

## Online osteoarthritis training programme for community-based clinicians: Mixed methods cohort study

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### ABSTRACT

**Background:** Core osteoarthritis interventions are ideally delivered in community-based settings. However, many community-based clinicians lack confidence and/or competence to effectively deliver high-quality, culturally-safe, evidence-based osteoarthritis care.

**Objective:** Assess changes in community-based dietitians', pharmacists', and physiotherapists' knowledge and confidence to treat people with knee osteoarthritis after completing online KneeCAPS training, and explore perceptions of usefulness, what clinicians learned, and how this influenced their ability to provide osteoarthritis care.

**Design:** Mixed methods cohort study with quantitative measures and qualitative free-text and focus group interviews.

**Results:** 158 clinicians completed baseline measures, of which 121 completed all required training modules and 68 provided 3-month follow-up; 17 participated in focus groups. Osteoarthritis Knowledge Scale scores (mean change 6.7; 95 % CI 5.1, 8.3) and Confidence in Osteoarthritis Skills scores (mean change 11.8; 95 % CI 9.4, 14.3) increased across the cohort. Clinicians considered the training was thorough, helpful, and clinically applicable. Clinicians reported increased confidence to manage osteoarthritis, and gaining knowledge and skills to help patients. Three themes reflected areas of learning or professional growth: the importance of culturally-safe relationship-building to engage all patients in care; helpful ways to think about osteoarthritis based on best evidence; and the focus and structure of consultations to support sustainable health behaviours. An integrative theme reflected new awareness of the impact of language and communication on patient relationships and outcomes.

**Conclusion:** KneeCAPS osteoarthritis training improved knowledge about and confidence in skills to manage knee osteoarthritis, particularly regarding culturally-safe relationships, paradigms for making sense of OA, supporting behaviour change, and communication to support participation.

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## 1. Introduction

Community-based care is ideally placed to deliver core recommended osteoarthritis (OA) interventions and mitigate inequities in access to care [1,2]. However, many primary care clinicians lack confidence and/or competence to effectively deliver co-ordinated and high-quality, evidence-based OA care [3]. Accessible and scalable training opportunities are needed to support clinicians to achieve OA competency standards.

In Aotearoa New Zealand (NZ) the prevalence and burden of OA amongst the Indigenous Māori population is higher than non-Māori [4]. Members of Indigenous communities in NZ and elsewhere report negative OA health care experiences that result in disengagement from health care, these include marginalisation, racism, and inadequate understanding of priorities by clinicians [5,6]. Provision of culturally-safe (see [Glossary](#)) OA care is important to realise health and wellbeing outcomes for people with OA in NZ and elsewhere [7,8] but inequities remain. NZ health regulatory bodies have set formal cultural safety standards to improve cultural safety practice and contribute to equity [9,10].

Online, self-guided learning allows clinicians to learn at their own pace and access learning irrespective of their geographic location, employment arrangements, or socioeconomic circumstance, enabling workforce capacity-building at scale [11]. Although some clinicians prefer learning through face-to-face workshops, these are associated with time and cost barriers, and many appreciate the self-directed and self-paced nature of e-learning [11–13]. Equivalent knowledge, belief, and behaviour changes can occur with online and face-to-face learning [14].

Qualitative evaluation of Australian physiotherapists completing the Physiotherapy Exercise and Physical Activity for Knee Osteoarthritis (PEAK) online e-learning programme indicates that physiotherapists highly value an e-learning model, but it is difficult to develop content to meet all learners' needs [11]. Small changes in intention to include patient education, strengthening exercises, and physical activity in treatment plans have been observed following e-learning, but the ability to change clinicians' OA knowledge and confidence in their OA management skills remains unexamined [15]. The way in which OA e-learning is perceived by other disciplines integral to OA care is also unknown.

Te Tauwhiro Turi mā te Rongoā | Knee Care for Arthritis through Pharmacy Study (KneeCAPS) is a randomised controlled trial (RCT) in NZ measuring the impact of structured community-based pharmacy, physiotherapy, and dietetic care for people with knee OA on health outcomes, health care use, and costs [16]. A programme of six self-guided knee OA e-learning modules and an online interprofessional workshop were designed for trial clinicians to support effective and consistent OA care. This programme drew on the PEAK e-learning modules and models of patient empowerment [11,17,18]. It addresses core recommended OA interventions (education to support self-management, structured land-based exercise, support to participate in physical activity, and dietary change for those who are overweight [19–21]). It uses strengths-based language, promotes biopsychosocial understanding of OA and cultural safety, addresses common misconceptions, and encourages active participation in health-enhancing behaviour, as emphasised by the Change Osteoarthritis Narrative global initiative [22]. Trial clinicians were required to complete the training programme before providing care to KneeCAPS participants.

The current study aimed to evaluate the KneeCAPS training programme. Specifically, it explored: 1) changes in clinicians' knowledge about knee OA and confidence in their skills to treat people with knee OA; 2) clinicians' perceptions of e-learning modules' usefulness; and 3) clinicians' reports of what they learnt and how this influenced their perceived ability to provide OA care.

## 2. Methods

This mixed-methods prospective cohort study includes quantitative measures, post-intervention free-text survey data, and qualitative focus

group data. Quantitative data were prioritised for assessing changes in knowledge and confidence. Qualitative data were prioritised for assessing training utility, learning, and influence on practice. Quantitative and qualitative datasets were analysed independently and integrated following analysis. Ethical approval was received from the University of Otago Human Ethics Committee (D22-166). The study is reported in alignment with the Strengthening the Reporting of Observational Studies in Epidemiology [23], Consolidated Criteria for Reporting Qualitative Studies [24], and Good Reporting of A Mixed Methods Study recommendations ([supplementary material 1](#)) [25].

### 2.1. Participants and setting

The study was advertised to pharmacies via email and expressions of interest sought. Local Community Pharmacy Groups selected pharmacies to participate based on the demographic characteristics of the client population and anticipated ability to assist achievement of RCT recruitment goals of 50 % Māori and 50 % non-Māori participants (described in RCT protocol [16]). All NZ registered pharmacists working in these pharmacies were invited to complete training. Aotearoa NZ registered dietitians and physiotherapists located near participating pharmacies were invited via emails distributed by their respective professional bodies. There was no screening or purposive selection of clinicians. All dietitian, pharmacist, and physiotherapist clinicians undertaking training as part of the KneeCAPS trial were invited to participate in the evaluation of the training programme. Community-based dietitians, pharmacists, and physiotherapists were recruited between August 18, 2022 and June 30, 2023. Training was completed by July 24, 2023. Follow-up data collection concluded November 11, 2023.

### 2.2. Exposure

E-learning modules were accessed via an open-access webpage (<https://www.freefromkneepain.org/resources/kneecaps-clinician-training>). Detailed description of the KneeCAPS training programme is in [supplementary material 2](#). To deliver care as part of the KneeCAPS trial, all trial clinicians were required to complete four core modules: 1) 'Culturally safe and ready to empower', focusing on culturally safe practice and implicit bias, Māori health models, health literacy, and interprofessional practice; 2) 'Empowering people with knee OA', focusing on positive language, OA explanatory models, and supporting behaviour change; 3) 'Physical activity, exercise, and knee OA', focusing on sustainable participation in physical activity and exercise; and 4) 'Nutrition, body size, and knee OA', focusing on healthy eating and drinking for all irrespective of weight. In addition, pharmacists were required to complete 'Medication review for people with knee OA' and physiotherapists were required to complete 'Exercise prescription for people with knee OA'; these two additional modules were open to all clinicians. In addition, after completion of e-learning most clinicians participated in a 90-min facilitated interactive and interprofessional online workshop to consolidate learning, enhance behaviour change skills, and discuss implementation with their own clients and in collaboration with clinicians from the other professions [12].

### 2.3. Data collection

Prior to undertaking training, participants completed measures to assess their OA knowledge and confidence in OA skills. On completion of each e-learning module, clinicians were asked to anonymously complete a brief evaluation of that module. Three months after each participant completed training, they were invited to repeat the OA knowledge and confidence measures. All quantitative data and all free-text data were entered by participants directly into the Research Electronic Data Capture electronic data management platform hosted at the University of Otago [26].

Following the conclusion of trial recruitment in their area, subgroups of clinicians (pharmacists, physiotherapists, dietitians) were invited to participate in a 90-min interdisciplinary focus group. Seventeen clinicians were purposively selected to include a range of gender, ethnicity (Māori, non-Māori), location, and KneeCAPS provision experience. There were four focus groups in total, each containing 3 to 8 participants, conducted in-person or via Zoom (Zoom Video Communications Inc., San Jose, CA) by an experienced facilitator. Focus groups were audio-recorded and transcribed verbatim.

## 2.4. Measures

### 2.4.1. Demographic characteristics

Characteristics collected included discipline, gender, age, ethnicity, and years of practice.

### 2.4.2. OA knowledge

OA knowledge was measured with the Knee Osteoarthritis Knowledge Scale (Knee OAKS) [27]. The 11 items are measured on a 5-point Likert scale (1 = false; 5 = true); total score range: 11–55. Higher scores indicate better knowledge. The OAKS is a unidimensional scale with adequate psychometric properties (assessed with people who have OA): person separation index was 0.75; test-retest intraclass correlation coefficient 0.85 (95 % CI 0.79, 0.90); and smallest detectable change 8 points [28]. The OAKS is based on international consensus of key information for people with OA and was designed to be answered by health professionals and the general public as well as people with OA, allowing collection of normative data across cohorts and settings [27]. It has been validated with health professionals [29].

### 2.4.3. OA confidence

Confidence in OA skills was measured using the scale developed by Briggs et al. [3]. The 16 items are measured on a 5-point Likert scale (1 = not at all confident; 5 = very confident); total score range: 16–80. Higher scores indicate greater self-rated confidence. Originally developed in relation to rheumatoid arthritis care and subsequently adapted to osteoarthritis [30]. Prior to deployment in the original RCT by Fary et al., [30] items were evaluated for internal consistency (Cronbach's  $\alpha = 0.91$ ) and test-re-test reliability was evaluated as high (ICC: 0.93; 95 % CI 0.81, 0.97). Adaptation to OA skills was evaluated for content validity [31], from which a modified kappa statistic was estimated for each item: range  $k = 0.83$  (95 % CI 0.80, 0.83) to  $k = 1.0$  (95 % CI 1.0, 1.0) [3,30].

### 2.4.4. E-learning module evaluation

Module evaluations were completed anonymously immediately after completion of an e-learning module and were not linked to survey responses. Clinicians reported their discipline and years' clinical experience (less than 2 years, 2–5 years, 5–10 years, more than 10 years). They were then asked to rate module usefulness (not at all, somewhat, moderately, very, extremely) followed by two free-text items ("What are three key things that you have learnt from this [module name] training module?" and "What, if any, change would you most like to see in the [module name] training module?").

### 2.4.5. Clinician focus groups

Focus groups, conducted after gaining experience of providing care to KneeCAPS participants, explored trial clinicians' experiences and perceptions of how training influenced KneeCAPS intervention delivery and their clinical practice, and their suggestions for future implementation. The semi-structured interview schedule was developed and iterated by the interdisciplinary research team (supplementary material 3). It included one warm-up item and one item to explore changes in thinking or clinical practice arising from training. Prompts covered how well training prepared clinicians for working with KneeCAPS trial participants or patients generally. Three specific sub-prompts were included to explore important areas that strongly emerged from e-

learning module evaluation: implicit bias, whakawhanaungatanga and the hui process (see Glossary) [32], and altering language to empower people with OA.

### 2.4.6. Sample size

No formal sample size calculation was undertaken for this evaluation study. The KneeCAPS trial sought 36 community pharmacists to meet RCT participant recruitment targets [16]. There was no pre-defined sample size for dietitian and physiotherapy participants.

## 2.5. Analysis

Demographic data were analysed using descriptive statistics (frequencies, medians and interquartile range). Clinicians who did not complete all the required e-learning modules were excluded from analyses of changes in knowledge or confidence.

The mean and standard deviation of the OA knowledge and confidence scores were calculated pre- and post-intervention for clinicians who completed baseline and follow-up measures and reported for the pooled cohort and by discipline. The mean change score with 95 % confidence interval was calculated to estimate the magnitude of any change, using a paired *t*-test to identify any statistically significant change, with alpha set at 0.05. Group interactions were not analysed. Item-missingness was handled in line with scale expectations (e.g. for OAKS, data from participants with some missing items but at least 12 complete items out of 15 were included using person-mean substitution to derive a total score) [33]. Loss-to-follow-up analysis explored whether clinicians who did not complete the follow-up measures varied from those included in analysis in terms of baseline knowledge or confidence.

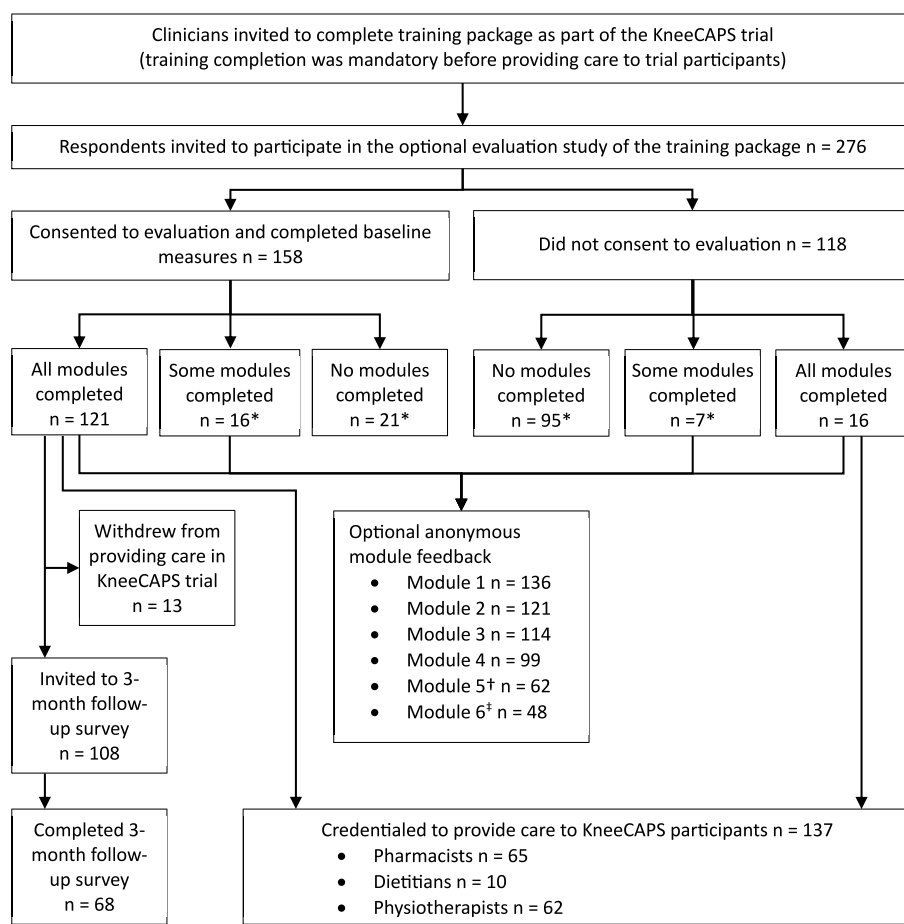
E-learning module evaluation measures were single time-point evaluations, reported using descriptive statistics, and were reported for all individuals completing the ratings (regardless of whether they completed all modules).

Qualitative methods are fully described in supplementary material 4. Data were managed with NVivo software and analysed inductively using Interpretive Description [34], with the goal of developing broad themes and ideas for intervention or implementation improvements. Two experienced qualitative researchers led a 7-person analytic team. Free-text data were analysed first to form an initial thematic framework, which evolved as focus group transcripts were iteratively coded not only against the existing thematic framework but also into new themes and sub-themes not previously identified in free-text data. The analytic team provided feedback at multiple stages of thematic development. Quantitative results together with qualitative themes were discussed with the wider research team to integrate findings.

## 3. Results

In total, 158 clinicians consented to participate and completed baseline measures, of these 121 (77 %) completed all required e-learning modules, and 68 (56 %) provided 3-month follow-up. Participant flow through the study is shown in Fig. 1. Participant characteristics and baseline scale scores are presented in Table 1 for those who completed the training and were able to deliver KneeCAPS care ( $n = 108$ ). Physiotherapists had the highest OA knowledge and self-reported confidence in OA skills at baseline. Dietitians and pharmacists had similar OA knowledge, but dietitians reported less confidence in their OA skills. The cohort that completed training and both surveys had slightly more physiotherapists and were a little older/more experienced than those who dropped out, but their baseline knowledge and confidence scores were comparable (supplementary material 5).

Evaluations of the four core e-learning modules were completed by between 99 and 136 people. Over half the clinicians completing modules had practised for more than ten years. Modules were rated as moderately, very, or extremely useful by 88–95 % of clinicians (Table 2). Free-text comments reporting the three key things learned were entered by



**Fig. 1.** Participant flow through the study.

Participation in the evaluation study was optional. Completion of module feedback was optional and anonymous and open to all those who completed a module, including those who declined to take part in the evaluation study of the training package. \* Module marked as complete when clinician entered their name and email address to receive a completion certificate; learners may have completed modules but not entered their details. † Module 5 completion was only required by pharmacists. ‡ Module 6 completion was only required by physiotherapists.

66–85 % of respondents and changes recommended were entered by 10–25 % of respondents.

### 3.1. Quantitative changes in OA knowledge and skills

OA knowledge scores increased across the cohort (mean change 6.7; 95 % CI 5.1, 8.3). Mean changes in dietitians (10.3; 6.0, 14.6) and pharmacists (11.9; 9.1, 14.7) were greater than the smallest detectable change of 8 points [28]. Mean changes in physiotherapists was smaller (2.4; 1.4, 3.4), with substantial ceiling effects (Fig. 2). Response change for individual items (supplementary material 5) was most marked for item 1 (wear and tear), item 2 (worse over time), item 4 (X-ray needed for diagnosis), and item 11 (need for joint replacement).

Confidence in OA skills scores increased across the cohort (mean change 11.8; 95 % CI 9.4, 14.3). Mean changes were greatest in pharmacists (17.9; 13.9, 21.9), followed by dietitians (12.3; 0.6, 24.0) and physiotherapists (7.4; 4.9, 10.0) (Fig. 3). Response change for individual items was greatest for item 3 (exercise), item 5 (medicines), item 7 (pain management), item 8 (prognosis), item 9 (lack of need for imaging or surgery), item 10 (OA beliefs), item 11 (shared decision-making), item 12 (management plan development), and item 13 (support health behaviour change).

### 3.2. Qualitative evaluation of training

Focus group data complemented free-text data by revealing how training had influenced and changed practice over time, whereas free-text comments (provided immediately after completion of each module) focused on what was learnt and expectations of practice change. Summaries of data are provided in Fig. 4. An overview of the general

findings, three key themes, and one integrative theme are presented with verbatim extracts below.

#### 3.2.1. General findings: the big picture: thorough, clinically relevant, and accessible

Module evaluation and focus group comments indicated that clinicians thought that the training was thorough, helpful, and directly applicable clinical practice. Clinicians reported that their confidence in their ability to manage OA and other conditions increased, and that they gained knowledge and skills for helping patients. Business owners felt the skills gained by their staff added value to their practice.

*I thoroughly enjoyed the education and I know I am a better clinician because of it. (Physiotherapist)*

Clinicians said they appreciated the online, self-paced approach and the flexible access, which allowed them to return to review the material later. They considered the content useful because it was new to them, shifted their thinking, or provided a clear succinct summary, reminder, or reinforcement.

*Information like that regular exercise is as effective as NSAIDs for pain and function, that actually blew my mind, I was shocked. (Pharmacist)*

Feedback was predominantly directly positive or framed positively (e.g. “some of it was not stuff that was new but it kind of reaffirmed a few things”). The few negative comments focused on aspects of e-learning platform functionality, or modules taking longer than advertised/necessary. For those who completed the ‘changes recommended’ item, the most common response was to suggest no change (Table 2). Suggestions of ways in which e-learning could be improved mostly related to platform functionality, altering indicated module time commitments,

**Table 1**  
Clinician characteristics at baseline.

Characteristic		Total n (%) or mean (SD)	Dietitian (n = 9)	Pharmacist (n = 46)	Physiotherapist (n = 56)
Age	20–29 years	34 (31.5)	1 (11.1)	9 (20.5)	24 (43.6)
	30–39 years	28 (25.9)	4 (44.4)	13 (29.5)	11 (20.0)
	40–49 years	20 (18.5)	3 (33.3)	10 (22.7)	7 (12.7)
	50–59 years	21 (19.4)	1 (11.1)	10 (22.7)	10 (18.2)
	60–69 years	5 (4.6)	0 (0.0)	2 (4.5)	3 (5.5)
	Not answered	3	0	2	1
Gender	Woman	74 (67.9)	8 (88.9)	30 (68.2)	36 (64.3)
	Man	35 (32.1)	1 (11.1)	14 (31.8)	20 (35.7)
	Not answered	2	0	2	0
Ethnicity	NZ	81 (74.3)	9 (100.0)	28 (63.6)	44 (78.6)
	European	10 (9.2)	2 (22.2)	3 (6.8)	5 (8.9)
	Māori	1 (0.9)	0	0	1 (1.8)
	Pacific	29 (26.6)	0	16 (36.4)	13 (23.2)
	Asian	3 (2.8)	0	1 (2.3)	2 (3.6)
	MELAA Not answered	2	0	2	0
Years in practice	Less than 2 years	22 (20.6)	1 (12.5)	5 (11.6)	16 (28.6)
	3–5 years	15 (14.0)	1 (12.5)	5 (11.6)	9 (16.1)
	6–10 years	11 (10.3)	0	6 (14.0)	5 (8.9)
	10–19 years	24 (22.4)	3 (37.5)	12 (27.9)	9 (16.1)
	20 years or more	35 (32.7)	3 (37.5)	15 (34.9)	17 (30.4)
	Not answered	4	1	3	0
KOAKS score <sup>a</sup>		46.6 (7.22)	41.3 (5.0)	41.3 (7.4)	51.3 (3.1)
Confidence in skills <sup>a</sup>		52.2 (12.5)	37.1 (6.7)	44.5 (8.4)	60.7 (9.0)

MELAA, Middle Eastern, Latin American, African. KOAKS, Knee Osteoarthritis Knowledge Scale (scores range from 11 to 55, higher scores indicate better knowledge). Confidence in Osteoarthritis Skills Scale (scores range from 16 to 80, higher scores indicate higher confidence).

<sup>a</sup> Scale scores are presented for those who completed follow-up surveys.

clarifying content or reducing repetition, and requests for more audio-visual content, practical examples, and client worksheets to build on existing content.

3.2.2. The three key themes

Three themes described what clinicians perceived were the key elements and messages expressed in the modules, and which aspects would support them to help people with OA in their own clinical practice. Across themes, participants described: a) areas in which their awareness or knowledge improved; b) ways in which they gained strategies to use with confidence in their clinical practice; and c) physical and online resources/aids they used (or intended to use) with their patients (Fig. 4).

**Theme 1: ‘Participation for all’** described clinicians’ perceptions that cultural safety e-learning helped them to improve accessibility to, and engagement in, OA care by building meaningful relationships founded on connection, understanding, and trust (trust in the clinician

and trust in the health system for marginalised groups). Two-way self-disclosure in building relationships with patients was recognised as central to the connection process.

*Developing a more meaningful relationship with patients [through whakawhanaungatanga] over and above rapport will lead to better communication and results for the patient and us. (Pharmacist)*

*That we have the potential to make someone feel more positive about the health or medical industry with our interactions. (Physiotherapist)*

Clinicians appreciated learning practical and step-by-step ways in which to implement this process in their clinical practice. The cultural safety module extended previous education they had undertaken.

*I have learnt more about the hui process, and in a way that I can easily incorporate into my own practice. (Pharmacist)*

The sense of ‘inclusiveness for all’ helped clinicians to recognise and work to overcome their implicit biases around weight and culture. Clinicians perceived that new awareness of the potential effects of implicit bias on patient outcomes, and regular use of self-audit tools, improved their ability to provide safe care to people from diverse cultural backgrounds and body sizes.

*I also thought the process of self-auditing was a good one since it is very hard to otherwise become aware of our blind spots. (Pharmacist)*

Clinicians reported learning about health literacy at organisation, clinician, and personal levels. This included ways to check patients’ understanding while enhancing mana and not making patients “feel like it’s a test”. Visual aids were appreciated to support patient health choices.

*Asking how someone will use the info you’ve provided as a way of checking their understanding and what they’ve retained that was meaningful. (Dietitian)*

*Visual aids as a support to spoken education to improve health literacy. (Pharmacist)*

**Theme 2: ‘Paradigms for making sense of OA and its management’** described new ways in which OA could be understood, explained, or managed, as well as the ways in which patients could be supported to develop helpful mindsets about OA and pain. Clinicians appreciated the inclusion of patient quotes in the e-learning to “help see their side of things”.

Clinicians frequently reported a new understanding of the myth that OA means progressive joint deterioration and inevitable joint replacement. The e-learning gave them a deeper awareness of how and why people with OA may be reluctant to exercise, as well as providing high-quality evidence-based information and helpful ways to talk confidently and dispel myths about OA, pain, exercise, pain medication, body size and healthy behaviour. Clinicians often repeated short, memorable verbatim soundbites from the e-learning, such as “Pain is an alarm system, not a damage report”.

*Exercise improves the health of the joint, it doesn't "wear it down". (Pharmacist)*

Clinicians appreciated easy access to peer-reviewed research articles and, for physiotherapists, specialised resources at such as the PEAK exercise program.

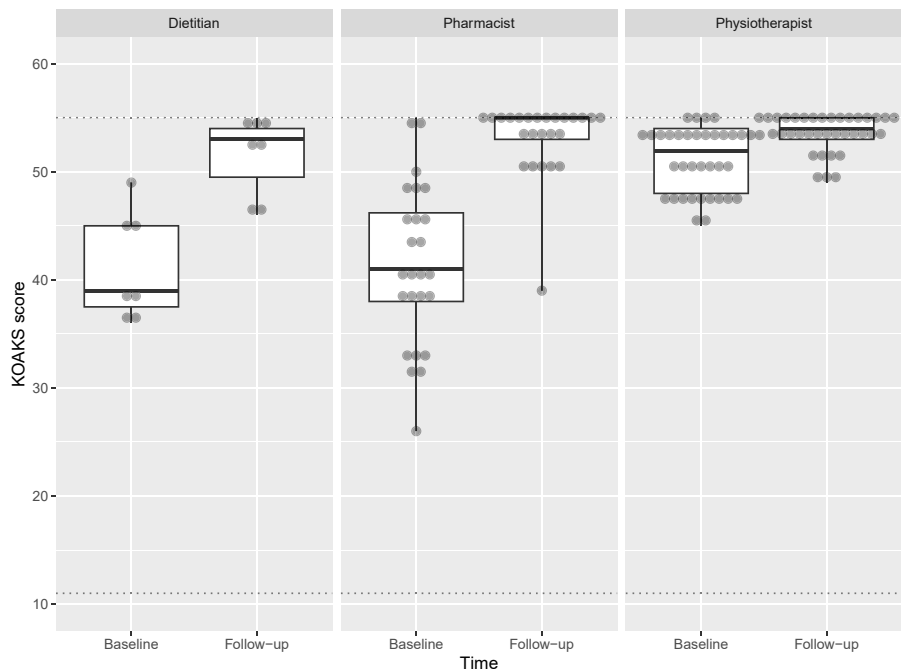
*Good to have access to the research articles to read the evidence, so sound more knowledgeable when discussing myths people have. (Physiotherapist)*

In addition to supporting health literacy and inclusiveness (see Theme 1), clinicians thought that the visual aids and resources supported their conversations with patients about beliefs, particularly those around

**Table 2**  
Characteristics and responses from clinicians who completed training module evaluations.

Characteristic		Cultural safety (N = 136) n (%)	Empowering OA (N = 121) n (%)	Physical activity and exercise (N = 114) n (%)	Nutrition and body size (N = 99) n (%)	Reviewing OA pain medications <sup>a</sup> (N = 62) n (%)	Exercise prescription <sup>b</sup> (N = 48) n (%)
Discipline	Dietitian	8 (6)	7 (6)	6 (5)	6 (6)	0	0
	Pharmacist	60 (44)	57 (47)	55 (48)	46 (46)	52 (84)	4 (8)
	Physiotherapist	66 (49)	55 (45)	52 (46)	45 (45)	7 (11)	43 (90)
	Missing	2 (1)	2 (2)	1 (1)	2 (2)	3 (5)	1 (2)
Years in practice	Less than 2 years	34 (25)	23 (19)	22 (19)	19 (19)	10 (16)	11 (23)
	Two to five years	13 (10)	11 (9)	10 (9)	8 (8)	7 (11)	4 (8)
	Five to ten years	18 (13)	17 (14)	14 (12)	13 (13)	9 (15)	4 (8)
	More than ten years	69 (51)	69 (57)	66 (58)	59 (60)	35 (56)	29 (60)
	Missing	2 (1)	1 (1)	2 (2)	0	1 (2)	0
Usefulness	Not at all useful	1 (1)	1 (1)	0	2 (2)	1 (2)	0
	Somewhat useful	7 (5)	6 (5)	9 (8)	4 (4)	6 (10)	3 (6)
	Moderately useful	26 (19)	18 (15)	23 (20)	16 (16)	17 (27)	7 (15)
	Very useful	72 (53)	61 (50)	56 (49)	55 (56)	26 (42)	21 (44)
	Extremely useful	26 (19)	33 (27)	24 (21)	22 (22)	12 (19)	17 (35)
Three key things learnt	Missing	4 (3)	2 (2)	2 (2)	0	0	0
	Free text data provided	115 (85)	102 (84)	91 (80)	75 (76)	41 (66)	37 (77)
	Not answered	21 (15)	19 (16)	23 (20)	24 (26)	21 (34)	11 (23)
Change most recommended	Free text suggestion provided	34 (25)	19 (16)	14 (12)	10 (10)	7 (11)	8 (17)
	Answered the recommended no change	40 (29)	46 (38)	41 (36)	30 (30)	20 (32)	12 (25)
	Not answered	62 (46)	56 (46)	59 (52)	59 (60)	35 (56)	28 (58)

<sup>a</sup> Module compulsory only for pharmacists but open to all disciplines.  
<sup>b</sup> Module compulsory only for physiotherapists but open to all disciplines.



**Fig. 2.** Knee Osteoarthritis Knowledge Scale scores at baseline and three months post-completion of training for dietitians (n = 7), pharmacists (n = 25), and physiotherapists (n = 36).

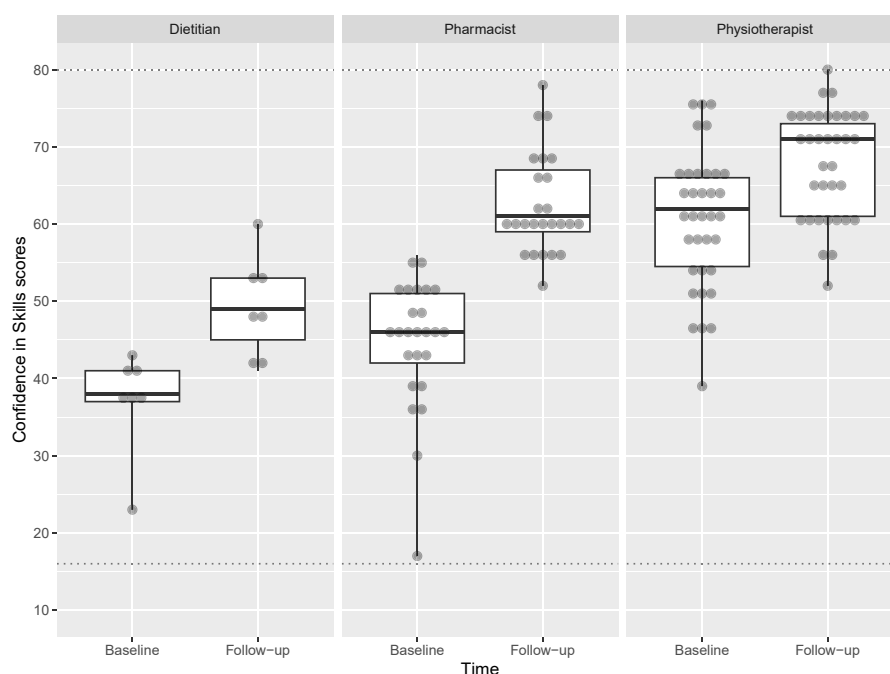
pain vs. damage, exercise/activity to improve joint health, and opioid or NSAID use. Resources to support interprofessional communication regarding changes in care were also appreciated.

As well as developing clinical skills to support patients, clinicians appreciated professional support. They felt the interprofessional workshop (via Zoom) helped reduce feelings of isolation by creating connections with like-minded clinicians. Direct connection to clinicians they would be working alongside was highly valued.

*It was nice to put faces to names; to meet real people (Pharmacist). That was really useful. (Dietitian)*

*[Different disciplines] getting the same terminology, the same strains of information ... it gave you really good confidence that you're singing from the same hymn sheet. (Physiotherapist)*

**Theme 3: 'Supporting sustainable healthy lifestyles'** described alterations to consultation structure (such as structured progression



**Fig. 3.** Confidence in Osteoarthritis Skills scores at baseline and three months post-completion of training for dietitians (n = 7), pharmacists (n = 25), and physiotherapists (n = 35).

toward OA exercise independence) and techniques (such as using Motivational Interviewing) to create individualised patient-centred plans, SMART behavioural goals, and sustainable steps toward healthy behaviour change. Applying these principles directly to OA care was appreciated, and particularly, specific examples of questions to ask patients with OA, ways to set expectations (including during OA flare-ups), and the clear structure and priorities for progressing patient independence for ongoing self-management and support-seeking.

*The importance of setting behavioural rather than outcome-based goals, focus on empowering people with knee OA to make positive, sustainable changes. (Physiotherapist)*

Clinicians described how they had learnt to respond to barriers, challenging questions, or difficult situations. This included reinforcing helpful paradigms introduced by other clinicians while helping the patient overcome lingering doubts about OA progression, pain, exercise participation, or medication use. Clinicians also appreciated having specific resources to recommend to patients; these included free online resources (e.g., painTRAINER™) and resources for use in the clinic, such as the exercise logbook to affirm the patient's progress.

### 3.2.3. Integrative theme

**‘How I communicate matters’** threaded through the other themes. For each of the three main themes, clinicians frequently described a new awareness of communication and its risks and opportunities, as well as skills and techniques to effectively share information.

*Confidence, because of how thorough that training was, then empowers you as a professional to know you're saying the right thing (Dietitian)*

Clinicians described learning language and phrases to alter perceptions of OA and its management, particularly in relation to pathophysiology, pain, exercise, healthy behaviours, and medication. This included both general language and specific words or phrases that allowed them to

use a participatory discourse to encourage engagement, enhance outcomes, and support patient empowerment.

*Absolutely that language that is so commonly used, that “bone-on-bone”, needs to be absolutely banned. It is just so detrimental ... [but] those little catchphrases, “motion is lotion” ... [when patients] say those back to you, like they've just discovered it ... And I was like “oh great!” (Physiotherapist)*

## 4. Discussion

This mixed-methods study explored community-based clinicians' perceptions of the online KneeCAPS OA training programme and assessed whether training was associated with an improvement in clinicians' OA knowledge and confidence in their clinical skills. Clinicians typically rated each e-learning module highly and there were meaningful improvements in their OA knowledge and confidence in OA skills between baseline and follow-up three months after training completion, closing gaps between disciplines that were measured pre-training. Three themes reflected areas of learning or professional growth: the importance of culturally-safe relationship-building to engage all patients in care; helpful ways to think about OA based on best evidence; and the focus and structure of consults to support sustainable health behaviours. An integrative theme reflected new awareness of the impact that language and communication methods have on the prior three themes.

These findings indicate that the KneeCAPS training programme can help to address previously identified gaps in community-based clinicians' OA knowledge and increase confidence in their skills to provide high-value OA care [3]. Clinicians reported that the training improved their knowledge and practice, described ways in which they could achieve this, and provided resources they could use in their daily practice. Key areas of improved knowledge were the nature and prognosis of OA, the unnecessary of X-rays for OA diagnosis and poor correlation with symptoms, and the majority not needing joint replacement. Key areas of improved confidence were explaining exercise, medicines, and pain management, and skills to develop management plans, share decisions,

Theme	Subtheme	Summaries of data extracts		
		Areas in which my awareness or knowledge was raised	Ways in which I gained confidence and strategies to improve what I do and what I say in my clinic	Online or hardcopy aids and resources to assist in my clinical work
Theme 1: Participation for all by building relationships founded on connection, trust, and understanding	Implicit bias	Cultural and weight bias, stigma, thin privilege	[Ways to check] self-awareness and self-audit of bias	Self-audit tool
	Building trust and connection	Cultural safety, whakawhanaungatanga, hui process, Māori models of health, using te reo, trust in the health system*	Acting to build trust and connection including self-disclosure, integrating the hui process	Hui process*
	Health literacy	Recognising the importance of health literacy.	Ways to check understanding while enhancing mana	[Visual] aids to understanding
Theme 2: Paradigms for making sense of OA and its management	Information	Evidence-based information about OA and its management	Helpful ways to talk with confidence about OA, pain, exercise, body size, healthy behaviour, and pain medication	OA booklet, video clips, research articles, websites, resources for patients care planning, guiding exercise intensity.
	Helpful paradigms	Models for explaining OA myths vs. facts, pain vs. damage, weight loss vs. health gain. Interprofessional connections with clinicians using similar paradigms	Ways to encourage a healthy mindset	Aids to communicate with other practitioners
Theme 3: Supporting healthy lifestyles	Consultation structure and techniques	Motivational Interviewing and creating patient-derived plans	Ways in which to structure consults to focus on the person and their goals	KneeCAPS consultation guide
	Focus on behaviours not outcomes	Importance of small sustainable behaviour-based goals Setting expectations, including during OA flare-ups	How to create individual plans, SMART goals and sustainable steps to support someone in healthy living. How to respond to barriers, challenging questions or situations	Exercise and physical activity log books
Integrative theme: How I communicate matters		Building relationships and understanding, empowering not impairing, building confidence and motivation	Engaging and sharing information effectively, framing conversations and altering perceptions	Specific phrases and words to reframe OA/pain/damage and exercise, healthy behaviours and pain medication

**Fig. 4.** Themes and subthemes arising from free-text and focus group analysis, including an integrative theme that cut across all themes.

SMART, specific, measurable, achievable, realistic, time-framed. \* The hui process is a process to effectively engage with Māori patients and whānau. Within this process, whakawhanaungatanga is a process for forming connection or relationship with another party. Te reo is the language of the Indigenous people of Aotearoa New Zealand.

and support positive health behaviour change. This programme therefore represents a fit-for-purpose training for the KneeCAPS RCT and an accessible and scalable mechanism to build community-based workforce capacity in OA care. Although designed to meet the needs of the NZ community, the KneeCAPS training programme was based on international evidence and research priorities, suggesting broader relevance [19–21,35].

This study extends previous qualitative findings that physiotherapists value web-based OA training [11]. Inclusion of pharmacists and dietitians demonstrates the opportunity to upskill clinicians from across community-based disciplines with one training programme and build transdisciplinary workforce competence. Qualitative findings indicated that completing a common training programme enabled clinicians from

these three disciplines to access a shared language and approach, supporting consistent messaging to patients and effective interprofessional communication. Reducing unwarranted care variation is a key health system priority to reduce the burden of OA [36]. Frustration with inconsistent, siloed care is commonly reported by people with OA [17, 37]. Our study demonstrates the opportunity to support consistency in best-practice care and communication through open-access e-learning available to and appropriate for a range of health disciplines and specific to the local clinical and cultural context [17].

A key component of the KneeCAPS training programme was the cultural safety e-learning module and this was highly valued by clinicians. They considered that it provided the knowledge and skills to ensure that people from diverse communities, backgrounds, and health

literacy levels could meaningfully and safely participate in care. Clinicians said this module filled a gap in professional development and was an accessible way to develop cultural safety capability. This aligns with findings that a cross-cultural training programme (including a 1.5 h online module and full-day face-to-face workshop) was acceptable to pharmacists and increased capability and motivation to deliver culturally responsive care [38]. Cultural safety is a universal concept applicable to all contexts [5,7]. While this module used interaction with Māori patients as examples, the core concepts are applicable to clinicians practising in any context.

Prior interest in OA, in initiatives to improve service delivery, or in online learning may have influenced clinicians' participation in this study, raising the possibility that findings may not be generalisable to all clinicians from these disciplines. Equally, however, the free and flexible nature of this training programme may have attracted clinicians needing development opportunities to meet their professional requirements. Physiotherapists' confidence in OA skills scores were similar to those found in prior research involving Australian, Canadian, and NZ physiotherapists [3]. It is likely that those who opt in to any future implementation of the new model of OA service delivery (for which training was developed) will be similarly inclined. As such, these findings could inform expectations of the impact of training on these clinicians. Many clinicians valued the comprehensive nature of the e-learning, however, a small number noted that these took too much time.

This study used validated measures of OA knowledge and confidence in OA skills but did not directly assess clinical performance nor include a control group. It is possible that the changes in OA knowledge and confidence measured were influenced by factors external to the study, however, we are unaware of any systematic clinician OA training interventions that occurred at the same time as this study. OAKS items could be considered basic for clinicians, however, a previous study found comparable scores in people with knee OA and clinicians [29]. Baseline OAKS scores were high for physiotherapists (mean 51.3/55), but much lower for dietitians and pharmacists (mean 41.3/55), indicating the scale was appropriate for this cohort and to explore whether consistent knowledge was held after training. Sample size for the study was driven by using a convenience sample of those completing training to deliver care as part of the KneeCAPS trial (which was formally powered to meet participant recruitment targets); the evaluation was not powered to detect any specific magnitude of knowledge or confidence change, and no formal hypothesis testing was undertaken between groups of clinicians. As per any completed study, the confidence intervals reported for the mean changes in outcome scores between pre- and post-training periods provide the best reflection of the impact of sample size on the change estimates (and the lower bounds of these confidence intervals suggest that there is). Our interpretation that knowledge and confidence changes observed are meaningful is subjective as there are no established minimal clinically important differences for these scales; the changes observed equate to a mean 15 % improvement for knowledge score (27 % for pharmacists) and 18 % improvement for confidence score (28 % for pharmacists). Future studies could assess whether knowledge and confidence result in improved clinician competence or patient outcomes [14].

Few dietitians participated, reflecting the low prevalence of community-based dietitians in NZ. Three-quarters of participants completed all required modules, well above rates commonly observed for free e-learning courses [15,39]. E-learning modules are hosted on open-access dynamic webpages rather than Learning Management System (LMS) to reduce recognised access barriers associated with LMS account creation [15]. Webpages store progress (including quiz completion) while open, but reset when closed and only recorded completion when the clinician entered their details to receive a certificate. Some participants expressed frustration with this functionality (including reporting completing modules without entering their details); this may have contributed to either clinicians not completing

all modules or module completion not being recorded. Optional creation of an LMS account could be considered in future. Face-to-face workshops could also be offered for those who prefer this mode of learning [13].

As is common in studies involving clinicians, not all clinicians who completed training consented to participate in the evaluation and amongst those who did, there was moderate loss-to-follow-up (37 %). Comparison of baseline characteristics between those who completed both measures and those lost to follow-up did not identify any meaningful differences in key demographic characteristics, OA knowledge, or confidence. Clinicians who did not take part in the evaluation (before and after surveys and focus groups) were able to rate e-learning modules and leave anonymous free-text comments that were included in analysis and many did so.

In conclusion, this study demonstrates that an online programme of OA training improved knowledge about OA and confidence in skills to manage OA in community-based dietitians, pharmacists, and physiotherapists in NZ. Clinicians considered the training to be useful and reported learning information, skills, and techniques that enabled them to provide better OA care. Clinicians found cultural safety training particularly valuable, including frameworks for creating connection and establishing trust. These non-technical aspects of care are important to include in future training programmes, particularly in countries with diverse populations such as Indigenous peoples.

## Author contributions

All authors made substantial contributions to study conception or design, or data acquisition, analysis, or interpretation, and reviewed the paper critically for important intellectual content, approved the final version to be published, agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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## Declaration of competing interest

All authors state that they have no conflicts.

## Glossary

**Cultural safety** The requirement for clinicians to be aware of their own culture and context, to acknowledge and address any of their own biases, attitudes, assumptions, stereotypes, prejudices, structures and characteristics that may affect the quality of care provided, and to engage in an ongoing process of self-reflection, self-awareness, and self-accountability, and to provide care within the framework of recognising and respecting the difference of any individual.

**Hui process** A framework to guide clinical interaction with Māori derived from engagement and relationship building principles of Te Ao Māori (the Māori world). It applies traditional principles of greeting, introducing, starting a relationship, and closure of an encounter to the setting of a health consultation.

**Mana** Prestige, power, authority

**Māori** Indigenous people of Aotearoa New Zealand

**SMART goals** Specific, Measurable, Achievable, Realistic, Time-framed  
**Whakawhanaungatanga** Forming a connection or relationship between parties.

**Whānau** Family and support network

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ocarto.2025.100610>.

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