a warfarin management service has improved my relationship with the patients involved.	Strongly agree	79%
	Agree	21%
	Neither agree nor disagree	0%
	Disagree	0%
	Strongly disagree	0%
As a direct result of seeing patients for their INR testing, I have been able to help them with other aspects of their health care.	Strongly agree	67%
	Agree	27%
	Neither agree nor disagree	3%
	Disagree	3%
	Strongly disagree	0%
I don't feel confident managing my patients' warfarin treatment.	Strongly agree	3%
	Agree	0%
	Neither agree nor disagree	0%
	Disagree	50%
	Strongly disagree	47%
I find it difficult to make time for the CPAMS because of the other demands of my work.	Strongly agree	3%
	Agree	15%
	Neither agree nor disagree	21%
	Disagree	29%
	Strongly disagree	32%
I would like to be able to continue to offer a warfarin management service to my patients.	Strongly agree	79%
	Agree	21%
	Neither agree nor disagree	0%
	Disagree	0%
	Strongly disagree	0%

CPAMS, community pharmacist-led anticoagulation management service; GP, general practitioner; INR, international normalised ratio.



### Other comments

Some pharmacists commented that GPs who initially had strong reservations had later referred their more difficult patients. All pharmacists indicated that they would like the service to continue.

### General practitioners

Completed questionnaires were returned by 28 of the 115 GPs with patients involved in the service, a response rate of 24%. The GPs were based at 21 of the 52 practices in the study and were linked with 12 of the 15 pharmacies. Telephone interviews were carried out with seven GPs from different practices. Questionnaire responses are given in Table 3 and indicate that GP respondents were generally supportive of the service and pharmacists' ability to provide it.

### Benefits of the service

Most GPs felt that their patients had benefited from the service and reported high levels of patient satisfaction and better compliance. The majority (85%) agreed that the service had saved them time.

### Disadvantages of the service

Some GPs remained cautious about the service. Concerns included the GP lacking familiarity with their patients' anticoagulation, uncertainty over where responsibility lay if things went wrong and pharmacists being unaware of changes in patients' medical conditions.

### The general practitioner–pharmacist relationship

All GPs commented that they had a good professional relationship with the pharmacists before the service started. Some felt that their relationship had improved; others felt that there had been no noticeable change.

### Confidence in the service

The majority (89%) agreed that they were confident that the pharmacist could manage their patients' treatment safely and the INR results from the point-of-care testing device were reliable.

### Other comments

Some GPs said they had referred all their warfarin patients to the service, except those who were medically unstable. Others had only referred those who were considered more adherent to treatment. All GP respondents would like the service to

**Table 3** General practitioner questionnaire responses (*n* = 28)

I am confident that the INR results from the CoaguChek XS Plus device used in the pharmacy are reliable.	Strongly agree	25%
	Agree	64%
	Neither agree nor disagree	7%
	Disagree	4%
	Strongly disagree	0%
I find it easy to access information about the warfarin treatment of my patients involved in the CPAMS using INR Online.	Strongly agree	19%
	Agree	33%
	Neither agree nor disagree	41%
	Disagree	7%
	Strongly disagree	0%
I am not confident that the dosing recommendations obtained from INR Online are appropriate.	Strongly agree	4%
	Agree	28%
	Neither agree nor disagree	14%
	Disagree	43%
	Strongly disagree	11%
How does the pharmacist inform you of INRs above 4.0 or below 1.5?	By email	46%
	By phone	25%
	By fax	29%
Please tick all that apply.	Other	18%
I am confident that this method of informing me about INRs above 4.0 or below 1.5 is effective.	Strongly agree	30%
	Agree	44%
	Neither agree nor disagree	4%
	Disagree	22%
	Strongly disagree	0%
I am confident that the pharmacist can manage my patients' warfarin treatment safely.	Strongly agree	32%
	Agree	57%
	Neither agree nor disagree	7%
	Disagree	4%
	Strongly disagree	0%
As a direct result of seeing my patients for warfarin management, the pharmacist has helped them with other aspects of their health care.	Strongly agree	11%
	Agree	25%
	Neither agree nor disagree	60%
	Disagree	4%
	Strongly disagree	0%
Having my patients enrolled in the CPAMS has saved me time.	Strongly agree	53%
	Agree	32%
	Neither agree nor disagree	4%
	Disagree	11%
	Strongly disagree	0%
Having my patients enrolled in the CPAMS has saved time for my practice nurse and/or receptionist.	Strongly agree	64%
	Agree	25%
	Neither agree nor disagree	7%
	Disagree	4%
	Strongly disagree	0%
Since my patients have been involved in the CPAMS, their warfarin treatment has been less well controlled.	Strongly agree	0%
	Agree	7%
	Neither agree nor disagree	25%
	Disagree	54%
	Strongly disagree	14%
I would like the CPAMS to continue to be available to my patients.	Strongly agree	43%
	Agree	39%
	Neither agree nor disagree	14%
	Disagree	0%
	Strongly disagree	4%
I think the CPAMS should be made available to patients throughout New Zealand.	Strongly agree	46%
	Agree	29%
	Neither agree nor disagree	21%
	Disagree	0%
	Strongly disagree	4%

CPAMS, community pharmacist-led anticoagulation management service; INR, international normalised ratio.

continue to be available for their patients (100%), and there was strong support for nationwide availability (95%).

### Practice nurses

Completed questionnaires were returned by 24 of the 89 practice nurses with patients involved in the service, a response rate of 27%. The practice nurses were based at 16 of the 52 practices in the study and were linked with 12 of the 15 pharmacies. Telephone interviews were carried out with five nurses from different practices. Questionnaire responses are given in Table 4.

### Benefits of the service

The majority of nurses (95%) agreed that the service had saved them time, especially in informing patients of test results and dose changes and following up non-attendees. Several commented that previously there had often been long delays before test results were received from the laboratory. The service was seen as particularly helpful for those who had previously been inconsistent with testing and for those who had poor venous access.

### Disadvantages of the service

Some nurses raised concerns about possible fragmentation of care and loss of their input for some patients.

### Relationships

Several nurses noted that some older patients were uncertain about their warfarin care being transferred away from their GP or felt it was disloyal to have testing done elsewhere.

### Confidence in the service

The majority of nurses (95%) were confident that the pharmacist could manage patients' warfarin treatment safely.

### Other comments

All practice nurse respondents agreed that the service should continue, and it should be made available throughout New Zealand (100%). A number felt it was important that the GP-led model of care remained available for those patients who preferred it.

**Table 4** Practice nurse questionnaire responses (*n* = 22)

It is more convenient for patients to have their INR blood test at the pharmacy.	Strongly agree	50%
	Agree	41%
	Neither agree nor disagree	9%
	Disagree	0%
	Strongly disagree	0%
It is better for patients to be told straight away what their warfarin dose should be rather than having to contact the GP later.	Strongly agree	77%
	Agree	23%
	Neither agree nor disagree	0%
	Disagree	0%
	Strongly disagree	0%
I am confident that the pharmacist can manage our patients' warfarin treatment safely.	Strongly agree	63%
	Agree	32%
	Neither agree nor disagree	5%
	Disagree	0%
	Strongly disagree	0%
Since our patients have been involved in CPAMS, their warfarin treatment has been less well controlled.	Strongly agree	5%
	Agree	0%
	Neither agree nor disagree	27%
	Disagree	41%
	Strongly disagree	27%
As a direct result of seeing our patients for warfarin management, the pharmacist has been able to help them with other aspects of their health care.	Strongly agree	9%
	Agree	41%
	Neither agree nor disagree	45%
	Disagree	0%
	Strongly disagree	5%
As a direct result of our warfarin patients being involved in the CPAMS, they have missed out on help I could give them.	Strongly agree	0%
	Agree	0%
	Neither agree nor disagree	52%
	Disagree	29%
	Strongly disagree	19%
Having our patients enrolled in the CPAMS has saved me time.	Strongly agree	90%
	Agree	5%
	Neither agree nor disagree	0%
	Disagree	5%
	Strongly disagree	0%
Having our patients enrolled in the CPAMS has saved time for the GPs.	Strongly agree	72%
	Agree	14%
	Neither agree nor disagree	14%
	Disagree	0%
	Strongly disagree	0%
I would like the CPAMS to continue to be available to our patients.	Strongly agree	82%
	Agree	18%
	Neither agree nor disagree	0%
	Disagree	0%
	Strongly disagree	0%
I think the CPAMS should be made available to patients throughout New Zealand.	Strongly agree	77%
	Agree	18%
	Neither agree nor disagree	5%
	Disagree	0%
	Strongly disagree	0%

CPAMS, community pharmacist-led anticoagulation management service; GP, general practitioner; INR, international normalised ratio.

## Discussion

### Main findings

This study has indicated that a new collaborative model of care, the CPAMS, was highly valued by the great majority of patients, pharmacists, GPs and practice nurses who participated. Patients particularly appreciated the convenience, saved time, method of testing and improved continuity of care provided through CPAMS. Pharmacists were very enthusiastic about the opportunity for enhanced patient care roles and better utilisation of their clinical knowledge and skills. GP and practice nurse respondents felt that there were positive benefits of the service both for patients (convenience) and themselves (time saved). All participants expressed confidence in pharmacists' ability to provide the service and in the testing and decision support systems, and supported its continuation and wider availability.

### Limitations

These findings may, in part, be the result of selection bias. Pharmacies that participated were selected from a pool of pharmacies expressing interest. They may have been more progressive, with better existing relationships, than is the case for community pharmacy at large. Likewise, GP and patient participants were a self-selected cohort. Those who took part may have been more accepting of extended roles for pharmacists. Furthermore, the questionnaire responses may have been influenced by response bias as all participants were aware that the pharmacist-led service was undergoing a trial and that any continuation of the service would be dependent on its success. The response rate to questionnaires by GPs and practice nurses was disappointing (less than 30%), which may have resulted in responder bias. However, low response rates by these groups are common, and there was consistency in the responses to many questions. Only a small sample of GPs and practice nurses was interviewed, but again there were many commonalities in the opinions expressed. With hindsight, the inclusion of interviews in this study may have been unnecessary as sufficient data were collected from the questionnaire surveys to draw reasonable conclusions. The interviews did, however, give the opportunity for clarification and expansion of some issues, and the quantitative and qualitative data were interpreted as an overall picture of the anticoagulation service from four perspectives.

### Wider context

CPAMS incorporated many of the key components identified by Garcia *et al.* as supporting the delivery of optimised anticoagulant therapy, namely scheduling, testing, decision support and use of a tracking system to minimise the

likelihood of patients being lost to follow-up.<sup>[3]</sup> It reduced fragmentation of care by the incorporation of sampling, testing and dose adjustment into one consultation involving a single health professional. One of the main concerns expressed by GPs and practice nurses in this study was possible fragmentation of care; interestingly, this concern diminished as the study progressed and patients acted as advocates for the benefits of the service to their GPs and practice nurses. Patients liked being given a printout with details of their dose and next test date; previously, this information had usually been communicated by telephone, meaning there was a higher risk of miscommunication. Not surprisingly, there was a very strong preference for capillary over venous sampling, as was found previously in a study by Woods *et al.*<sup>[27]</sup>

The advantages of pharmacist-led anticoagulation clinics, both in hospital outreach settings and in GP practices or primary care clinics are well established, but the same issues of patient convenience and accessibility still pertain.<sup>[18–22]</sup> There are relatively few reported studies of services based at community pharmacies. The current study underlined the benefits reported in those studies, including greater convenience and accessibility for patients, a greater clinical role for community pharmacists and a reduced burden on general practice. To the best of our knowledge, the current study is the first to report the benefits of combining point-of-care testing with decision support software in community pharmacy-based anticoagulation management.

### Implications for practice

The service was designed as a collaborative arrangement between patient, pharmacist and GP. Its continuation and expansion will depend not only on the skills and knowledge of pharmacists but their recognition and acceptance by patients and other health professionals. Our findings indicate that a significant number of patients are willing to accept this extended role, especially when it is viewed as a collaboration whereby the GP remains involved with their care. However, as seen in this project, there will be patients who prefer to remain with the GP-led model of care, mainly because of avoiding 'disloyalty' to the doctor or a lack of confidence in the pharmacist's training or motivation.

It has been observed previously that collaboration problems between GPs and community pharmacists can frustrate attempts to expand the role of community pharmacists.<sup>[28]</sup> Gaining the support of GPs, either individually or at a regional or national level, is likely to be one of the major barriers to wider implementation. A recent New Zealand study showed that while GPs are supportive of pharmacists being involved in medication review, they are less supportive of other clinical activities such as screening, monitoring and prescribing.<sup>[29]</sup> Some GPs may be attracted to the service if they view it as a delegation of routine work, allowing them to



focus on more specialist roles.<sup>[30]</sup> The issue of funding will also need to be addressed. The majority of GPs do not currently charge specifically for anticoagulation management and are funded through the general medical benefits scheme – there may be resistance from GPs and laboratories if funding reallocation to pharmacy is proposed.

GPs could potentially provide point-of-care INR testing in surgeries. This approach could increase patient convenience and acceptability when compared with the standard GP-led model of care. However, it would not achieve the aim of reducing the burden on general practice by better use of the health workforce. For some patients, self-monitoring of INR with a portable testing device and support from a health professional as necessary may be the optimum model of care. However, this might not be cost-effective for the funder and, as previously reported, only a small percentage of patients (14%) are likely to be willing and able to undertake it on a long-term basis.<sup>[31,32]</sup>

## Conclusion

This pilot study demonstrates the contribution community pharmacists can make to patient care beyond their accepted role of medicines provision, medication counselling and treating minor ailments. The study found that the majority of both patients and primary care practitioners accepted this extended role. Pharmacists reported high levels of satisfaction with being able to put their clinical knowledge to use in direct

patient care. A number of concerns were raised, particularly with regard to ensuring that there was adequate communication between health care providers. Wider implementation of the service will require strong collaborative relationships and will depend on the support of GP organisations. As a post-script to this study, CPAMS was established as a contracted community pharmacy service in New Zealand in late 2012.

## Declarations

### Conflict of interest

The Author(s) declare(s) that there are no conflicts of interest to disclose.

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### Authors' contributions

All authors contributed equally to the study and had complete access to the study data that support the publication.

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