BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (http://bmjopen.bmj.com).

If you have any questions on BMJ Open's open peer review process please email

info.bmjopen@bmj.com

Developing a training programme in physical activity counselling for undergraduate medical curricula: a nationwide Delphi study

SCHOLARONE™
Manuscripts

Developing a training programme in physical activity counselling for undergraduate medical curricula: a nationwide Delphi study

Authors' names

Apichai Wattanapisit [1][2]

Prachyapan Petchuay [1]

Sanhapan Wattanapisit [3]

Titiporn Tuangratananon [4]

[1] School of Medicine, Walailak University, Thasala, Nakhon Si Thammarat, Thailand

[2] Walailak University Hospital, Thasala, Nakhon Si Thammarat, Thailand

[3] Thasala Hospital, Thasala, Nakhon Si Thammarat, Thailand

[4] International Health Policy Program, Thailand, Ministry of Public Health, Muang, Nonthaburi, Thailand

Correspondence to Apichai Wattanapisit, School of Medicine, Walailak University, Thasala, Nakhon Si Thammarat, 80161, Thailand; apichai.wa@wu.ac.th

Keywords: curricula; medical education; physical activity counselling

Word count: 2631 (excluding title page, 278 words of abstract, 36 references, 5 tables, acknowledgements, and footnotes)

1

Abstract

Objectives: To identify the essential content and approaches for developing a training programme in physical activity (PA) counselling for undergraduate medical curricula.

Design: A three-round Delphi survey was conducted to investigate four key topics: 1) contents of PA counselling in medical education; 2) teaching and learning methods; 3) medical school collaboration; and 4) educational policy implementation. Round 1 collected opinions from the participants. Round 2 focused on scoring the opinions. Round 3 summarised the expert opinions. A mean score of 4 or above identified an important item.

Setting: All 23 medical schools in Thailand.

Participants: Academic staff who were experts or in charge of medical schools in the fields of PA, health promotion, or medical education.

Results: Twenty representatives from 18 of the 23 Thai medical schools participated in the study (for a response rate 78.2%). The top three most important indicators of knowledge were 1) the definition and types of PA (4.75±0.55); 2) the FITT principle (frequency, intensity, time, and type) (4.75±0.55); and 3) the benefits of PA (4.65±0.67). The most important component of the training involved general communication skills (4.55±0.60). An extra-curricular module (4.05±0.76) was preferable to an intra-curricular module (3.95±0.94). Collaborations with medical education centres and teaching hospitals (4.45±0.78) and supporting policies to increase medical students' PA (4.40±0.73) were considered to be important.

Conclusion: Knowledge and counselling skills are important for PA counselling. Building collaborations between medical education and health institutions, as well as implementing effective educational policies, are key approaches to the integration of PA counselling into medical education. Future research should focus on investigating the effects of training in PA

counselling on the learning outcomes of medical students and clinical outcomes of patients.

Strengths and limitations of this study

- The study had a 78.2% response rate (18 out of 23 medical schools) from the medical schools in Thailand.

- The characteristics of the Delphi study, using a series of questionnaires, helped to achieve the consensus of expert opinion and avoid problems arising from a few powerful participants and group pressures.

- The study sites did not include medical education centres and teaching hospitals, which were affiliated with the medical schools or universities.

3

Introduction

Promoting physical activity (PA) in clinical settings is a promising approach to reduction of physical inactivity.[1] From the patients' point of view, physicians are credible sources of health-related information and guidance.[2] PA counselling is an effective strategy to increase the PA level of patients.[3] A systematic review concluded that 1 out of 12 sedentary patients will become physically active after promotion of PA in health care services.[4] PA can reduce risks of mortality and cardiovascular disease.[5, 6] This leads to the concept that exercise and PA are important aspects of lifestyle in medicine.[7-9] However, important barriers to PA counselling include time constraints and a lack of knowledge and communication skills among healthcare professionals.[10] The World Health Organisation proposes a policy action to strengthen curricula of medical professionals to ensure effective integration of the health benefits of PA into the formal training.[11]

Inadequate training in PA topics may be one barrier to PA counselling. Medical curricula address a limited number of PA topics during undergraduate training, representing only 4.2 hours in the UK, 8.1 hours in the US, and 12.3 hours in Australia.[12-14] Given the time spent teaching PA topics, overall training in PA counselling is insufficient. A study conducted in Thailand found that, during the six-year curriculum, even when the curriculum included 25 hours of instruction in PA topics, the training specifically addressing PA counselling to be absent.[15] Thus, training in PA counselling is still limited at both undergraduate and postgraduate levels.[16, 17]

Given the concept that 'exercise is medicine', exercise or PA should be regarded as an important aspect of treatment for every patient.[18] The UK approach, Making Every Contact Count, encourages healthcare professionals to talk with patients about their health and

4

wellbeing during routine interactions.[19] According to these concepts, training in PA counselling can be instilled as a component of the patient care programme for medical students. The gap in knowledge involves how to best develop medical students' awareness and abilities to conduct PA counselling during their clinical rotations and ultimately in their post-graduate clinical practices. As a result, this study was designed to identify the essential content and approaches for developing effective techniques that can be incorporated into the undergraduate medical curricula for PA counselling.

Methods

Study design

A Delphi survey method was conducted to gather opinions from expert medical educators in Thailand. The initial questions emerged from a roundtable discussion. A panel of experts, composed of eight specialist academics and practitioners from six institutions, was formed in July 2018; these experts were from the fields of PA, medical education, primary care, sports science, sports medicine, internal medicine, endocrinology, orthopaedics, as well as health promotion and health policy. This panel addressed four key topics: 1) the content of PA counselling in medical education; 2) teaching and learning methods; 3) medical school collaborations; and 4) educational policy implementation.

The authors then conducted a three-round survey through online questionnaires. Round 1 was designed to collect additional opinions from the participants, round 2 focused on scoring the opinions, and round 3 entailed producing a summary of the expert opinions.

Setting and participants

5

The authors sent letters to contact the deans of all 23 medical schools in Thailand to request for the permission to conduct the study and the names of one to two eligible participants. The inclusion criterion was academic staff who were experts or in charge of medical schools in the fields of PA, health promotion, or medical education. Medical school representatives who had participated in the initial roundtable discussion were excluded.

Data collection and analysis

The online questionnaires were sent to the participants' email addresses. Each round took about one month. If there was no response from to the questionnaire within two weeks, the authors would send an email to remind the participant. The non-responders would be prompted again by a phone call one week after the second email. After that prompt, any non-responders were dropped from the study and no longer considered a potential source of data. After the completion of each round, the research team analysed data and developed the questions for the next rounds. All data collection was conducted between August and December 2018.

Round 1

The questionnaire, using Google Forms (Alphabet Inc., Mountain View, CA, USA), provided some items that emerged from the roundtable discussion of the 4 key topics (Table 1: '*' symbol presents items emerged from the roundtable discussion). The authors asked the medical school representatives to include additional opinions on each key topic by using open-ended questions. Additionally, the authors offered participants to include their opinions to form additional key topics. The answers from round 1 were qualitatively analysed by the authors and confirmed by discussion within the research team. All the items that emerged after the round 1 analysis were collected as questions for round 2.

Round 2

The questionnaire, using the Google Forms, was developed based on analysis of round 1. The authors asked the participants to score each item from 1 to 5 based on their opinions, in which a score of 1 = not important; 2 = slightly important; 3 = moderately important; 4 = important; and 5 = very important. The overall score for each item was calculated as a mean score with a standard deviation. These calculations were performed using Excel software (a component of the Office 365 University package, Microsoft Inc, Redmond, WA, USA). Achieving consensus was considered by having 75% of participants' scores within two categories – important (score = 4) and very important (score = 5).[20] The data analysed from round 2 were ranked by mean scores and developed into the round 3 questionnaire.

Round 3

The items provided in the questionnaire, using Google Sheets (Alphabet Inc., Mountain View, CA, USA), were similar to the items in the round 2 questionnaire. However, in this round, the participants could see the sequences of items ranked by mean scores, item mean scores and standard deviations from the results of round 2, as well as their previous scores. In this final round, the participants were asked to confirm or change their scores. The final consensus criterion was defined as 75% of agreement among participants.[20] The consensus in this round meant that the item was consider important or very important by at least 75% of experts. The mean scores and standard deviations were also calculated in this round. The items with mean scores J 4 were considered to be important items. The mean scores reflected the level of importance of items.

Patient and public involvement

The study did not involve patients as study participants. The presentation of the findings was
anonymous to preserve confidentiality.

Results

Baseline characteristics of participants

Twenty representatives from 18 of the 23 Thai medical schools, including both public and
private institutions, participated, for a response rate of 78.2%. The participants were between
30 and 61 years old (mean 40.5±8.2 years). Eleven (55.0%) were females and ten (50%)
specialised in family medicine (Table 1). All participants were active throughout all three
rounds of the survey.

Table 1 Participant codes and characteristics (n=20)

Participant code	Institution code	Gender	Age (year)	Specialty
P1	I1	Female	34	Family medicine
P2	I2	Male	49	Community medicine
P3	I3	Female	39	Physiology
P4	I4	Male	42	Physical medicine and rehabilitation
P5	I5	Female	39	Family medicine
P6	I5	Female	61	Health promotion
P7	I6	Female	33	Paediatrics
P8	I7	Male	53	Public health/epidemiology
P9	I8	Female	34	Family medicine
P10	I9	Female	48	Public health/health economics
P11	I10	Male	30	Family medicine
P12	I11	Female	32	Family medicine
P13	I12	Female	45	Family medicine
P14	I13	Male	43	Internal medicine
P15	I14	Male	38	Family medicine
P16	I14	Male	48	Physical medicine and rehabilitation
P17	I15	Female	40	Family medicine
P18	I16	Male	30	Family medicine
P19	I17	Male	39	Epidemiology
P20	I18	Female	33	Family medicine

Content of physical activity counselling in medical education

8

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Knowledge of PA and training in counselling were the two sub-topics regarding contents of PA counselling in medical education. In the round 1, the items regarding knowledge of PA emerged from seven to 23 items, and the items regarding training in counselling increased from three to ten items. The top three most important areas of knowledge were 1) the definition and types of PA (4.75±0.55); 2) the FITT principle (frequency, intensity, time, and type) (4.75±0.55); and 3) the benefits of PA (4.65±0.67). The top three most important topics for training the students in counselling were 1) general communication skills (4.55±0.60); 2) counselling techniques (4.45±0.69); and 3) the 5 A's (4.30±0.73) (Table 2).

Table 2 Content of physical activity counselling in medical education

Item	Round 2 Agreement** (Mean±SD	Round 3 Agreement** Mean±SD
Knowledge of physical activity: 23 items		
1) definition and types of physical activity*	85% 4.55±1.00	95% 4.75±0.55
2) FITT principle (frequency, intensity, time, and type)*	85% 4.50±1.05	95% 4.75±0.55
3) benefits of physical activity*	80% 4.45±1.05	90% 4.65±0.67
4) recommendations on physical activity for health*	85% 4.35±1.04	95% 4.60±0.60
5) physical activity in patients with non-communicable diseases	95% 4.45±0.76	100% 4.55±0.51
6) pre-screening for physical activity participation*	85% 4.40±0.88	100% 4.50±0.51
7) injury prevention from physical activity	85% 4.35±0.88	85% 4.40±0.75
8) integrating the knowledge about physical activity in daily living and health care services	80% 4.40±0.82	95% 4.40±0.68
9) health risks associated with physical activity participation*	85% 4.30±0.86	100% 4.40±0.50
10) physical activity in the elderly	95% 4.35±0.75	100% 4.40±0.50
11) methods of physical fitness tests (i.e. strength, endurance, agility, balance)	75% 4.30±0.86	85% 4.35±0.75
12) basic exercise physiology and physiological responses in exercise	75% 4.30±0.86	75% 4.30±0.86
13) assessment of the intensity of physical activity (i.e. metabolic equivalent (MET), heart rate zone, etc.)	75% 4.25±0.85	75% 4.15±0.81

9

14) physical activity in patients with neurological disorders	70% 4.05±0.83	80% 4.15±0.75
15) physical activity monitoring and assessment (e.g. using self-administered questionnaires, mobile devices)	65% 4.15±0.93	80% 4.15±0.75
16) tools and teams for facilitating physical activity counselling*	70% 4.05±0.94	85% 4.10±0.64
17) physical activity in patients with heart diseases	80% 4.05±0.83	85% 4.10±0.64
18) associations between physical activity and nutrition	70% 4.00±0.79	80% 4.05±0.60
19) environmental management for promoting physical activity	70% 4.05±1.05	80% 4.00±0.65
20) evidence-based medicine regarding physical activity topics	60% 4.00±0.92	60% 3.90±0.85
21) epidemiology of physical activity in population	65% 3.75±1.02	55% 3.75±0.79
22) physical activity in palliative patients	65% 3.80±0.83	55% 3.65±0.81
23) Global Action Plan on Physical Activity 2018-2030 (World Health Organisation)	50% 3.75±0.85	35% 3.50±0.76
Training in counselling: 10 items		
1) general communication skills	80% 4.35±1.04	95% 4.55±0.60
2) counselling techniques*	80% 4.25±0.91	90% 4.45±0.69
3) the 5 A's (Ask, Advise, Assess, Assist, and Arrange)	75% 4.10±0.91	90% 4.30±0.73
4) psychology of behaviour change*	90% 4.30±0.80	90% 4.25±0.64
5) motivational interviewing	60% 4.00±1.12	75% 4.10±0.91
6) practices to overwhelm barriers to physical activity counselling (e.g. time constraints and systemic barriers)*	65% 3.90±0.91	75% 4.05±0.76
7) leadership skills	75% 4.05±0.89	75% 4.00±0.73
8) evaluation and management of patients with clinical difficulties	65% 3.90±0.91	60% 3.80±0.77
9) concepts of behavioural science	55% 3.75±1.12	50% 3.70±1.03
10) cognitive behavioural therapy (CBT)	50% 3.50±1.00	50% 3.55±1.05

*Item emerged from the roundtable discussion.
**Percentage of participants who scored 4 and 5 for each item.
SD, standard deviation.

Teaching and learning methods

10

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Several items regarding intra-curricular activities, extra-curricular activities, and evaluation were raised by the participants in round 1. There was a preference for training in PA counselling to be provided as extra-curricular module (4.05±0.76) rather than an intra-curricular module (3.95±0.94). The top priorities for the intra-curricular activities were 1) interactive activities (4.50±0.69); 2) interprofessional education (4.40±0.75); and 3) project-based learning (4.40±0.68). The most important extra-curricular activities were online modules (4.35±0.67), followed by interactive activities (4.30±0.73), and interprofessional education (4.30±0.66). The important evaluation methods included 1) self-assessment and reflection (4.40±0.68); 2) student behaviours (4.20±1.11); and 3) clinical performance of students (4.20±0.77) (Table 3).

Table 3 Teaching and learning methods

Item	Round 2 Agreement** Mean±SD	Round 3 Agreement** Mean±SD
Intra-curricular activities: 17 items		
1) interactive activities (e.g. workshops)*	85% 4.45±0.76	90% 4.50±0.69
2) interprofessional education	80% 4.25±0.91	85% 4.40±0.75
3) project based learning	80% 4.30±0.92	90% 4.40±0.68
4) online modules*	80% 4.25±0.79	90% 4.30±0.80
5) problem based learning	75% 4.25±0.97	90% 4.25±0.79
6) team based learning	85% 4.15±0.99	85% 4.20±0.83
7) case based learning	80% 4.15±0.88	85% 4.20±0.70
8) assignment (e.g. short films, media)	65% 4.00±0.97	80% 4.15±0.75
9) clinical practices in home health care (home visits)	80% 4.15±0.88	90% 4.15±0.75
10) clinical practices in ambulatory settings	75% 4.15±0.93	85% 4.10±0.79

11

11) VDO demonstration of physical activity counselling	65% 4.05±0.89	65% 4.00±0.86
12) training in physical activity counselling should be one of the intra-curricular modules	65% 3.90±1.02	65% 3.95±0.94
13) teaching during exercise classes/activities	70% 4.00±0.92	70% 3.90±0.72
14) self-directed learning (SDL) *	55% 3.80±0.95	55% 3.80±0.83
15) role plays	65% 3.80±1.01	65% 3.70±0.92
16) lectures*	50% 3.60±0.82	60% 3.65±0.88
17) exercise physiology laboratory	50% 3.70±0.92	60% 3.65±0.75
Extra-curricular activities: 10 items		
1) online modules*	90% 4.30±0.80	90% 4.35±0.67
2) interactive activities (e.g. workshops)*	75% 4.20±0.83	85% 4.30±0.73
3) interprofessional education	80% 4.25±0.79	90% 4.30±0.66
4) elective modules	80% 4.15±0.75	80% 4.10±0.85
5) health promotion activities (e.g. sports clubs, sport competitions)	75% 4.00±0.86	80% 4.10±0.72
6) training in physical activity counselling should be one of the extra-curricular modules	75% 4.05±1.00	75% 4.05±0.76
7) observation in workplaces (i.e. rehabilitation clinics, health promotion clinics)	80% 4.05±0.83	80% 4.05±0.69
8) self-directed learning (SDL)*	60% 3.85±1.04	75% 3.95±0.83
9) extra-curricular assignments (e.g. VDO clips)	65% 3.75±0.79	80% 3.95±0.60
10) seminars or group discussions	70% 3.95±0.89	65% 3.80±0.70
Evaluation: 11 items		
1) self-assessment and reflection	75% 4.20±0.95	90% 4.40±0.68
2) student behaviours (students' physical activity participation)*	75% 4.25±0.85	75% 4.20±1.11
3) clinical performance of students*	75% 4.10±0.91	80% 4.20±0.77
4) students' physical fitness	60% 3.70±1.34	65% 3.95±1.19
5) academic performance (e.g. grades, scores)*	75% 4.00±0.97	70% 3.90±0.97
6) curriculum evaluation (i.e. numbers of subjects included physical activity topics)	50% 3.75±1.07	55% 3.80±0.95
7) log book	55%	60%

	3.60±1.14	3.75±1.02
8) research or assigned projects	65% 3.90±1.12	65% 3.75±0.91
9) levels of satisfaction of the training	50% 3.70±1.03	55% 3.70±0.98
10) oral presentations	50% 3.55±1.00	55% 3.65±1.04
11) patient outcomes (e.g. physical activity levels, clinical outcomes)	50% 3.70±1.13	45% 3.60±1.10

*Item emerged from the roundtable discussion.
**Percentage of participants who scored 4 and 5 for each item.
SD, standard deviation.

Medical school collaborations

According to the initial survey, collaboration among organisations was a key to successful implementation of training in PA counselling. There were two organisations mentioned in the roundtable discussion. Subsequently, 12 additional items were offered during round 1. According to the final results, medical schools should collaborate with 1) medical education centres and teaching hospitals (4.45±0.78); 2) The Society of Medical Students of Thailand (4.39±0.72); and 3) Thai Health Foundation (4.38±0.74) (Table 4).

Table 4 Medical school collaborations

Item	Round 2 Agreement** Mean±SD	Round 3 Agreement** Mean±SD
Medical school collaborations: 14 items		
1) medical education centres and teaching hospitals	80% 4.40±0.94	85% 4.45±0.78
2) The Society of Medical Students of Thailand*	85% 4.30±0.88	90% 4.39±0.72
3) Thai Health Foundation	80% 4.30±0.91	90% 4.38±0.74
4) Collaborative Project to Increase Production of Rural Doctor	70% 4.15±0.97	85% 4.36±0.76
5) collaborations among health and sports sciences students/faculties (faculty levels – within a university)	80% 4.30±0.94	80% 4.34±0.85
6) networks of university health promotion (university levels – within a country or regions)	75% 4.15±0.94	80% 4.29±0.84
7) Consortium of Thai Medical Schools*	75% 4.15±0.94	90% 4.29±0.71

13

8) Ministry of Public Health	60% 3.85±1.02	65% 4.08±0.90
9) Institute of Physical Education	60% 3.80±0.98	65% 3.95±0.92
10) introduce the physical activity research collaboration among Thai medical schools via Medical Research Network of the Consortium of the Thai Medical schools (MedResNet)	65% 3.80±0.94	60% 3.91±0.88
11) collaborations among health professional councils (e.g. Physical Therapy Council, Thailand Nursing and Midwifery Council) (Professional levels)	65% 3.65±1.02	65% 3.86±0.90
12) conduct surveys on physical activity among Thai medical students	65% 3.80±1.04	65% 3.86±0.90
13) The University Sports of Thailand	60% 3.85±0.91	60% 3.85±0.91
14) International Federation of Medical Students Association (IFMSA) – Thailand	50% 3.65±1.06	55% 3.68±1.06

*Item emerged from the roundtable discussion.
**Percentage of participants who scored 4 and 5 for each item.
SD, standard deviation.

Educational policy implementation

The top three ranks of educational policy implementation were 1) support policies to increase

medical students' PA (4.40±0.73); 2) assess PA levels of all medical students (4.36±0.85);

and 3) provide active environments (4.35±0.79) (Table 5).

Table 5 Educational policy implementation

Item	Round 2 score Mean ± SD	Round 3 score Mean ± SD
Educational policy implementation: 10 items		
1) support policies to increase medical students' physical activity (e.g. leisure time, healthy behaviours)*	80% 4.25±1.04	85% 4.40±0.73
2) assess physical activity levels of all medical students (i.e. annual check-ups)	80% 4.25±1.00	85% 4.36±0.85
3) provide active environments (e.g. walkable areas, bicycle lanes and parks, recreational areas)*	80% 4.25±1.04	80% 4.35±0.79
4) test medical students' physical fitness and body composition*	80% 4.20±0.87	85% 4.34±0.73
5) promote medical students' physical activity*	85% 4.25±0.83	90% 4.34±0.66
6) integrate physical activity topics and counselling in preclinical and clinical subjects (educational policies)	85% 4.25±0.95	80% 4.23±0.89

14

7) promote role models (e.g. medical teachers, residents)	65% 3.85±0.99	70% 4.04±0.91
8) establish medical student health leaders to promote and design physical activity in daily life	70% 3.85±0.93	65% 3.84±0.84
9) introduce physical activity topics into the national medical licensing examination	55% 3.60±1.07	55% 3.67±1.02
10) use a physical activity credit to assess physical activity behaviours	55% 3.65±1.03	50% 3.60±1.14

*Item emerged from the roundtable discussion.
**Percentage of participants who scored 4 and 5 for each item.
SD, standard deviation.

Discussion

The nationwide survey that was performed in this study gave insight into the key elements that are important for PA counselling in medical education, teaching and learning methods, medical school collaboration, and educational policy implementation. The definition and types of PA and general communication skills were the most important contents of PA knowledge and training in counselling. Training in PA counselling could utilise either intra- or extra-curricular modules. Interactive activities, such as workshops, were the most important intra-curricular activities, while online modules were the most meaningful extra- curricular activities. The emphasis on evaluation was self-assessment and reflection by medical students. To drive the training in PA counselling in medical education, collaboration among institutions was needed, including good collaboration between medical education centres and teaching hospitals. Policies to increase the awareness of medical students about the importance of PA for health had the highest priority.

Overall, the participants recognised about two-thirds of the items as being important (with a mean score J 4). This reflected the importance of training in PA counselling in medical education. The evidence from the study supported the concept that training in PA counselling during medical education improved the knowledge, skills, and attitudes of the medical

15

students.[16] Trained physicians were more likely than untrained physicians to discuss PA benefits.[21] Although lifestyle aspects of medicine were deemed important, the majority of medical schools did not include the topic of lifestyles and PA in their curricula.[22] One possible reason was that no structured models to integrate lifestyle medicine topics into medical education were available.[23] The findings that emerged from this study could help to develop future educational programmes. Another possible explanation of the lack of training in PA counselling was the inadequacy of awareness. Stakeholders should educate medical schools, universities, academics and students to regard PA as an important factor for health maintenance and inactivity as a risk factor for development of illnesses. Additionally, stakeholders should reinforce knowledge, capacity and skills in the promotion of PA through training programmes and opportunities.[11]

The findings of the present study revealed many considerations for the development of training in PA counselling in medical education. Accordingly, in terms of medical education, designing an appropriate programme of learning was necessary. Many items were considered to be important knowledge and necessary for the acquisition of good counselling skills. Therefore, the newly designed programmes should focus on the knowledge base of the learners and the baseline training needed for most of the medical students, who are non-specialists. One challenge for inserting any new topic into the medical curriculum is the problem of curriculum overload. Assuring appropriate content and sequences of the topics presented to the medical students is necessary to ease their academic burden and avoid information overload.[24] Moreover, a well-designed PA module with a limited duration (1.5 hour) can improve the competence in counselling of medical students.[25] To achieve the learning outcomes that are necessary to meet the students' PA counselling needs, it must be recognised that competent communication with patients will require specific knowledge and

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

skills, including (a) content – what to do with communication reactions, (b) process – how communication interactions occur, and (c) perceptual skills - how that impacts communication, including feelings, thoughts, and attitudes.[26] This can be achieved by using several teaching, learning, and evaluation methods.[27, 28] According to the results of the study, the important evaluation methods covered three domains, including knowledge of PA, PA behaviours, and clinical skills.

An emerging key topic involved building collaborations among medical schools and other organisations. These collaborations can increase opportunities for developing faculty, sharing resources across institutions, and enriching the combination of the knowledge, innovation, and experiences.[29] Important items for educational policy implementation included seven out of the ten policies recognised as helpful to increase PA in medical students. Previous evidence supported a strong association between medical students' PA behaviours and PA counselling attitudes and practices.[30, 31] In other words, physically active medical students are more likely to counsel their patients about PA. This is a notion to develop PA counselling via promoting PA behaviours among medical students. Advocating for an educational policy to improve the PA behaviours of medical students requires a specific understanding of medical students' initial PA behaviours, as well as facilitating and barrier factors for PA.[32]

Strengths and limitations of the study

There were some strengths of the study. First, the study had a 78.2% response rate (18 out of 23 medical schools) from the medical schools in a national-level survey. Moreover, all participants remained engaged throughout the study. A strategy used in the study to maintain the participation was sending extra prompts with specific reminder content.[33] Second, the characteristics of the Delphi study, using a series of questionnaires, helped to achieve the

17

consensus of expert opinion and avoid problems arising from a few powerful participants and group pressures.[34, 35] Third, although the findings did not provide a ready-to-use PA counselling module, they did lead to more specific components of PA education and training than are available with the previous non-specific components provided by the Medical Council of Thailand.[36] The findings also are adaptable and transferable from the national level in the Thai context to the international level for developing a new approach to this aspect of medical education.

Three limitations of the study were identified. The study sites did not include medical education centres and teaching hospitals, which were affiliated with the medical schools or universities. However, medical education centres and teaching hospitals were identified as a potential part of a collaboration to develop the training in PA counselling. Another limitation was that half of participants specialised in family medicine, which might be skewed. A reason that could explain this result because training in noncommunicable diseases, lifestyle medicine and health promotion during family medicine rotations is common practice in Thailand. Lastly, the findings were based on expert opinions about medical education that could not reflect the efficacy and effectiveness of clinical practices and patient outcomes.

Conclusions

This is the first study conducted at a national level in Thailand to identify ways to develop training programs for PA counselling in undergraduate medical education. The definition and types of PA, the FITT principle, and benefits of PA are essential training for medical students. Moreover, training in PA counselling skills should include general communication skills, counselling techniques, and the 5 A's (Ask, Advise, Assess, Assist, and Arrange). Both intra- and extra-curricular activities are required. Building collaborations between medical

18

educators and health institutions as well as implementing effective educational policies are additional approaches that will be needed to inculcate PA counselling in clinical practice. Future research should focus on implementing training programmes for the undergraduate medical curriculum and to investigate the learning outcomes of medical students. In addition, there is a need to elucidate the clinical outcomes in patients that are the endpoints of the training.

Acknowledgements

Footnotes

Contributors

AW, SW, and TT initiated the concepts of the study. AW and PP designed the methodology. All the authors contributed to data collection and analysis. AW wrote the first draft of the manuscript and the rest of the team read and critically revised the draft. All the authors read and approved the final version of the manuscript.

Competing interests

None declared.

Funding

Data sharing

Data used during the study are available from the corresponding author on reasonable request.

Ethical approval

This study was approved by the Human Research Ethics Committee of Walailak University (protocol number: WUEC-18-039-01). The participation in this study was voluntary. All participants were asked to give informed consent via the online system by ticking the checkbox at the end of the information sheet.

References

1.   Vuori IM, Lavie CJ, Blair SN. Physical activity promotion in the health care system. *Mayo Clin Proc* 2013;88:1446-61.

2.   Phillips EM, Kennedy MA. The exercise prescription: a tool to improve physical activity. *PM R* 2012;4:818-25.

3.   Aittasalo M, Kukkonen-Harjula K, Toropainen E, et al. Developing physical activity counselling in primary care through participatory action approach. *BMC Fam Pract* 2016;17:141.

4.   Orrow G, Kinmonth A-L, Sanderson S, et al. Effectiveness of physical activity promotion based in primary care: systematic review and meta-analysis of randomised controlled trials. *BMJ* 2012;344.

5.   Hupin D, Edouard P, Gremeaux V, et al. Physical activity to reduce mortality risk. *Eur Heart J* 2017;38:1534-7.

6.   Lear SA, Hu W, Rangarajan S, et al. The effect of physical activity on mortality and

cardiovascular disease in 130 000 people from 17 high-income, middle-income, and low-

income countries: the PURE study. *Lancet* 2017;390: 2643-54.

7.   Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as

therapy in 26 different chronic diseases. *Scand J Med Sci Sports* 2015;3:1-72.

8.   Russell E. Exercise is medicine. *CMAJ* 2013;185: E526.

9.   Taylor D. Physical activity is medicine for older adults. *Postgrad Med J* 2014; 90:26.

10.   Hebert ET, Caughy MO, Shuval K. Primary care providers' perceptions of physical

activity counselling in a clinical setting: a systematic review. *Br J Sports Med* 2012;46:625-

31.

11.   World Health Organization. *Global action plan on physical activity 2018–2030: more

active people for a healthier world*. Geneva: World Health Organization; 2018.

12.   Stoutenberg M, Stasi S, Stamatakis E, et al. Physical activity training in US medical

schools: Preparing future physicians to engage in primary prevention. *Phys Sportsmed*

2015;43:388-94.

13.   Strong A, Stoutenberg M, Hobson-Powell A, et al. An evaluation of physical activity

training in Australian medical school curricula. *J Sci Med Sport* 2017;20:534-8.

14.   Weiler R, Chew S, Coombs N, et al. Physical activity education in the undergraduate

curricula of all UK medical schools: are tomorrow's doctors equipped to follow clinical

guidelines? *Br J Sports Med* 2012;46:1024-6.

15.   Wattanapisit A, Vijitpongjinda S, Saengow U, et al. Results from the Medical School

Physical Activity Report Card (MSPARC) for a Thai Medical School: a mixed methods

study. *BMC Med Educ* 2018;18:288.

16.   Dacey ML, Kennedy MA, Polak R, et al. Physical activity counseling in medical

school education: a systematic review. *Med Educ Online* 2014;19.

21

17.   Wattanapisit A, Tuangratananon T, Thanamee S. Physical activity counseling in

primary care and family medicine residency training: a systematic review. *BMC Med Educ*

2018;18:159.

18.   Sallis R. Exercise is medicine: a call to action for physicians to assess and prescribe

exercise. *Phys Sportsmed* 2015;43:22-6.

19.   Chisholm A, Ang-Chen P, Peters S, et al. Public health practitioners' views of the

'Making Every Contact Count' initiative and standards for its evaluation. *J Public Health*

2018;30.doi:10.1093/pubmed/fdy094.

20.   Diamond IR, Grant RC, Feldman BM, et al. Defining consensus: A systematic review

recommends methodologic criteria for reporting of Delphi studies. *J Clin Epidemiol*

2014;67:401-9.

21.   O'Brien M, Shields C, Crowell S, et al. The effects of previous educational training on

physical activity counselling and exercise prescription practices among physicians across

Nova Scotia: a cross-sectional study. *Can Med Educ J* 2018;9:e35-e45.

22.   Polak R, Pojednic RM, Phillips EM. Lifestyle medicine education. *Am J Lifestyle Med*

2015;9:361-7.

23.   Phillips E, Pojednic R, Polak R, et al. Including lifestyle medicine in undergraduate

medical curricula. *Med Educ Online* 2015;20:26150.

24.   McLeod P, Steinert Y. Twelve tips for curriculum renewal. Med Teach. 2015;37:232-

8.

25.   Jadczak AD, Tam KL, Visvanathan R. Educating medical students in counselling

older adults about exercise: The impact of a physical activity module. *J Frailty Aging*

2018;7:113-9.

26.   Denniston C, Molloy E, Nestel D, et al. Learning outcomes for communication skills across the health professions: a systematic literature review and qualitative synthesis. *BMJ Open* 2017;7:e014570.

27.   Deveugele M, Derese A, De Maesschalck S, et al. Teaching communication skills to medical students, a challenge in the curriculum? *Patient Educ Couns* 2005;58:265-70.

28.   Haq C, Steele DJ, Marchand L, et al. Integrating the art and science of medical practice: innovations in teaching medical communication skills. *Fam Med* 2004;36: S43-50.

29.   Sicat BL, O'Kane Kreutzer K, Gary J, et al. A collaboration among health sciences schools to enhance faculty development in teaching. *Am J Pharm Educ* 2014;78:102.

30.   Lobelo F, Duperly J, Frank E. Physical activity habits of doctors and medical students influence their counselling practices. *Br J Sports Med* 2009;43:89-92.

31.   Stanford FC, Durkin MW, Stallworth JR, et al. Factors that influence physicians' and medical students' confidence in counseling patients about physical activity. *J Prim Prev* 2014;35:193-201.

32.   Wattanapisit A, Fungthongcharoen K, Saengow U, et al. Physical activity among medical students in Southern Thailand: a mixed methods study. *BMJ Open* 2016;6:e013479.

33.   Van Mol C. Improving web survey efficiency: the impact of an extra reminder and reminder content on web survey response. *Int J Soc Res Methodol* 2017;20:317-27.

34.   Thangaratinam S, Redman CWE. The Delphi technique. *Obstet Gynecol* 2005;7:120-5.

35.   Hsu; CC, Sandford BA. The Delphi technique: Making sense of consensus. *PARE* 2007;12.

36.   Wattanapisit A, Vijitpongjinda S, Saengow U, et al. Development of a physical activity monitoring tool for Thai medical schools: a protocol for a mixed methods study. *BMJ Open* 2017;7:e017297.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

24

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5
		Case-control study—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	
		Cross-sectional study—Give the eligibility criteria, and the sources and methods of selection of participants	
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed	-
		Case-control study—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-7
Bias	9	Describe any efforts to address potential sources of bias	-
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	-
		(*b*) Describe any methods used to examine subgroups and interactions	-
		(*c*) Explain how missing data were addressed	6
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed	6-7
		Case-control study—If applicable, explain how matching of cases and controls was addressed	
		Cross-sectional study—If applicable, describe analytical methods taking account of sampling strategy	
		(*e*) Describe any sensitivity analyses	-

1

Results

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7-8
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8
		(b) Indicate number of participants with missing data for each variable of interest	-
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	-
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	-
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	-
		Cross-sectional study—Report numbers of outcome events or summary measures	8-13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	-
		(*b*) Report category boundaries when continuous variables were categorized	8-13
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-

Discussion

Key results	18	Summarise key results with reference to study objectives	13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	16

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Developing a training programme in physical activity counselling for undergraduate medical curricula: a nationwide Delphi study

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2019-030425.R1
Article Type:	Research
Date Submitted by the Author:	05-Aug-2019
Complete List of Authors:	Wattanapisit, Apichai; Walailak University School of Medicine, ; Walailak University Hospital, Petchuay, Prachyapan ; Walailak University School of Medicine Wattanapisit, Sanhapan ; Thasala Hospital Tuangratananon, Titiporn ; International Health Policy Program, Thailand, Ministry of Public Health
Primary Subject Heading:	Sports and exercise medicine
Secondary Subject Heading:	Medical education and training
Keywords:	curricula, medical education, physical activity counselling

SCHOLARONE™
Manuscripts

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Developing a training programme in physical activity counselling for undergraduate medical curricula: a nationwide Delphi study

Authors' names

Apichai Wattanapisit [1] [2]

Prachyapan Petchuay [1]

Sanhapan Wattanapisit [3]

Titiporn Tuangratananon [4]

[1] School of Medicine, Walailak University, Thasala, Nakhon Si Thammarat, Thailand

[2] Walailak University Hospital, Thasala, Nakhon Si Thammarat, Thailand

[3] Thasala Hospital, Thasala, Nakhon Si Thammarat, Thailand

[4] International Health Policy Program, Thailand, Ministry of Public Health, Muang, Nonthaburi, Thailand

Correspondence to Apichai Wattanapisit, School of Medicine, Walailak University, Thasala, Nakhon Si Thammarat, 80161, Thailand; apichai.wa@wu.ac.th

Word count: 2674 (excluding title page, 278 words of abstract, 36 references, 5 tables, acknowledgements, and footnotes)

1

Abstract

Objectives: To identify the essential content and approaches for developing a training programme in physical activity (PA) counselling for undergraduate medical curricula.

Design: A three-round Delphi survey was conducted to investigate four key topics: 1) contents of PA counselling in medical education; 2) teaching and learning methods; 3) medical school collaboration; and 4) educational policy implementation. Round 1 collected opinions from the participants. Round 2 focused on scoring the opinions. Round 3 summarised the expert opinions. A mean score of 4 or above identified an important item.

Setting: All 23 medical schools in Thailand.

Participants: Academic staff who were experts or in charge of medical schools in the fields of PA, health promotion, or medical education.

Results: Twenty representatives from 18 of the 23 Thai medical schools participated in the study (for a response rate 78.2%). The top three most important indicators of knowledge were 1) the definition and types of PA (4.75±0.55); 2) the FITT principle (frequency, intensity, time, and type) (4.75±0.55); and 3) the benefits of PA (4.65±0.67). The most important component of the training involved general communication skills (4.55±0.60). An extra-curricular module (4.05±0.76) was preferable to an intra-curricular module (3.95±0.94). Collaborations with medical education centres and teaching hospitals (4.45±0.78) and supporting policies to increase medical students' PA (4.40±0.73) were considered to be important.

Conclusion: Knowledge and counselling skills are important for PA counselling. Building collaborations between medical education and health institutions, as well as implementing effective educational policies, are key approaches to the integration of PA counselling into medical education. Future research should focus on investigating the effects of training in PA

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

counselling on the learning outcomes of medical students and clinical outcomes of patients.

Strengths and limitations of this study

- The study had a 78.2% response rate (18 out of 23 medical schools) from the medical schools in Thailand.

- The characteristics of the Delphi study, using a series of questionnaires, helped to achieve the consensus of expert opinion and avoid problems arising from a few powerful participants and group pressures.

- The study sites did not include medical education centres and teaching hospitals, which were affiliated with the medical schools or universities.

3

Introduction

Promoting physical activity (PA) in clinical settings is a promising approach to reduction of physical inactivity.[1] From the patients' point of view, physicians are credible sources of health-related information and guidance.[2] PA counselling is an effective strategy to increase the PA level of patients.[3] A systematic review concluded that 1 out of 12 sedentary patients will become physically active after promotion of PA in health care services.[4] PA can reduce risks of mortality and cardiovascular disease.[5, 6] This leads to the concept that exercise and PA are important aspects of lifestyle in medicine.[7-9] However, important barriers to PA counselling include time constraints and a lack of knowledge and communication skills among healthcare professionals.[10] The World Health Organisation proposes a policy action to strengthen curricula of medical professionals to ensure effective integration of the health benefits of PA into the formal training.[11]

Inadequate training in PA topics may be one barrier to PA counselling. Medical curricula address a limited number of PA topics during undergraduate training, representing only 4.2 hours in the UK, 8.1 hours in the US, and 12.3 hours in Australia.[12-14] Given the time spent teaching PA topics, overall training in PA counselling is insufficient. A study conducted in Thailand found that, during the six-year curriculum, even when the curriculum included 25 hours of instruction in PA topics, the training specifically addressing PA counselling to be absent.[15] Thus, training in PA counselling is still limited at both undergraduate and postgraduate levels.[16, 17]

Given the concept that 'exercise is medicine', exercise or PA should be regarded as an important aspect of treatment for every patient.[18] The UK approach, Making Every Contact Count, encourages healthcare professionals to talk with patients about their health and

4

wellbeing during routine interactions.[19] According to these concepts, training in PA counselling can be instilled as a component of the patient care programme for medical students. The gap in knowledge involves how to best develop medical students' awareness and abilities to conduct PA counselling during their clinical rotations and ultimately in their post-graduate clinical practices. As a result, this study was designed to identify the essential content and approaches for developing effective techniques that can be incorporated into the undergraduate medical curricula for PA counselling.

Methods

Study design

A Delphi survey method was conducted to gather opinions from expert medical educators in Thailand. The initial questions emerged from a roundtable discussion. A panel of experts, composed of eight specialist academics and practitioners from six institutions, was formed in July 2018; these experts were from the fields of PA, medical education, primary care, sports science, sports medicine, internal medicine, endocrinology, orthopaedics, as well as health promotion and health policy. This panel addressed four key topics: 1) the content of PA counselling in medical education; 2) teaching and learning methods; 3) medical school collaborations; and 4) educational policy implementation.

The authors then conducted a three-round survey through online questionnaires. Round 1 was designed to collect additional opinions from the participants, round 2 focused on scoring the opinions, and round 3 entailed producing a summary of the expert opinions.

Setting and participants

5

The authors sent letters to contact the deans of all 23 medical schools in Thailand to request for the permission to conduct the study and the names of one to two eligible participants. The inclusion criterion was academic staff who were experts or in charge of medical schools in the fields of PA, health promotion, or medical education. Medical school representatives who had participated in the initial roundtable discussion were excluded.

Data collection and analysis

The online questionnaires were sent to the participants' email addresses. Each round took about one month. If there was no response from to the questionnaire within two weeks, the authors would send an email to remind the participant. The non-responders would be prompted again by a phone call one week after the second email. After that prompt, any non-responders were dropped from the study and no longer considered a potential source of data. After the completion of each round, the research team analysed data and developed the questions for the next rounds. Participants' names and institutions were coded to ensure confidentiality and anonymity. All data collection was conducted between August and December 2018. The study protocol was approved by the Human Research Ethics Committee of Walailak University (protocol number: WUEC-18-039-01).

Round 1

The questionnaire, using Google Forms (Alphabet Inc., Mountain View, CA, USA), provided some items that emerged from the roundtable discussion of the 4 key topics (Table 1: '*' symbol presents items emerged from the roundtable discussion). The authors asked the medical school representatives to include additional opinions on each key topic by using open-ended questions. Additionally, the authors offered participants to include their opinions to form additional key topics. The answers from round 1 were qualitatively analysed by the

6

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

authors and confirmed by discussion within the research team. All the items that emerged after the round 1 analysis were collected as questions for round 2.

Round 2

The questionnaire, using the Google Forms, was developed based on analysis of round 1. The authors asked the participants to score each item from 1 to 5 based on their opinions, in which a score of 1 = not important; 2 = slightly important; 3 = moderately important; 4 = important; and 5 = very important. The overall score for each item was calculated as a mean score with a standard deviation. These calculations were performed using Excel software (a component of the Office 365 University package, Microsoft Inc, Redmond, WA, USA). Achieving consensus was considered by having 75% of participants' scores within two categories – important (score = 4) and very important (score = 5).[20] The data analysed from round 2 were ranked by mean scores and developed into the round 3 questionnaire.

Round 3

The items provided in the questionnaire, using Google Sheets (Alphabet Inc., Mountain View, CA, USA), were similar to the items in the round 2 questionnaire. However, in this round, the participants could see the sequences of items ranked by mean scores, item mean scores and standard deviations from the results of round 2, as well as their previous scores. In this final round, the participants were asked to confirm or change their scores. The final consensus criterion was defined as 75% of agreement among participants.[20] The consensus in this round meant that the item was consider important or very important by at least 75% of experts. The mean scores and standard deviations were also calculated in this round. The items with mean scores ≥ 4 were considered to be important items. The mean scores reflected the level of importance of items.

7

Patient and public involvement

The study did not involve patients as study participants. The presentation of the findings was anonymous to preserve confidentiality.

Results

Baseline characteristics of participants

Twenty representatives from 18 of the 23 Thai medical schools, including both public and private institutions, participated, for a response rate of 78.2%. The participants were between 30 and 61 years old (mean 40.5±8.2 years). Eleven (55.0%) were females and ten (50%) specialised in family medicine (Table 1). All participants were active throughout all three rounds of the survey.

Table 1 Participant codes and characteristics (n=20)

Participant code	Institution code	Gender	Age (year)	Specialty
P1	I1	Female	34	Family medicine
P2	I2	Male	49	Community medicine
P3	I3	Female	39	Physiology
P4	I4	Male	42	Physical medicine and rehabilitation
P5	I5	Female	39	Family medicine
P6	I5	Female	61	Health promotion
P7	I6	Female	33	Paediatrics
P8	I7	Male	53	Public health/epidemiology
P9	I8	Female	34	Family medicine
P10	I9	Female	48	Public health/health economics
P11	I10	Male	30	Family medicine
P12	I11	Female	32	Family medicine
P13	I12	Female	45	Family medicine
P14	I13	Male	43	Internal medicine
P15	I14	Male	38	Family medicine
P16	I14	Male	48	Physical medicine and rehabilitation
P17	I15	Female	40	Family medicine
P18	I16	Male	30	Family medicine
P19	I17	Male	39	Epidemiology
P20	I18	Female	33	Family medicine

8

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Content of physical activity counselling in medical education

Knowledge of PA and training in counselling were the two sub-topics regarding contents of PA counselling in medical education. In the round 1, the items regarding knowledge of PA emerged from seven to 23 items, and the items regarding training in counselling increased from three to ten items. The top three most important areas of knowledge were 1) the definition and types of PA (4.75±0.55); 2) the FITT principle (frequency, intensity, time, and type) (4.75±0.55); and 3) the benefits of PA (4.65±0.67). The top three most important topics for training the students in counselling were 1) general communication skills (4.55±0.60); 2) counselling techniques (4.45±0.69); and 3) the 5 A's (4.30±0.73) (Table 2).

Table 2 Content of physical activity counselling in medical education

Item	Round 2 Agreement** Mean±SD	Round 3 Agreement** Mean±SD
Knowledge of physical activity: 23 items		
1) definition and types of physical activity*	85% 4.55±1.00	95% 4.75±0.55
2) FITT principle (frequency, intensity, time, and type)*	85% 4.50±1.05	95% 4.75±0.55
3) benefits of physical activity*	80% 4.45±1.05	90% 4.65±0.67
4) recommendations on physical activity for health*	85% 4.35±1.04	95% 4.60±0.60
5) physical activity in patients with non-communicable diseases	95% 4.45±0.76	100% 4.55±0.51
6) pre-screening for physical activity participation*	85% 4.40±0.88	100% 4.50±0.51
7) injury prevention from physical activity	85% 4.35±0.88	85% 4.40±0.75
8) integrating the knowledge about physical activity in daily living and health care services	80% 4.40±0.82	95% 4.40±0.68
9) health risks associated with physical activity participation*	85% 4.30±0.86	100% 4.40±0.50
10) physical activity in the elderly	95% 4.35±0.75	100% 4.40±0.50
11) methods of physical fitness tests (i.e. strength, endurance, agility, balance)	75% 4.30±0.86	85% 4.35±0.75

9

12) basic exercise physiology and physiological responses in exercise	75% 4.30±0.86	75% 4.30±0.86
13) assessment of the intensity of physical activity (i.e. metabolic equivalent (MET), heart rate zone, etc.)	75% 4.25±0.85	75% 4.15±0.81
14) physical activity in patients with neurological disorders	70% 4.05±0.83	80% 4.15±0.75
15) physical activity monitoring and assessment (e.g. using self-administered questionnaires, mobile devices)	65% 4.15±0.93	80% 4.15±0.75
16) tools and teams for facilitating physical activity counselling*	70% 4.05±0.94	85% 4.10±0.64
17) physical activity in patients with heart diseases	80% 4.05±0.83	85% 4.10±0.64
18) associations between physical activity and nutrition	70% 4.00±0.79	80% 4.05±0.60
19) environmental management for promoting physical activity	70% 4.05±1.05	80% 4.00±0.65
20) evidence-based medicine regarding physical activity topics	60% 4.00±0.92	60% 3.90±0.85
21) epidemiology of physical activity in population	65% 3.75±1.02	55% 3.75±0.79
22) physical activity in palliative patients	65% 3.80±0.83	55% 3.65±0.81
23) Global Action Plan on Physical Activity 2018-2030 (World Health Organisation)	50% 3.75±0.85	35% 3.50±0.76
Training in counselling: 10 items		
1) general communication skills	80% 4.35±1.04	95% 4.55±0.60
2) counselling techniques*	80% 4.25±0.91	90% 4.45±0.69
3) the 5 A's (Ask, Advise, Assess, Assist, and Arrange)	75% 4.10±0.91	90% 4.30±0.73
4) psychology of behaviour change*	90% 4.30±0.80	90% 4.25±0.64
5) motivational interviewing	60% 4.00±1.12	75% 4.10±0.91
6) practices to overwhelm barriers to physical activity counselling (e.g. time constraints and systemic barriers)*	65% 3.90±0.91	75% 4.05±0.76
7) leadership skills	75% 4.05±0.89	75% 4.00±0.73
8) evaluation and management of patients with clinical difficulties	65% 3.90±0.91	60% 3.80±0.77
9) concepts of behavioural science	55% 3.75±1.12	50% 3.70±1.03
10) cognitive behavioural therapy (CBT)	50% 3.50±1.00	50% 3.55±1.05

*Item emerged from the roundtable discussion.

**Percentage of participants who scored 4 and 5 for each item.

SD, standard deviation.

10

Teaching and learning methods

Several items regarding intra-curricular activities, extra-curricular activities, and evaluation were raised by the participants in round 1. There was a preference for training in PA counselling to be provided as extra-curricular module (4.05±0.76) rather than an intra-curricular module (3.95±0.94). The top priorities for the intra-curricular activities were 1) interactive activities (4.50±0.69); 2) interprofessional education (4.40±0.75); and 3) project-based learning (4.40±0.68). The most important extra-curricular activities were online modules (4.35±0.67), followed by interactive activities (4.30±0.73), and interprofessional education (4.30±0.66). The important evaluation methods included 1) self-assessment and reflection (4.40±0.68); 2) student behaviours (4.20±1.11); and 3) clinical performance of students (4.20±0.77) (Table 3).

Table 3 Teaching and learning methods

Item	Round 2 Agreement** Mean±SD	Round 3 Agreement** Mean±SD
Intra-curricular activities: 17 items		
1) interactive activities (e.g. workshops)*	85% 4.45±0.76	90% 4.50±0.69
2) interprofessional education	80% 4.25±0.91	85% 4.40±0.75
3) project based learning	80% 4.30±0.92	90% 4.40±0.68
4) online modules*	80% 4.25±0.79	90% 4.30±0.80
5) problem based learning	75% 4.25±0.97	90% 4.25±0.79
6) team based learning	85% 4.15±0.99	85% 4.20±0.83
7) case based learning	80% 4.15±0.88	85% 4.20±0.70
8) assignment (e.g. short films, media)	65% 4.00±0.97	80% 4.15±0.75
9) clinical practices in home health care (home visits)	80% 4.15±0.88	90% 4.15±0.75

11

10) clinical practices in ambulatory settings	75% 4.15±0.93	85% 4.10±0.79
11) VDO demonstration of physical activity counselling	65% 4.05±0.89	65% 4.00±0.86
12) training in physical activity counselling should be one of the intra-curricular modules	65% 3.90±1.02	65% 3.95±0.94
13) teaching during exercise classes/activities	70% 4.00±0.92	70% 3.90±0.72
14) self-directed learning (SDL) *	55% 3.80±0.95	55% 3.80±0.83
15) role plays	65% 3.80±1.01	65% 3.70±0.92
16) lectures*	50% 3.60±0.82	60% 3.65±0.88
17) exercise physiology laboratory	50% 3.70±0.92	60% 3.65±0.75
Extra-curricular activities: 10 items		
1) online modules*	90% 4.30±0.80	90% 4.35±0.67
2) interactive activities (e.g. workshops)*	75% 4.20±0.83	85% 4.30±0.73
3) interprofessional education	80% 4.25±0.79	90% 4.30±0.66
4) elective modules	80% 4.15±0.75	80% 4.10±0.85
5) health promotion activities (e.g. sports clubs, sport competitions)	75% 4.00±0.86	80% 4.10±0.72
6) training in physical activity counselling should be one of the extra-curricular modules	75% 4.05±1.00	75% 4.05±0.76
7) observation in workplaces (i.e. rehabilitation clinics, health promotion clinics)	80% 4.05±0.83	80% 4.05±0.69
8) self-directed learning (SDL)*	60% 3.85±1.04	75% 3.95±0.83
9) extra-curricular assignments (e.g. VDO clips)	65% 3.75±0.79	80% 3.95±0.60
10) seminars or group discussions	70% 3.95±0.89	65% 3.80±0.70
Evaluation: 11 items		
1) self-assessment and reflection	75% 4.20±0.95	90% 4.40±0.68
2) student behaviours (students' physical activity participation)*	75% 4.25±0.85	75% 4.20±1.11
3) clinical performance of students*	75% 4.10±0.91	80% 4.20±0.77
4) students' physical fitness	60% 3.70±1.34	65% 3.95±1.19
5) academic performance (e.g. grades, scores)*	75% 4.00±0.97	70% 3.90±0.97
6) curriculum evaluation (i.e. numbers of subjects included	50%	55%

12

physical activity topics)	3.75±1.07	3.80±0.95
7) log book	55%	60%
	3.60±1.14	3.75±1.02
8) research or assigned projects	65%	65%
	3.90±1.12	3.75±0.91
9) levels of satisfaction of the training	50%	55%
	3.70±1.03	3.70±0.98
10) oral presentations	50%	55%
	3.55±1.00	3.65±1.04
11) patient outcomes (e.g. physical activity levels, clinical outcomes)	50%	45%
	3.70±1.13	3.60±1.10

*Item emerged from the roundtable discussion.
**Percentage of participants who scored 4 and 5 for each item.
SD, standard deviation.

Medical school collaborations

According to the initial survey, collaboration among organisations was a key to successful implementation of training in PA counselling. There were two organisations mentioned in the roundtable discussion. Subsequently, 12 additional items were offered during round 1. According to the final results, medical schools should collaborate with 1) medical education centres and teaching hospitals (4.45±0.78); 2) The Society of Medical Students of Thailand (4.39±0.72); and 3) Thai Health Foundation (4.38±0.74) (Table 4).

Table 4 Medical school collaborations

Item	Round 2 Agreement** Mean±SD	Round 3 Agreement** Mean±SD
Medical school collaborations: 14 items		
1) medical education centres and teaching hospitals	80% 4.40±0.94	85% 4.45±0.78
2) The Society of Medical Students of Thailand*	85% 4.30±0.88	90% 4.39±0.72
3) Thai Health Foundation	80% 4.30±0.91	90% 4.38±0.74
4) Collaborative Project to Increase Production of Rural Doctor	70% 4.15±0.97	85% 4.36±0.76
5) collaborations among health and sports sciences students/faculties (faculty levels – within a university)	80% 4.30±0.94	80% 4.34±0.85
6) networks of university health promotion (university levels – within a country or regions)	75% 4.15±0.94	80% 4.29±0.84

13

7) Consortium of Thai Medical Schools*	75% 4.15±0.94	90% 4.29±0.71
8) Ministry of Public Health	60% 3.85±1.02	65% 4.08±0.90
9) Institute of Physical Education	60% 3.80±0.98	65% 3.95±0.92
10) introduce the physical activity research collaboration among Thai medical schools via Medical Research Network of the Consortium of the Thai Medical schools (MedResNet)	65% 3.80±0.94	60% 3.91±0.88
11) collaborations among health professional councils (e.g. Physical Therapy Council, Thailand Nursing and Midwifery Council) (Professional levels)	65% 3.65±1.02	65% 3.86±0.90
12) conduct surveys on physical activity among Thai medical students	65% 3.80±1.04	65% 3.86±0.90
13) The University Sports of Thailand	60% 3.85±0.91	60% 3.85±0.91
14) International Federation of Medical Students Association (IFMSA) – Thailand	50% 3.65±1.06	55% 3.68±1.06

*Item emerged from the roundtable discussion.
**Percentage of participants who scored 4 and 5 for each item.
SD, standard deviation.

Educational policy implementation

The top three ranks of educational policy implementation were 1) support policies to increase

medical students' PA (4.40±0.73); 2) assess PA levels of all medical students (4.36±0.85);

and 3) provide active environments (4.35±0.79) (Table 5).

Table 5 Educational policy implementation

Item	Round 2 score Mean ± SD	Round 3 score Mean ± SD
Educational policy implementation: 10 items		
1) support policies to increase medical students' physical activity (e.g. leisure time, healthy behaviours)*	80% 4.25±1.04	85% 4.40±0.73
2) assess physical activity levels of all medical students (i.e. annual check-ups)	80% 4.25±1.00	85% 4.36±0.85
3) provide active environments (e.g. walkable areas, bicycle lanes and parks, recreational areas)*	80% 4.25±1.04	80% 4.35±0.79
4) test medical students' physical fitness and body composition*	80% 4.20±0.87	85% 4.34±0.73
5) promote medical students' physical activity*	85% 4.25±0.83	90% 4.34±0.66

14

6) integrate physical activity topics and counselling in preclinical and clinical subjects (educational policies)	85% 4.25±0.95	80% 4.23±0.89
7) promote role models (e.g. medical teachers, residents)	65% 3.85±0.99	70% 4.04±0.91
8) establish medical student health leaders to promote and design physical activity in daily life	70% 3.85±0.93	65% 3.84±0.84
9) introduce physical activity topics into the national medical licensing examination	55% 3.60±1.07	55% 3.67±1.02
10) use a physical activity credit to assess physical activity behaviours	55% 3.65±1.03	50% 3.60±1.14

*Item emerged from the roundtable discussion.
**Percentage of participants who scored 4 and 5 for each item.
SD, standard deviation.

Discussion

The nationwide survey that was performed in this study gave insight into the key elements that are important for PA counselling in medical education, teaching and learning methods, medical school collaboration, and educational policy implementation. The definition and types of PA and general communication skills were the most important contents of PA knowledge and training in counselling. Training in PA counselling could utilise either intra- or extra-curricular modules. Interactive activities, such as workshops, were the most important intra-curricular activities, while online modules were the most meaningful extra-curricular activities. The emphasis on evaluation was self-assessment and reflection by medical students. To drive the training in PA counselling in medical education, collaboration among institutions was needed, including good collaboration between medical education centres and teaching hospitals. Policies to increase the awareness of medical students about the importance of PA for health had the highest priority.

Overall, the participants recognised about two-thirds of the items as being important (with a mean score ≥ 4). This reflected the importance of training in PA counselling in medical education. The evidence from the study supported the concept that training in PA counselling

15

during medical education improved the knowledge, skills, and attitudes of the medical students.[16] Trained physicians were more likely than untrained physicians to discuss PA benefits.[21] Although lifestyle aspects of medicine were deemed important, the majority of medical schools did not include the topic of lifestyles and PA in their curricula.[22] One possible reason was that no structured models to integrate lifestyle medicine topics into medical education were available.[23] The findings that emerged from this study could help to develop future educational programmes. Another possible explanation of the lack of training in PA counselling was the inadequacy of awareness. Stakeholders should educate medical schools, universities, academics and students to regard PA as an important factor for health maintenance and inactivity as a risk factor for development of illnesses. Additionally, stakeholders should reinforce knowledge, capacity and skills in the promotion of PA through training programmes and opportunities.[11]

The findings of the present study revealed many considerations for the development of training in PA counselling in medical education. Accordingly, in terms of medical education, designing an appropriate programme of learning was necessary. Many items were considered to be important knowledge and necessary for the acquisition of good counselling skills. Therefore, the newly designed programmes should focus on the knowledge base of the learners and the baseline training needed for most of the medical students, who are non-specialists. One challenge for inserting any new topic into the medical curriculum is the problem of curriculum overload. Assuring appropriate content and sequences of the topics presented to the medical students is necessary to ease their academic burden and avoid information overload.[24] Moreover, a well-designed PA module with a limited duration (1.5 hour) can improve the competence in counselling of medical students.[25] To achieve the learning outcomes that are necessary to meet the students' PA counselling needs, it must be

16

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

recognised that competent communication with patients will require specific knowledge and skills, including (a) content – what to do with communication reactions, (b) process – how communication interactions occur, and (c) perceptual skills - how that impacts communication, including feelings, thoughts, and attitudes.[26] This can be achieved by using several teaching, learning, and evaluation methods.[27, 28] According to the results of the study, the important evaluation methods covered three domains, including knowledge of PA, PA behaviours, and clinical skills.

An emerging key topic involved building collaborations among medical schools and other organisations. These collaborations can increase opportunities for developing faculty, sharing resources across institutions, and enriching the combination of the knowledge, innovation, and experiences.[29] Important items for educational policy implementation included seven out of the ten policies recognised as helpful to increase PA in medical students. Previous evidence supported a strong association between medical students' PA behaviours and PA counselling attitudes and practices.[30, 31] In other words, physically active medical students are more likely to counsel their patients about PA. This is a notion to develop PA counselling via promoting PA behaviours among medical students. Advocating for an educational policy to improve the PA behaviours of medical students requires a specific understanding of medical students' initial PA behaviours, as well as facilitating and barrier factors for PA.[32]

Strengths and limitations of the study

There were some strengths of the study. First, the study had a 78.2% response rate (18 out of 23 medical schools) from the medical schools in a national-level survey. Moreover, all participants remained engaged throughout the study. A strategy used in the study to maintain the participation was sending extra prompts with specific reminder content.[33] Second, the

17

characteristics of the Delphi study, using a series of questionnaires, helped to achieve the consensus of expert opinion and avoid problems arising from a few powerful participants and group pressures.[34, 35] Third, although the findings did not provide a ready-to-use PA counselling module, they did lead to more specific components of PA education and training than are available with the previous non-specific components provided by the Medical Council of Thailand.[36] The findings also are adaptable and transferable from the national level in the Thai context to the international level for developing a new approach to this aspect of medical education.

Three limitations of the study were identified. The study sites did not include medical education centres and teaching hospitals, which were affiliated with the medical schools or universities. However, medical education centres and teaching hospitals were identified as a potential part of a collaboration to develop the training in PA counselling. Another limitation was that half of participants specialised in family medicine, which might be skewed. It might be useful to include more sport and exercise specialists in this survey. A reason that could explain this result because training in noncommunicable diseases, lifestyle medicine and health promotion during family medicine rotations is common practice in Thailand. Lastly, the findings were based on expert opinions about medical education that could not reflect the efficacy and effectiveness of clinical practices and patient outcomes.

Conclusions

This is the first study conducted at a national level in Thailand to identify ways to develop training programs for PA counselling in undergraduate medical education. The definition and types of PA, the FITT principle, and benefits of PA are essential training for medical students. Moreover, training in PA counselling skills should include general communication

18

skills, counselling techniques, and the 5 A's (Ask, Advise, Assess, Assist, and Arrange). Both intra- and extra-curricular activities are required. Building collaborations between medical educators and health institutions as well as implementing effective educational policies are additional approaches that will be needed to inculcate PA counselling in clinical practice. Future research should focus on implementing training programmes for the undergraduate medical curriculum and to investigate the learning outcomes of medical students. In addition, there is a need to elucidate the clinical outcomes in patients that are the endpoints of the training.

Acknowledgements

Footnotes

Contributors

AW, SW, and TT initiated the concepts of the study. AW and PP designed the methodology. All the authors contributed to data collection and analysis. AW wrote the first draft of the manuscript and the rest of the team read and critically revised the draft. All the authors read and approved the final version of the manuscript.

Competing interests

None declared.

Funding

19

Data sharing

Data used during the study are available from the corresponding author on reasonable

request.

Ethical approval

This study was approved by the Human Research Ethics Committee of Walailak University

(protocol number: WUEC-18-039-01). The participation in this study was voluntary. All

participants were asked to give informed consent via the online system by ticking the

checkbox at the end of the information sheet.

References

1.   Vuori IM, Lavie CJ, Blair SN. Physical activity promotion in the health care system.

Mayo Clin Proc 2013;88:1446-61.

2.   Phillips EM, Kennedy MA. The exercise prescription: a tool to improve physical

activity. *PM R* 2012;4:818-25.

3.   Aittasalo M, Kukkonen-Harjula K, Toropainen E, et al. Developing physical activity

counselling in primary care through participatory action approach. *BMC Fam Pract*

2016;17:141.

4.   Orrow G, Kinmonth A-L, Sanderson S, et al. Effectiveness of physical activity

promotion based in primary care: systematic review and meta-analysis of randomised

controlled trials. *BMJ* 2012;344.

20

5.   Hupin D, Edouard P, Gremeaux V, et al. Physical activity to reduce mortality risk. *Eur Heart J* 2017;38:1534-7.

6.   Lear SA, Hu W, Rangarajan S, et al. The effect of physical activity on mortality and cardiovascular disease in 130 000 people from 17 high-income, middle-income, and low-income countries: the PURE study. *Lancet* 2017;390: 2643-54.

7.   Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scand J Med Sci Sports* 2015;3:1-72.

8.   Russell E. Exercise is medicine. *CMAJ* 2013;185: E526.

9.   Taylor D. Physical activity is medicine for older adults. *Postgrad Med J* 2014; 90:26.

10.   Hebert ET, Caughy MO, Shuval K. Primary care providers' perceptions of physical activity counselling in a clinical setting: a systematic review. *Br J Sports Med* 2012;46:625-31.

11.   World Health Organization. *Global action plan on physical activity 2018–2030: more active people for a healthier world*. Geneva: World Health Organization; 2018.

12.   Stoutenberg M, Stasi S, Stamatakis E, et al. Physical activity training in US medical schools: Preparing future physicians to engage in primary prevention. *Phys Sportsmed* 2015;43:388-94.

13.   Strong A, Stoutenberg M, Hobson-Powell A, et al. An evaluation of physical activity training in Australian medical school curricula. *J Sci Med Sport* 2017;20:534-8.

14.   Weiler R, Chew S, Coombs N, et al. Physical activity education in the undergraduate curricula of all UK medical schools: are tomorrow's doctors equipped to follow clinical guidelines? *Br J Sports Med* 2012;46:1024-6.

15.   Wattanapisit A, Vijitpongjinda S, Saengow U, et al. Results from the Medical School Physical Activity Report Card (MSPARC) for a Thai Medical School: a mixed methods study. *BMC Med Educ* 2018;18:288.

21

16.   Dacey ML, Kennedy MA, Polak R, et al. Physical activity counseling in medical school education: a systematic review. *Med Educ Online* 2014;19.

17.   Wattanapisit A, Tuangratananon T, Thanamee S. Physical activity counseling in primary care and family medicine residency training: a systematic review. *BMC Med Educ* 2018;18:159.

18.   Sallis R. Exercise is medicine: a call to action for physicians to assess and prescribe exercise. *Phys Sportsmed* 2015;43:22-6.

19.   Chisholm A, Ang-Chen P, Peters S, et al. Public health practitioners' views of the 'Making Every Contact Count' initiative and standards for its evaluation. *J Public Health* 2018;30.doi:10.1093/pubmed/fdy094.

20.   Diamond IR, Grant RC, Feldman BM, et al. Defining consensus: A systematic review recommends methodologic criteria for reporting of Delphi studies. *J Clin Epidemiol* 2014;67:401-9.

21.   O'Brien M, Shields C, Crowell S, et al. The effects of previous educational training on physical activity counselling and exercise prescription practices among physicians across Nova Scotia: a cross-sectional study. *Can Med Educ J* 2018;9:e35-e45.

22.   Polak R, Pojednic RM, Phillips EM. Lifestyle medicine education. *Am J Lifestyle Med* 2015;9:361-7.

23.   Phillips E, Pojednic R, Polak R, et al. Including lifestyle medicine in undergraduate medical curricula. *Med Educ Online* 2015;20:26150.

24.   McLeod P, Steinert Y. Twelve tips for curriculum renewal. Med Teach. 2015;37:232-8.

25.   Jadczak AD, Tam KL, Visvanathan R. Educating medical students in counselling older adults about exercise: The impact of a physical activity module. *J Frailty Aging* 2018;7:113-9.

26.   Denniston C, Molloy E, Nestel D, et al. Learning outcomes for communication skills across the health professions: a systematic literature review and qualitative synthesis. *BMJ Open* 2017;7:e014570.

27.   Deveugele M, Derese A, De Maesschalck S, et al. Teaching communication skills to medical students, a challenge in the curriculum? *Patient Educ Couns* 2005;58:265-70.

28.   Haq C, Steele DJ, Marchand L, et al. Integrating the art and science of medical practice: innovations in teaching medical communication skills. *Fam Med* 2004;36: S43-50.

29.   Sicat BL, O'Kane Kreutzer K, Gary J, et al. A collaboration among health sciences schools to enhance faculty development in teaching. *Am J Pharm Educ* 2014;78:102.

30.   Lobelo F, Duperly J, Frank E. Physical activity habits of doctors and medical students influence their counselling practices. *Br J Sports Med* 2009;43:89-92.

31.   Stanford FC, Durkin MW, Stallworth JR, et al. Factors that influence physicians' and medical students' confidence in counseling patients about physical activity. *J Prim Prev* 2014;35:193-201.

32.   Wattanapisit A, Fungthongcharoen K, Saengow U, et al. Physical activity among medical students in Southern Thailand: a mixed methods study. *BMJ Open* 2016;6:e013479.

33.   Van Mol C. Improving web survey efficiency: the impact of an extra reminder and reminder content on web survey response. *Int J Soc Res Methodol* 2017;20:317-27.

34.   Thangaratinam S, Redman CWE. The Delphi technique. *Obstet Gynecol* 2005;7:120-5.

35.   Hsu; CC, Sandford BA. The Delphi technique: Making sense of consensus. *PARE* 2007;12.

36.   Wattanapisit A, Vijitpongjinda S, Saengow U, et al. Development of a physical activity monitoring tool for Thai medical schools: a protocol for a mixed methods study. *BMJ Open* 2017;7:e017297.

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	Page
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	-
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5-7
Bias	9	Describe any efforts to address potential sources of bias	-
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	-
		(*b*) Describe any methods used to examine subgroups and interactions	-
		(*c*) Explain how missing data were addressed	6
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	6-7
		(*e*) Describe any sensitivity analyses	-

Results

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7-8
		(b) Give reasons for non-participation at each stage	-
		(c) Consider use of a flow diagram	-
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7-8
		(b) Indicate number of participants with missing data for each variable of interest	-
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	-
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	-
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	-
		Cross-sectional study—Report numbers of outcome events or summary measures	8-13
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	-
		(*b*) Report category boundaries when continuous variables were categorized	8-13
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	-
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	-

Discussion

Key results	18	Summarise key results with reference to study objectives	13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	16

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	18

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.