ORIGINAL RESEARCH ARTICLE

Development and Evaluation of An Online Motivational Interviewing Course for Diabetes Care in Primary Health Care Teams

Chutima Wachrakul[1], Isaraporn Thepwongsa[2]*, Pat Nonjui[3], Radhakrishnan Muthukumar[4]

[1,2,3]Department of Community, Family and Occupational Medicine, Faculty of Medicine, Khon Kaen University, Thailand
[4]Academic Affairs, Faculty of Medicine, Khon Kaen University, Thailand

DOI: 10.55489/njcm.160920255768

ABSTRACT

Background: Optimal diabetes management requires sustained patient behavior change, yet many primary care professionals lack proficiency in Motivational Interviewing (MI). Online learning represents a flexible modality to enhance MI competencies; however, structured programs tailored for multidisciplinary teams remain scarce. This study aimed to design and evaluate an online MI course for healthcare professionals engaged in diabetes care within Thai primary care settings.

Methods: A three-phase research and development approach was employed. Phase 1 comprised a learning needs assessment with 320 professionals and focus group discussions with nine volunteers. In Phase 2, an online course was developed using the ADDIE framework, content validated by three experts, and pilot tested with seven participants. Phase 3 involved course implementation using a one-group pretest–post-test design.

Results: Of 320 professionals, 174 responded (54.4%). Most (65.5%) had no prior MI training but reported strong interest (mean = 4.30, SD = 0.61). The finalized seven-lesson multimedia course demonstrated high appropriateness (IOC = 1.00). Thirty-nine participants (12.2%) enrolled, with post-training knowledge scores significantly higher than pre-training scores (19.10 vs. 13.36, p <0.001). Two-thirds reported maximal knowledge application, and overall satisfaction was high (mean = 4.41, SD = 0.41).

Conclusion: The online MI course significantly enhanced knowledge and demonstrated strong acceptability, supporting its potential scalability across Thailand's primary care system and adaptability to other similar areas.

Keywords: Continuing education, Diabetes care, Motivational Interviewing, Multidisciplinary professionals, Online learning, Primary health care

ARTICLE INFO

Financial Support: None declared
Conflict of Interest: The authors have declared that no conflict of interests exists.
Received: 29-06-2025, **Accepted**: 19-08-2025, **Published**: 01-09-2025
***Correspondence:** Isaraporn Thepwongsa (Email: tisara@kku.ac.th)

How to cite this article: Wachrakul C, Thepwongsa I, Nonjui P, Muthukumar R. Development and Evaluation of An Online Motivational Interviewing Course for Diabetes Care in Primary Health Care Teams. Natl J Community Med 2025;16(9):916-924. DOI: 10.55489/njcm.160920255768

www.njcmindia.com | pISSN: 0976-3325 | eISSN: 2229-6816 | Published by Medsci Publications

INTRODUCTION

Diabetes is a major global health concern, affecting approximately 537 million people worldwide as of 2023, with numbers projected to reach 700 million by 2045.[1] Complications from diabetes include cardiovascular disease, kidney disease, vision loss, and lower-limb amputations.[2] Effective management of type 2 diabetes requires not only medical treatment but also sustained lifestyle and behavioral changes an ongoing challenge in chronic care.

Motivational Interviewing (MI) is a proven counseling technique that supports health behavior change by strengthening patients' internal motivation. Unlike traditional advice-giving, MI emphasizes collaboration and autonomy, helping patients commit to change. Evidence shows that MI improves dietary habits, physical activity, self-care confidence, and clinical outcomes in people with diabetes.[3-5]

In Thailand, primary healthcare plays a key role in chronic disease management,[6] especially in rural areas where healthcare teams have close relationships with patients. In Thailand, diabetes represents a substantial healthcare burden, with approximately 6.5 million people affected. The National Health Security Office reported that non-insulin dependent diabetes ranked as the second most common outpatient service under the universal health coverage scheme, accounting for over 11.3 million visits in fiscal year 2023 alone.[7] This significant care demand places considerable pressure on Thailand's primary healthcare infrastructure, highlighting the urgent need for effective training programs to enhance healthcare professionals' capacity in diabetes management. However, heavy workloads and limited consultation time often only 1–10 minutes per patient make it difficult for staff to use traditional, time-intensive behavior-change strategies[7]. MI is particularly well-suited to such constraints, as it can be adapted for brief interventions without losing its core effectiveness. The Thai Ministry of Public Health has classified MI as part of Brief Intervention approaches designed for short clinical encounters[8,9], and evidence shows that even condensed MI training can enhance healthcare professionals' ability to integrate these techniques within limited time frames.

Online learning is a promising approach[10] to address this training gap. It offers flexibility and accessibility, allowing healthcare personnel to learn at their own pace, despite time and resource constraints. Recent evidence supports the efficacy of online learning in multidisciplinary healthcare settings. Well-designed online programs have been shown to significantly improve participants' knowledge, confidence, and counseling skills, with outcomes comparable to or exceeding those of traditional in-person workshops, particularly when interactive and practice-based components are included.[11,12] Previous studies also report that online delivery can enhance scalability, reduce training costs, and facilitate participation across geographically dispersed teams without disrupting routine clinical services.[13,14] These advantages are especially relevant in resource-constrained environments, such as Thailand's primary care system, where time, staffing, and travel limitations hinder access to in-person training.

Online synchronous MI training demonstrates comparable effectiveness to traditional face-to-face training.[15] Web-based MI training courses have shown positive results across different healthcare professional levels.[16] However, few specifically examine online MI training effectiveness within integrated team-based care models.[16] This underscores the potential of an online MI course to address skill gaps and support capacity building among diverse primary care professionals. In addition, since 2020, Thailand's Division of Non-Communicable Diseases has promoted online training for diabetes and hypertension care,[17] yet structured online MI courses for multidisciplinary teams remain scarce. Therefore, this study aimed to develop an evidence-based online MI course for multidisciplinary primary care team.

METHODOLOGY

Study Design: This study employed a three-phase design: (1) a needs assessment using mixed methods, (2) development and pilot testing of the course, and (3) course implementation followed by pre- and post-intervention evaluation using a one-group pre-test-posttest design. While this design limits causal inference due to the absence of a control group, it was deemed appropriate for this research and development study, which aimed to develop an online MI course designed for Thailand's primary healthcare context rather than to test intervention efficacy.

Participants: Multidisciplinary healthcare professionals were recruited from primary care units in the seventh Health Region, Thailand. In Phase 1, 320 participants were selected through multi-stage stratified random sampling, conducted in three steps: first, simple random sampling of two districts from each of the four provinces in the seventh Health Region (total of eight districts); second, simple random sampling of six primary care units (PCUs) from each selected district (total of 48 PCUs); and third, inclusion of all multidisciplinary professionals working in the selected PCUs for the learning needs assessment. Phase 2 involved seven participants from a single primary care unit to enable feasibility testing within a controlled setting before broader implementation. Phase 3 consisted of implementing the online MI course for healthcare professionals in the selected region who self-enrolled, with course evaluation conducted using a one-group pretest–posttest design.

Inclusion criteria: Participants were healthcare professionals (physicians, nurses, and public health officers) working in primary care units, actively in-

volved in diabetes counseling, and willing to voluntarily participate, with or without prior MI training.

Instruments: Expert-validated tools were used across all phases. Phase 1 employed a needs assessment survey and focus group discussion guide, validated by three experts using content validity index (CVI ≥ 0.80 for all items) with reliability testing showing Cronbach's alpha of 0.89. Phase 2 utilized a focus group guideline for pilot course feedback, with content validation by three experts specializing in curriculum development, motivational interviewing, and e-learning program development to assess format appropriateness, content relevance, and language clarity. Phase 3 included pre- and post-intervention knowledge tests and a course satisfaction questionnaire, with content validity assessed by three experts to ensure alignment between test items and learning objectives.

Data Collection: Phase 1 included online surveys conducted from July to August 2022, followed by focus group discussions via Zoom in February 2023. Phase 2 involved a one-month pilot of the online course, followed by focus group discussions to gather feedback. Phase 3 implemented a two-month online training program, accompanied by pre- and post-course knowledge assessments and a satisfaction survey.

Data Analysis: Quantitative data were analyzed using descriptive statistics and paired t-tests. Qualitative data from focus group discussions were analyzed using content analysis.

Ethical Approval: This research study was approved by the Human Research Ethics Committee of Khon Kaen University (project numbers: HE651145 and HE661346). All participants involved in focus group discussions provided informed consent after receiving complete information disclosure. Additionally, the return of completed questionnaires by research participants was considered as implied consent.

RESULTS

Phase 1: Learning Needs Assessment

General Information of Survey Respondents: A total of 174 out of 320 healthcare professionals completed the survey, yielding a response rate of 54.4%. The majority were female (82.8%), with most working as nurses (44.3%). More than half (54.6%) had less than 10 years of experience in providing diabetes counseling (Table 1). Notably, 79.9% had never participated in e-learning training, and 65.5% had never received training in MI, highlighting a critical need for skill development in this area.

Participants' Needs for Educational Content: Survey findings indicated a high level of learning needs across all topics (Table 2). The greatest need was reported for learning about the principles of MI (Mean = 4.19, SD = 0.79), followed by the Stages of Change theory (Mean= 4.14, SD = 0.09), diabetes-related knowledge and behavioral risk factors (Mean = 4.10, SD = 0.69), and the application of MI through the DARES components (Mean = 4.07, SD = 0.87).

This hierarchy of learning needs suggests that participants place greater importance on foundational knowledge of MI and related behavioral theories, which are essential for the effective application of counseling techniques. General principles were prioritized over specific techniques such as OARS (Mean = 3.98, SD = 0.89), likely reflecting limited prior exposure or familiarity with these approaches.

Participants' Needs for Educational Methods: Participants reported high-level needs for technology-related skills, particularly in using smartphones or tablets (Mean = 4.06, SD = 0.74) and internet navigation (Mean = 4.05, SD = 0.77), indicating overall readiness for online learning. They expressed a strong preference for short, daily online learning sessions of 10–15 minutes (Mean = 3.90, SD = 0.87). However, the willingness to engage in learning during work hours (Mean = 3.44, SD = 1.01.) or after work (Mean = 3.27, SD = 1.14) was rated at a moderate level, reflecting time constraints and the heavy workload faced by healthcare personnel (see Table 3).

Regarding assessment and evaluation, participants expressed the highest level of need for access to correct answers and the issuance of certificates upon successful completion of the course (see Table 4). This reflects a strong desire for formal recognition of their learning achievements.

Table 1: Demographic Characteristics of 174 Phase 1 Survey Respondents (n=174)

General characteristics	Respondents (%)
Sex	
Males	30 (17.2)
Females	144 (82.8)
Age (years)	
<30	25 (14.4)
30-39	61 (35.1)
40-49	58 (33.3)
≥50	30 (17.2)
Current position	
Physician	2 (1.1)
Nurse	77 (44.3)
Public health officer	59 (33.9)
Public health technician	27 (15.5)
Others	9 (5.2)
Experience in diabetes patient counseling care (years)	
<5	51 (29.3)
10-Jun	44 (25.3)
15-Nov	39 (22.4)
16-20	28 (16.1)
≥21	12 (6.9)
Previous e-learning training	
Yes	35 (20.1)
No	139 (79.9)
Motivational Interviewing training	
Yes	60 (34.5)
No	114 (65.5)

Table 2: Participants perceived needs for Motivational Interviewing content (n = 174)

Participants perceived needs for learning content	Mean ± SD	Interpretation
Principles of Motivational Interviewing (MI)	4.19 ± 0.79	high level
Stage of change theory	4.14 ± 0.90	high level
Knowledge about diabetes and risk behavior	4.10 ± 0.69	high level
DARES components of MI	4.07 ± 0.87	high level
Summary of MI lessons for diabetic patients care	4.06 ± 0.92	high level
Example of using DARES components in MI	4.01 ± 0.84	high level
Motivational counseling using OARS participatory techniques	3.98 ± 0.89	high level
Example of using OARS techniques in MI	3.98 ± 0.89	high level

Table 3: Participants perceived needs for online educational methods (n = 174)

Participants perceived needs for online educational methods	Mean ± SD	Interpretation
Require having knowledge and skills in using a smart phone/tablet	4.06 ± 0.74	high level
Require knowledge and skills in using the internet	4.05 ± 0.77	high level
Require knowledge and skills in using computers	4.00 ± 0.75	high level
Require learning 10-15 mins/day through online systems	3.90 ± 0.87	high level
Require online learning during working period	3.44 ± 1.01	moderate level
Require online learning outside working hours	3.27 ± 1.14	moderate level

Table 4: Participants' needs for Motivational Interviewing course assessment and evaluation (n = 174)

Requirements for measurement and evaluation systems	Mean ± SD	Interpretation
Need to receive a certificate upon completion according to the course criteria	4.18 ± 0.83	highest level
Need to know the test answers after completed the learning unit	4.16 ± 0.76	highest level
Need to know the test scores before and after studying	3.93 ± 0.79	high level
Require for pre- and post-test	3.86 ± 0.85	high level

Qualitative data from focus group discussions highlighted several significant challenges in current practice. The most prominent issue was time constraints, as each hospital typically manages care for around 60 diabetes patients, yet only 1–10 minutes are available per counseling session. This underscores the need for brief, highly effective counseling techniques. Another major challenge was facilitating behavior change; despite understanding the advice, many patients failed to follow through or reverted to previous behaviors after initial improvement. This indicates a strong need for techniques that foster sustainable, intrinsic motivation. Content analysis revealed that difficulties in achieving sustained behavior change were the most frequently cited challenge, with 77.8% of focus group participants (7 of 9) noting that patients understood advice but struggled with follow-through. Nearly half (44.4%) requested course modules of 30 minutes or less to accommodate heavy workloads (see Table 5).

In terms of course preferences, participants emphasized the need for flexible online learning with practical, ready-to-use content that can be accessed anytime. They preferred learning modules of no more than 30 minutes. Additionally, they expressed a desire for content focused on building awareness and motivation, supported by culturally relevant media that reflects Thai contexts rather than foreign illustrations.

Phase 2: Course Development and Pilot Testing

Course Development: The developed online course comprises seven lessons and includes pre- and post-course knowledge assessments. The total study time is approximately 2 to 2.5 hours. Course content covers the following topics: diabetes and behavioral risk factors, foundational concepts of MI, the Stages of Change theory, the DARES components of MI, "OARS" communication techniques, and methods for measuring and evaluating MI outcomes.

The lessons are delivered through a variety of multimedia formats, including video lectures, text-based slides, images, animations, and role-play demonstration videos. The course is hosted on KKUMEDX, the online learning management system of our medical school. Each lesson includes formative assessments, with pre- and post-tests to evaluate knowledge acquisition and end-of-lesson quizzes.

Pilot Testing of the online MI course: Pilot testing of the course with multidisciplinary healthcare professionals at a primary care unit, followed by focus group discussions, identified several areas for improvement. System usability issues, particularly during registration, were addressed by developing step-by-step user manuals and establishing support channels via a LINE group. To reinforce learning, participants expressed the need to review content for better comprehension, leading to system modifications that allowed repeated attempts at end-of-lesson tests. Content relevance was also enhanced by incorporating conversation examples specifically related to diabetes care and adjusting illustrations including role-play scenarios with dialogue examples for diabetes dietary counseling, such as advising patients to reduce starchy foods like sticky rice and high-sugar fruits, to reflect Thai cultural contexts, along with improving font readability. Additionally, participants requested more accessible communication channels for technical support, prompting inclusion of telephone, email, and LINE contact options.

Table 5: Participants' experience and expectations of the online Motivational Interviewing training course

Participants' experience and expectations of online Motivational Interviewing training course	Comments
Continuing professional development courses related to diabetes care Various training courses were provided for the staff, including individual nutritional counseling, exercise sessions by external trainers, and meditation therapy. (M1, M3, M4, M6)	*"We used to have a nutritionist from hospital who came to teach us about dietary planning" M1* *"We also invited external speakers to teach about exercise, meditation therapy, and traditional Thai stretching exercises using Ruesi Dutton methods" M4*
Internet accessibility, computer and equipment facilitating online learning at primary care units Participants were fully IT-ready, with adequate devices and internet access at work and home, enabling unhindered participation in online learning. (M1, M2, M5)	*"Regarding IT equipment, I think all staff members are well-equipped and ready for online learning." M2*
Preferred characteristics of online courses on motivational counseling for diabetes patient care Participants preferred flexible learning to avoid disrupting their routine patient care. The courses should be limited to 30 minutes, presenting content with multimedia. The course should enable self-paced learning with instructor communication via Line or email. (M1, M3, M4, M6)	*"We have to admit that during online meetings or classes, we often need to do multitask. For example, while attending an online meeting at the health center, we still need to see our patients" M3* *"However, if it's an online course where the content is readily available, like video lectures that we can access and watch whenever we are available that would work much better" M4* *"I think it'd work really well if we make each online module lasts just only 30 minutes or less" M6*
Specific learning content for helping healthcare professionals to provide counseling diabetes patients to change their behavior Participants needed to learn motivational interviewing to enhance patients' awareness of their uncontrolled blood glucose and complications. Patients somewhat understood diabetes self-management but struggled with diet and exercise habits. (M1-M3, M4, M5, M6, M9)	*"Many of our patients understand everything, but don't follow the advice. It's mainly because they can't see the immediate impact. Like weight for example - they don't really think about how being overweight now could cause future problems" M3* *"We need techniques to help patients recognize the severity of their high blood sugar levels and motivate them to take control of their condition" M5*
Expectations for the online course on motivational counseling for diabetes patient care Participants requested clear, and focused instructional design course with easy-to-understand and clear objectives. Slides should be concise and relevant. Pre- and post-tests are needed per module, along with a completion certificate. Continuing education credits would be valuable. (M1, M3, M6, M7, M8, M9)	*"Personally, I prefer lecture slides... I like slides that are easy to read, with minimal text but concise and focused content" M7* *"Audio needs to be clear, and content should match the instructor's teaching goals. Things like animations or dialogue scenarios work well as they're easy to visualize" M8*

Phase 3: Course Implementation and Evaluation

A total of 39 participants (12.2%) voluntarily enrolled in the online MI course and completed both pre- and post-tests.

Knowledge Assessments: A comparison of pre- and post-test scores among 39 participants revealed a statistically significant improvement in knowledge, increasing from Time 1 (mean = 13.36, SD = 2.76) to Time 2 (mean = 19.10, SD = 2.19), t (38) = 12.19, $p < 0.01$ (two-tailed). The mean increase in knowledge test scores was -5.74 (SD = 2.91) (95% CI, -6.69, -4.79). The effect size was large (Cohen's d = 1.95), indicating substantial improvement in participants' knowledge following completion of the online MI course. The reduction in standard deviation also indicates a greater consistency in participants' knowledge following the training.

Table 6 shows the end-of-lesson test results, which indicated that the highest average scores were achieved in Lesson 6: Measurement and Evaluation of MI, and Lesson 1: Diabetes and Risk Factors. In contrast, the lowest average scores were observed in Lesson 2: Basic Knowledge of MI and Lesson 3: Stages of Change Theory, aligning with the lower performance areas identified in the pre-training assessment.

Table 6: Participants' end-of-lesson test score by topic (n = 39)

End-of-lesson test scores	Lowest	Highest	Mean ± SD
Diabetes and risk behavior	3	5	4.54 ± 0.68
Basic knowledge of MI	1	5	3.77 ± 1.22
Stage of Change theory	1	5	4.00 ± 1.21
DARES components in MI	1	5	4.10 ± 1.02
"OARS" techniques for MI	1	5	4.21 ± 1.00
Measurement and evaluation of MI	2	5	4.62 ± 0.75

The pre-training knowledge assessment of the 39 participants highlighted both strengths and areas for improvement. Participants demonstrated a solid understanding of basic diabetes knowledge, particularly regarding average cumulative blood glucose (HbA1c), with 92.3% answering correctly, and over 60% correctly responding to other diabetes-related items. However, notable gaps were identified in their understanding of MI.

Table 7: Participants' satisfaction with the online Motivational Interviewing course for diabetes care (n = 39)

Assessment Item	Highest (%)	High (%)	Moderate (%)	Low (%)	Lowest (%)	Mean ± SD
Media Quality						
Visual presentation quality	17 (43.6)	22 (56.4)	-	-	-	4.44 ± .50
Animation quality	20 (51.3)	19 (28.7)	-	-	-	4.51 ± .51
Text presentation quality	23 (59.0)	16 (41.0)	-	-	-	4.59 ± .49
Audio quality	21 (53.8)	17 (43.6)	1 (2.6)	-	-	4.51 ± .56
Media attractiveness	27 (69.2)	12 (30.8)	-	-	-	4.69 ± .47
Media effectiveness	28 (71.8)	10 (25.6)	1 (2.6)	-	-	4.69 ± .52
Course Content						
Content clarifies and interest	23 (59.0)	15 (38.5)	1 (2.6)	-	-	4.56 ± .55
Content amount appropriateness	23 (59.0)	14 (35.9)	2 (5.1)	-	-	4.54 ± .60
Content comprehensiveness	24 (61.5)	15 (38.5)	-	-	-	4.62 ± .49
Module length appropriateness	25 (64.1)	13 (33.3)	1 (2.6)	-	-	4.62 ± .54
Practice relevance	24 (61.5)	15 (38.5)	-	-	-	4.62 ± .49
Practical applicability	28 (71.8)	11 (28.2)	-	-	-	4.72 ± .46
Learning Outcomes						
Learned from the course content	27 (69.2)	12 (30.8)	-	-	-	4.69 ± .47
Ability to apply knowledge in practice	26 (66.7)	13 (33.3)	-	-	-	4.67 ± .48
Experience from the course is useful at work	25 (64.1)	14 (35.9)	-	-	-	4.64 ± .49
Knowledge improvement	23 (59.0)	16 (41.0)	-	-	-	4.59 ± .49
System Usability						
Registration ease	15 (38.5)	19 (48.7)	4 (10.3)	1 (2.6)	-	4.23 ± .74
System stability	18 (46.2)	19 (48.7)	2 (5.1)	-	-	4.41 ± .59
Learning support	22 (56.4)	15 (38.5)	2 (5.1)	-	-	4.51 ± .60
Certificate accessibility	18 (46.2)	19 (48.7)	2 (5.1)	-	-	4.41 ± .59

These included limited knowledge about the structure of MI sessions, the importance of evaluating MI during the counseling process, the appropriate use of decisional balance discussions, and identifying the core components of MI.

Satisfaction Assessment: Participants reported high to very high levels of satisfaction across all aspects of the course. The course content received the highest ratings, particularly for its practical applicability and relevance to professional practice, indicating that the course was well-designed. Participants noted that they gained new knowledge, were able to apply it in their work, and developed a deeper understanding after completing the training demonstrating the course's overall effectiveness.

The teaching media were rated as engaging and supportive of the learning process. However, satisfaction with the online platform was comparatively lower, especially regarding learning support and system stability. Registration received the lowest satisfaction scores, primarily due to initial issues with password setup and course access. These problems were promptly addressed by providing step-by-step user guides via Line groups, and no further technical difficulties were reported throughout the remainder of the training. (see Table 7)

DISCUSSION

This study explored the development and evaluation of an online course on MI tailored for multidisciplinary healthcare professionals in Thailand's primary care system. In Phase 1, findings revealed a substantial training gap. While a majority of participants had never received prior MI training, only a small proportion demonstrated baseline knowledge of MI techniques. These findings are consistent with previous studies[18] that reported limited training opportunities and insufficient service capabilities among healthcare professionals in rural and primary care settings.

Despite limited prior exposure, participants in the present study expressed strong interest in acquiring MI skills particularly foundational principles and behavioral change theories demonstrating a readiness for capacity building. This mirrors earlier findings[19] that affirmed the acceptability and effectiveness of MI training across diverse healthcare roles, especially when delivered in an accessible format.

The qualitative findings further supported these needs. Participants reported significant barriers to effective behavioral counseling in practice, including limited time per patient and challenges sustaining long-term behavior change. These observations align with previous reports[20] noting that traditional MI requires extended time and multiple sessions, making its application challenging in high-volume primary care settings. The adaptation of MI for brief interventions, as explored in this study, provides a practical solution consistent with current global efforts to streamline patient-centered communication strategies in constrained healthcare environments.

In Phase 2, the course was designed with concise modules and multimedia content, incorporating feedback to enhance usability, cultural relevance, and accessibility. The need for localized and culturally appropriate materials is supported by research[21] that emphasized culturally tailored interventions are

more effective in supporting diabetes self-management. Likewise, studies[22] have found that course content, ease of use, and contextual relevance significantly influence learner satisfaction and engagement factors directly addressed in this course through the inclusion of Thai-specific patient examples and media.

Phase 3 results confirmed the course's effectiveness. Participants showed substantial improvements in knowledge following the training, particularly in areas that were previously weak, such as the Stages of Change theory and MI core techniques. These findings are in line with recent systematic reviews[11] that concluded well-structured online continuing education programs can significantly enhance healthcare professionals' knowledge, especially when tailored to their practice needs. The increased consistency in knowledge, as reflected by reduced post-test variability, further suggests effective standardization of key concepts among learners.

High satisfaction ratings reinforced the course's practical value. Participants highlighted the relevance and applicability of the content to real-world practice findings that echo recent research[12] noting that online learning formats offering flexibility and practical utility are particularly effective in healthcare settings. Although initial technical issues, such as registration barriers, were reported, they were promptly addressed through additional support mechanisms, aligning with best practices in digital learning facilitation.

The significant knowledge gains observed in this study align with a previous study[11], which reported that tailored online courses improved healthcare professionals' competencies by 20-30% in similar multidisciplinary primary care settings. The large effect size in our study indicates an even greater relative improvement, suggesting that the culturally tailored content and context-specific examples may have further enhanced learning outcomes. Similarly, the high satisfaction ratings in our study are consistent with a previous study[12], which found that online professional development programs incorporating interactive multimedia and practical case examples achieved satisfaction rates exceeding 90% among healthcare professionals. The relevance, flexibility, and cultural adaptability of our course design likely contributed to achieving similarly high satisfaction levels.

While two-thirds of participants indicated confidence in applying MI skills post-training, MI is inherently complex and requires repeated practice for mastery. While participants reported confidence in applying MI skills, this study did not include direct workplace observations to verify skill application. Future evaluations should incorporate observational assessments in real clinical settings to confirm the translation of knowledge into practice, as self-reported confidence may not fully reflect actual skill use.[23] This echo concerns raised by previous studies[11] that found even trained primary care nurses often struggled with behavior change counseling and risked misinterpreting patient cues. To address this, post-training support systems such as mentorship, supervision, or communities of practice may be essential. This recommendation is supported by research[11,22] that identified peer and instructor support as key facilitators for sustained learning in online environments. However, while participants reported confidence in applying MI skills, this study did not observe actual skill application in clinical practice. Future evaluations should include workplace observations to confirm the translation of knowledge into practice, as self-reported confidence may not fully reflect actual skill application.[23]

In summary, this study confirmed the feasibility and effectiveness of an online MI course tailored to Thailand's primary care context. The course addressed both the knowledge-practice gap and systemic challenges such as time constraints, digital readiness, and culturally specific needs. Its success highlights the potential of targeted e-learning interventions to improve chronic disease management by equipping healthcare professionals with essential behavior change communication skills.

Strengths and Limitations

A key strength of this study is its comprehensive three-phase research design, which systematically integrated needs assessment, course development, and outcome evaluation. This sequential approach ensured that the course was directly informed by actual gaps in knowledge and practical challenges reported by healthcare professionals. The use of both quantitative and qualitative methods enhanced the depth of analysis, allowing the findings to capture not only statistical improvements but also contextual barriers and learner perspectives. Furthermore, the course's cultural adaptation such as integrating Thai-specific illustrations and dialogue significantly enhanced its relevance and potential for real-world application in the Thai healthcare setting. The course incorporated Thai-specific scenarios, such as counseling on traditional diets (e.g., somtam and sticky rice) and using culturally familiar communication styles, which enhanced learner engagement and increased the perceived relevance of the training to participants' daily practice.

However, several limitations should be acknowledged. The study was conducted in a single health region in Thailand, which may limit the generalizability of findings to other regions with differing healthcare infrastructure or training needs. While conducted in one health region, the course's modular design and cultural adaptability suggest potential applicability to other Asian primary care systems with similar resource constraints. Additionally, the evaluation was limited to short-term outcomes, such as immediate knowledge gain and self-reported sat-

isfaction, without assessing long-term behavior change, retention of skills, or clinical impact on patient outcomes. The absence of a control group also limits the ability to definitively attribute observed improvements solely to the intervention. The voluntary nature of participation in Phases 2 and 3 may have introduced selection bias, as those who chose to participate were potentially more motivated than the broader target population. This may have led to overestimation of satisfaction levels and knowledge gains compared with less motivated professionals.

Conclusion

This study demonstrated the successful development and evaluation of an online MI course for diabetes care, following a structured three-phase process. The course effectively addressed the specific needs of multidisciplinary healthcare professionals and responded to the practical time constraints of primary care settings. The evaluation findings confirmed significant improvements in participants' knowledge, particularly in areas previously identified as weak, such as counselling approaches and key components of the MI process.

Based on user feedback, the course was refined to suit the Thai healthcare context better by incorporating culturally relevant conversation examples and illustrations. The concise lesson format 10 to 20 minutes per unit and the integration of evidence-based techniques, such as DARES and OARS, contributed to the course's practical utility. By aligning content, format, and delivery with real-world conditions, the course offers a feasible and effective solution to enhance behavior-change communication skills within Thailand's primary care system.

Future Research

Future studies should expand the implementation of this online MI course to a broader range of healthcare settings and geographic regions to assess its scalability and generalizability. Scalability studies should assess barriers such as inconsistent internet access in rural areas and the need for institutional funding to support widespread adoption. Longitudinal research is recommended to evaluate the long-term retention of MI skills, their sustained application in clinical practice, and their impact on patient behavior and health outcomes. Future studies should include measurable outcomes such as MI skill retention after six months, reductions in patient HbA1c levels, and the frequency and quality of counseling sessions. Further exploration of blended learning models that combine online modules with face-to-face mentoring or peer feedback could also enhance skill acquisition and integration. Additionally, future research should investigate the cost-effectiveness of online MI training programs compared to traditional in-person workshops, particularly in resource-constrained primary care systems.

Acknowledgements: Author would like to thank all other members of the KKUMEDX team, the production house team, and the staff in Academic Affairs, Faculty of Medicine, Khon Kaen University for their assistance.

Authors' Contributions: CW and **IT** were responsible for the conceptualization, data curation, formal analysis, investigation, methodology development, project administration, resource acquisition, software implementation, validation, visualization, original draft writing, and reviewing and editing of the manuscript. **PN** contributed to the conceptualization, provision of resources, software implementation, validation, visualization, and reviewing and editing of the manuscript. **RM** contributed to validation, visualization, original draft writing, and reviewing and editing of the manuscript.

Availability of data: The data presented in this study are available on request from corresponding author.

Declaration of non-use of generative AI: No generative AI tools were used in the research design, analysis, interpretation, or content creation for this manuscript. AI assistance was limited to grammar and academic terminology checking only. All substantive content represents the authors' original work.

References

1. International Diabetes Federation. IDF Diabetes Atlas. 10th ed. Brussels: IDF; 2023 [cited 2025 Jan 2]. Available from: https://diabetesatlas.org/atlas/tenth-edition/
2. World Health Organization. Diabetes fact sheet. Geneva: WHO; 2025 [cited 2025 Jan 2]. Available from: https://www.who.int/news-room/fact-sheets/detail/diabetes.
3. Miller WR, Rollnick S. Ten things that motivational interviewing is not. Behav Cogn Psychother. 2009;37(2):129-140. DOI: https://doi.org/10.1017/S1352465809005128.
4. Lundahl B, Moleni T, Burke BL, Butters R, Tollefson D, Butler C, et al. Motivational interviewing in medical care settings: a systematic review and meta-analysis of randomized controlled trials. Patient Educ Couns. 2013;93(2):157-168. DOI: https://doi.org/10.1016/j.pec.2013.07.012 PMid:24001658
5. Thepwongsa I, Muthukumar R, Kessomboon P. Motivational interviewing by general practitioners for Type 2 diabetes patients: A systematic review. Fam Pract. 2017;34(4):376-383. DOI: https://doi.org/10.1093/fampra/cmx045
6. Deerochanawong C, Ferrario A. Diabetes management in Thailand: a literature review of the burden, costs, and outcomes. Globalization and Health. 2013;9:11. DOI: https://doi.org/10.1186/1744-8603-9-11 PMid:23497447 PMCid:PMC3623827
7. National Health Security Office. NHSO annual report fiscal year 2023 [Internet]. Bangkok: NHSO; 2024. Available from: https://www.nhso.go.th/th/aboutus-th/reports-annual/2024-11-21-06-39-26/55632-nhso-annual-report-2023/file [Accessed Jun 25, 2025]
8. Diabetes Association of Thailand; The Endocrine Society of Thailand. Clinical Practice guideline for diabetes 2023. Bangkok: Srimuang Printing; 2023. (In Thai). Available from: https://www.uckkpho.com/wp-content/uploads/2023/08/CPG.DM2566.pdf [Accessed August 12, 2025]

9. Thedsak Dechakong and editors. "Motivational Interviewing for NCDs; MI NCDs," Mental Health Knowledge Bank, Department of Mental Health, Bangkok: Beyond Publishing Co., Ltd.; 2017. Available from: https://dmh-elibrary.org/items/show/275 [Accessed August 12, 2025]

10. Allen IE, Seaman J. Online Report Card: Tracking Online Education in the United States. Oakland, CA; Babson Survey Research Group and Quahog Research Group, LLC; 2016. Available from: https://eric.ed.gov/?id=ED572777 [Accessed August 12, 2025]

11. Chaker R, Hajj-Hassan M, Ozanne S. The effects of online continuing education for healthcare professionals: A systematic scoping review. Open Educ Stud. 2024;6(1):e20220226. DOI: https://doi.org/10.1515/edu-2022-0226

12. Aryee GFB, Amoadu M, Obeng P, Sarkwah HN, Malcalm E, Abraham SA, et al. Effectiveness of eLearning programme for capacity building of healthcare professionals: A systematic review. Hum Resour Health. 2024;22(1):60. DOI: https://doi.org/10.1186/s12960-024-00924-x PMid:39223555

13. Thepwongsa I, Kirby CN, Schattner P, Piterman L. Online continuing medical education (CME) for GPs: does it work? A systematic review. Aust Fam Physician. 2014 Oct;43(10):717-721. PMID: 25286431.

14. Thepwongsa I, Muthukumar R, Sripa P, Waraassawapati S, Jenwitheesuk K, Virasiri S, et al. The perspectives of learners at a public medical school on the evaluation of an online learning management system for degree and non-degree courses. Med Educ Online. 2023;29(1):2299535. DOI: https://doi.org/10.1080/10872981.2023.2299535 PMid:38159283

15. Fairweather AE. Comparison of Face-to-Face and Synchronous Web-Based Training in Motivational Interviewing for Health and Human Service Professionals: Does Training Method Matter? North Dakota State University; 2018. Available from: https://library.ndsu.edu/ir/items/49296b06-7c5f-491e-a414-fa69057366c1 [Accessed August 12, 2025]

16. Lukaschek K, Schneider N, Schelle M, Kirk UB, Eriksson T, Kunnamo I, et al. Applicability of Motivational Interviewing for Chronic Disease Management in Primary Care Following a Web-Based E-Learning Course: Cross-Sectional Study. JMIR Ment Health. 2019;6(5):e12540. DOI: https://doi.org/10.2196/12540 PMid:31033446 PMCid:PMC6658265

17. Division of Non-Communicable Diseases. Indicator details for monitoring the quality of services in non-communicable disease operations (diabetes and hypertension) for fiscal year 2022. Bangkok: Department of Disease Control; 2021. Available from: https://www.ddc.moph.go.th/uploads/publish/1186620211012030022.pdf [Accessed August 12, 2025]

18. Wu Y, Wei X, Zhou L, Fenfen E, Zhu Y, Xu M, et al. The effectiveness of continuing education programmes for health workers in rural and remote areas: A systematic review and meta-analysis. Rural and Remote Health. 2023;23(4):8275. DOI: https://doi.org/10.22605/RRH8275 PMid:38031243

19. Rubak S, Sandbaek A, Lauritzen T, Christensen B. Motivational interviewing: a systematic review and meta-analysis. Br J Gen Pract. 2005 Apr;55(513):305-312. PMID: 15826439; PMCID: PMC1463134.

20. Resnicow K, DiIorio C, Soet JE, Borrelli B, Ernst D, Hecht J, et al. Motivational interviewing in medical and public health settings. In: Miller WR, Rollnick S, editors. Motivational interviewing: Preparing people for change. Plano Pkwy, TX: Guilford Press; 2001. p. 251-269. Available from: https://bluepeteraustralia.wordpress.com/wp-content/uploads/2012/12/motivational-interviewing.pdf#page=272

21. Pamungkas RA, Chamroonsawasdi K, Vatanasomboon P. A Systematic Review: Family Support Integrated with Diabetes Self-Management among Uncontrolled Type II Diabetes Mellitus Patients. Behav Sci (Basel). 2017 Sep 15;7(3):62. DOI: https://doi.org/10.3390/bs7030062 PMID: 28914815

22. Ucha CR. Role of course relevance and course content quality in MOOCs acceptance and use. Comput Educ Open. 2023;5:100147. DOI: https://doi.org/10.1016/j.caeo.2023.100147

23. Jansink R, Braspenning J, Van Der Weijden T, Elwyn G, Grol R. Primary care nurses struggle with lifestyle counseling in diabetes care: A qualitative analysis. BMC Fam Pract. 2010;11(1):41. DOI: https://doi.org/10.1186/1471-2296-11-41 PMid:20500841 PMCid:PMC2889883