





BMJ Open Facilitators and barriers for the implementation of exercise as medicine in routine clinical care in Dutch university medical centres: a mixed methodology study on clinicians' perceptions

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ABSTRACT

Objectives Despite the many proven advantages of a physically active lifestyle in patient populations, prescription of exercise is currently not widely implemented in routine clinical practice. The aims of this study were twofold: (1) to assess perceptions of clinicians on the current practice of exercise as medicine (E=M) prescription in two Dutch university medical centres and (2) to determine their perceived barriers and facilitators for the implementation of E=M in routine clinical care in Dutch university medical centres.

Design A mixed methodologies study, using both online questionnaires and semi-structured interviews.

Setting Dutch university medical centres.

Participants Clinicians working within the departments of medical oncology, orthopaedics and rehabilitation medicine of two university medical centres.

Results Forty-five clinicians (response rate of 51%) completed the questionnaire, and 19 clinicians were interviewed. The results showed that even though clinicians had a positive attitude towards prescribing E=M, only a few reported to regularly prescribe E=M to their patients. The 52 identified facilitators and barriers for implementation of E=M were categorised into four main themes: (1) beliefs toward the implementation of E=M (eg, clinicians knowledge and skills, and social support), (2) factors related to the patient perspective (eg, patient priorities or motivation), (3) factors related to the referral options (eg, knowledge of and trust in local referral options) and (4) practical considerations when implementing E=M (eg, time constraints).

Conclusions Our study showed that even though many clinicians have a positive attitude toward an active lifestyle, many are not prescribing E=M on a regular basis. In order for clinicians to effectively implement E=M, strategies should focus on increasing clinicians E=M

Strengths and limitations of this study

- A mixed methodologies design was used to assess the clinician's perspectives on the current status of exercise as medicine (E=M) and facilitators and barriers for implementation.
- The development of both the questionnaire and the topic guide was conducted in close collaboration with a broad range of experts and guided by the theory of planned behaviour and the framework for innovation within healthcare organisations.
- The study was conducted among clinicians working in academic hospitals; the results may not be generalisable to other Dutch hospitals.

referral skills, improving clinicians knowledge of E=M referral options and develop a support system to ensure that E=M is high on the priority list of clinicians.

INTRODUCTION

The health benefits of a physically active lifestyle are numerous.¹ This not only holds for healthy individuals but is maybe even more important for people who are living with health conditions. The benefits of prescribing physical activity and/or exercise in a clinical setting are numerous. They include a decrease in postoperative complications following exercise-based pre-habilitation,² beneficial effects of inpatient mobilisation on physical factors, psychological factors and quality of life.^{3 4} In people with stroke, the positive effects of a physically active lifestyle

have been reported on physical fitness and health-related quality of life.⁵ In people with cancer, an active lifestyle has shown to be associated with improved quality of life,⁶ reduced fatigue⁷ and higher survival rates.⁸ For people living with a physical impairment, physical activity may improve health and well-being.^{9,10} Despite the beneficial effects of physical activity, physical activity levels in people with chronic conditions are low.^{11–13}

The WHO has included specific advice for adults living with chronic conditions and those living with a disability into their physical activity guidelines.¹⁴ The WHO recommends that adults and older adults living with cancer, hypertension, type-2 diabetes, HIV and disabilities should undertake regular physical activity.¹⁴ The American College of Sports Medicine uses the paradigm ‘exercise is medicine’ (E=M) in its global initiative to increase awareness to consider physical activity as a treatment option. However, many other terms have been used, including ‘exercise on prescription’, ‘physical activity on prescription (schemes)’, ‘exercise on referral (scheme)’ or ‘green prescription’.¹⁵ These terms are used interchangeably. In this manuscript, we will use the term exercise is medicine as E=M.

A clinician can prescribe to be more physically active, or give a simple advice on physical activity. Discussing an active lifestyle by a clinician during a clinical consultation may have additional benefits. Since patients expect to receive recommendations from their clinician, the advice can serve as a strong external cue toward a more physically active lifestyle.¹⁶ Furthermore, clinicians’ outreach is broad and may include otherwise hard to reach populations, such as the elderly, socioeconomically disadvantaged or people on sick leave.¹⁷ Also, being diagnosed with a disease may be a ‘teachable moment’ for a patient toward a healthier lifestyle.¹⁸

Not much is known about the current practice of E=M in routine clinical or hospital care. Most evidence have been collected among primary healthcare workers. For example, in the USA, little over 30% of patients visiting a clinician or another health professional receive recommendations for exercise.¹⁹ In German primary healthcare, only 10% of patients receive counselling on physical activity.²⁰ And in Sweden, the nationally implemented E=M programme has a low uptake among primary healthcare workers.²¹ Nevertheless, for disease-specific counselling, a positive trend was observed for tailored physical activity interventions.²⁰

In the Netherlands, the picture seems to be promising. Of the 340 general practitioners included in a national survey, 54% reported that they referred patients to a fitness centre and 37% to another local exercise facility.²² However, the general practitioners also estimated that less than 20% of those patients who should increase their physical activity level for health reasons is referred to a professional.²² Another Dutch study among orthopaedic surgeons showed that 75% of the surgeons reported that they did ‘mention sports activities’ after a total hip arthroplasty or after a total knee arthroplasty. However, only

34% reported advising patients to meet the Dutch physical activity guidelines.²³

Reasons for the lack of prescription of E=M by clinicians have been described in the literature, of which the lack of time seems to be a key barrier.^{24–27} Also, inadequate knowledge, lack of routines and uncertainty regarding referral arrangements at the clinicians’ level are barriers for the implementation of E=M in clinical practice.^{24,27} These studies into barriers for E=M prescription were focused on E=M prescription during cancer treatment,²⁷ or focused on care providers (both primary care and specialists) for patients with osteoporosis.²⁴ However, it is unclear whether the barriers for E=M reported for those specific patient groups also apply to other patient groups and whether perceived barriers differ between clinicians working in primary care and medical specialists.

Better understanding of the underlying barriers for E=M implementation is, therefore, necessary to guide the development of future implementation strategies. Therefore, this study aims to assess clinicians’ perceptions on (1) current E=M practice and (2) facilitators and barriers for implementation of E=M in Dutch university medical centres.

METHODS

Participants

For the Physicians Implement Exercise=Medicine (PIE=M) study, clinicians (ie, medical physicians, specialist registrars, nursing specialists and physician assistants) were recruited at two university medical centres in the Netherlands. In the University Medical Center Groningen, the departments of orthopaedics and rehabilitation medicine were involved. In the Amsterdam University Medical Center (Location VUmc), the medical oncology and rehabilitation medicine departments participated. Data were collected between February 2019 and July 2019. Written informed consent was obtained from each participating clinician after a brief introduction of the study.²⁸

Data collection

Data were collected in two waves. First, a questionnaire was sent by email to all clinicians (n=89) working in the participating departments who treated adult patients. In the questionnaire, clinicians were also asked if they were available for a follow-up semi-structured interview. Interested clinicians were then contacted. Purposive sampling was conducted, meaning that we selected clinicians for interviews in a way that each department was adequately represented in the final dataset. In practice, this meant that not all clinicians who were available for an interview were contacted by the researchers. Interviews were in principle conducted until data saturation was reached, but was also guided by department size and willingness of clinicians to participate in an interview.

Questionnaire

The questionnaire for the clinicians (online supplemental appendix 1) was based on a questionnaire for Dutch general practitioners on frequency of E=M referral and referral procedures.²⁹ In order to gain a better understanding of the current referral behaviour of Dutch clinicians, the questionnaire was supplemented by questions on clinician's motivation for E=M referral. The additional questions were guided by the concepts of the theory of planned behaviour (TPB).³⁰ The TPB suggests that attitude, subjective norm and perceived behavioural control together lead to the intention to perform a behaviour.

The questionnaire contained 21 questions. In the introduction, a detailed description of 'referral regarding an active lifestyle' was provided: 'general advice, coaching toward an active lifestyle, referral to: a local sports club, walking club, physiotherapist, local sports coach, combined lifestyle intervention, physical activity and sports agency or sports and exercise specialists'. The questionnaire included questions on: (1) demographic information, (2) knowledge of patient-specific and current Dutch physical activity guidelines, (3) clinicians' perception regarding the promotion of an active lifestyle, (4) self-reported E=M referral, (5) open question regarding clinicians' perceived facilitators and barriers for implementing E=M and (6) questions regarding clinicians' needs, requirements and support for the implementation of E=M. The reliability and validity of the questionnaire were not assessed.

Semi-structured interview

Semi-structured interviews were conducted to assess clinicians' facilitators and barriers to implement E=M in their usual practice. The topic guide (online supplemental appendix 2) was specifically developed for this project and was guided by the framework for innovation within healthcare organisations.³¹ Within this framework, four main levels of determinants of implementation are described: (1) characteristics of the socio-political context, such as rules and legislation, (2) characteristics of the organisation, such as staff turnover or the decision-making process in the organisation, (3) characteristics of the person adopting the innovations, such as knowledge, skills and perceived support from colleagues and (4) characteristics of the innovation, such as complexity or relative advantage. The interview guide contained specific questions on each of the four levels of the framework.³¹ In the original framework, Fleuren *et al*.³¹ categorised participant characteristics as part of the socio-political context. Because the patient perspective can be one of the determinants that impact the implementation of E=M,³² it was decided to consider the patient perspective as a separate level of determinants for implementation.³²

An interview lasted approximately 60 min and was conducted face to face in the medical centre. The interviews were conducted by AJB, FvN and JN, who are female post-doctoral researchers and not involved in patient care. Each interview was audio recorded and transcribed

verbatim. Transcripts were not returned to participants for comment and/or correction.

Data analysis

We analysed the quantitative questionnaire data using descriptive statistics in IBM SPSS statistics (version 26). Open-ended questions in the questionnaire and the interview data were analysed in Atlas.ti by a thematic analysis, using a semantic approach.³³ We developed an initial codebook based on the Fleuren *et al*'s framework.³¹ Seven researchers coded nine interviews using 'open codes' (each coding two interviews independently; AJB, FvN, JN and four research assistants). The same seven researchers categorised all codes within the five levels described before.^{31 32} All interviews were then re-coded by two researchers (FvN and JN), based on the consensus-based codebook. Also, two open-ended questions from the questionnaire (i.e., (1) please give three reasons why you would discuss an active lifestyle with a patient and (2) please give three reasons why you would not discuss an active lifestyle with a patient) were coded, taking the codebook into account. When deemed necessary, additional codes were added to the codebook. After all data were coded, the themes were reviewed by two researchers (FvN and JN) and, when necessary, redefined to present the results in a coherent manner.³³ In order to interpret the codes of the codebook, two researchers (FvN and JN) made a summary of the quotations for each separate code, which are presented in the Results section. When deemed more informative, quotations were used to explain the codes. We did not ask individual clinicians to provide feedback on the findings, but representatives of the participating departments have been consulted throughout the process.

Because of the overlap between the questionnaire questions related to the TPB and the codebook, the results of the quantitative and qualitative data sources were combined into one table. Therefore, two researchers (FvN and JN) were selected for each statement: a quotation in disagreement and a quotation in support.

Patient and public involvement

No patient was involved.

RESULTS

Forty-five out of 89 clinicians completed the questionnaire (response rate: 51%). Demographic details of the respondents are provided in table 1. Two of the questions (13 and 15) out of the questionnaire were considered to be not of interest for the current study, the results of those questions are presented in online supplemental appendix 3. Thirty clinicians were willing to participate in a follow-up interview and were contacted by one of the researchers. Ultimately, 19 clinicians were interviewed (63%), after which data saturation was reached.

Current practice of E=M in Dutch university hospital clinicians

Many clinicians (84%, n=38) reported knowing the Dutch physical activity guidelines.³⁴ A little less than a third of

Table 1 Characteristics of clinicians participating in the PIE=M study

	Questionnaire			Interview		
	Total N (%)	Amsterdam UMC	UMC Groningen	Total	Amsterdam UMC	UMC Groningen
Gender						
Male	24 (53)	6	18	11 (58)	4	7
Female	21 (47)	6	15	8 (42)	2	6
Age categories (years)						
<34	19 (42)	5	14	8 (42)	3	5
35–44	11 (24)	4	7	1 (5)	0	1
>45	15 (33)	3	12	10 (53)	3	7
Job description						
Medical specialist	23 (51)	5	18	13 (68)	3	10
Specialist Registrar	17 (38)	6	12	6 (22)	3	3
Other	4 (9)	1	3	–	–	–
Years' experience						
<5	20 (44)	6	14	5 (26)	2	3
5–14	14 (31)	6	8	10 (53)	4	6
>15	11 (24)	–	11	4 (21)	–	4

PIE=M, Physicians Implement Exercise=Medicine.

the clinicians knew of diagnosis-specific physical activity guidelines, such as the pain guideline, spinal cord injury guideline, stroke guideline and arthritis guideline. All clinicians agreed that it was partially their task as a clinician to discuss physical activity levels with their patients. Also, many clinicians (91%, n=41) reported that they believed that the patient themselves to be responsible for a physically active lifestyle. Seventy-seven per cent of the clinicians (n=35) reported being responsible for their patient's active lifestyle, and 71% (n=32) reported that the general practitioner had a responsibility. The opinion regarding other professionals' responsibility, such as physiotherapists, lifestyle coaches and the municipality, was mixed (figure 1).

Thirty-one per cent (n=14) of the clinicians reported discussing a physically active lifestyle, with over 60% of their patients. The majority of the clinicians discusses a physically active lifestyle if this is relevant to the diagnosis of the patient (40%, n=18), if relevant for the general well-being of the patient (31%, n=14) or with specific patient groups (13%, n=6).

In table 2, the questions related to the TPB are illustrated with quotations from the interviews in disagreement and support of E=M. In general, clinicians working in rehabilitation medicine have a higher agreement with the statements of TPB than colleagues working in orthopaedics or medical oncology. The latter two departments often did not consider it their duty to discuss a physically active lifestyle (attitude—medical oncology: 43% and orthopaedics 67%), did report lower social support (subjective norm—medical oncology: 0%–57% and orthopaedics: 33%–60%) and more often felt they

lacked the knowledge and skills to properly discuss active lifestyle with their patients (perceived behavioural control—medical oncology 14%–29% and orthopaedics 53%–60%).

Perceived barriers and facilitators of clinicians for the implementation of E=M

The following themes were identified: (1) beliefs as perceived by the clinicians, (2) patient perspective as perceived by the clinicians, (3) E=M referral options and (4) practical considerations when implementing E=M (figure 2). Theme 1 was divided into three subthemes: beliefs of the clinician, beliefs within the department as perceived by the clinicians and beliefs within the socio-political environment as perceived by the clinicians.

Beliefs of the clinician

Almost all clinicians mentioned being aware of the benefits of a physically active lifestyle for patients' mental and physical health, which is regarded as a facilitator for implementing E=M. Yet, many of them reported to simply forget to discuss a physically active lifestyle with their patients. Some clinicians deemed it important to act as a role model for their patients or argued that physically active clinicians are more likely to discuss active lifestyle issues. Several clinicians believed that a piece of advice to adopt a more physically active lifestyle by a clinician may serve as a wake-up call. In contrast, others questioned the effect of discussing an active lifestyle with every patient:

[...] how much of [the physical activity advice] is adopted [by the patient] is, I think, very little. At least that seems to be the case for [the patients] that are

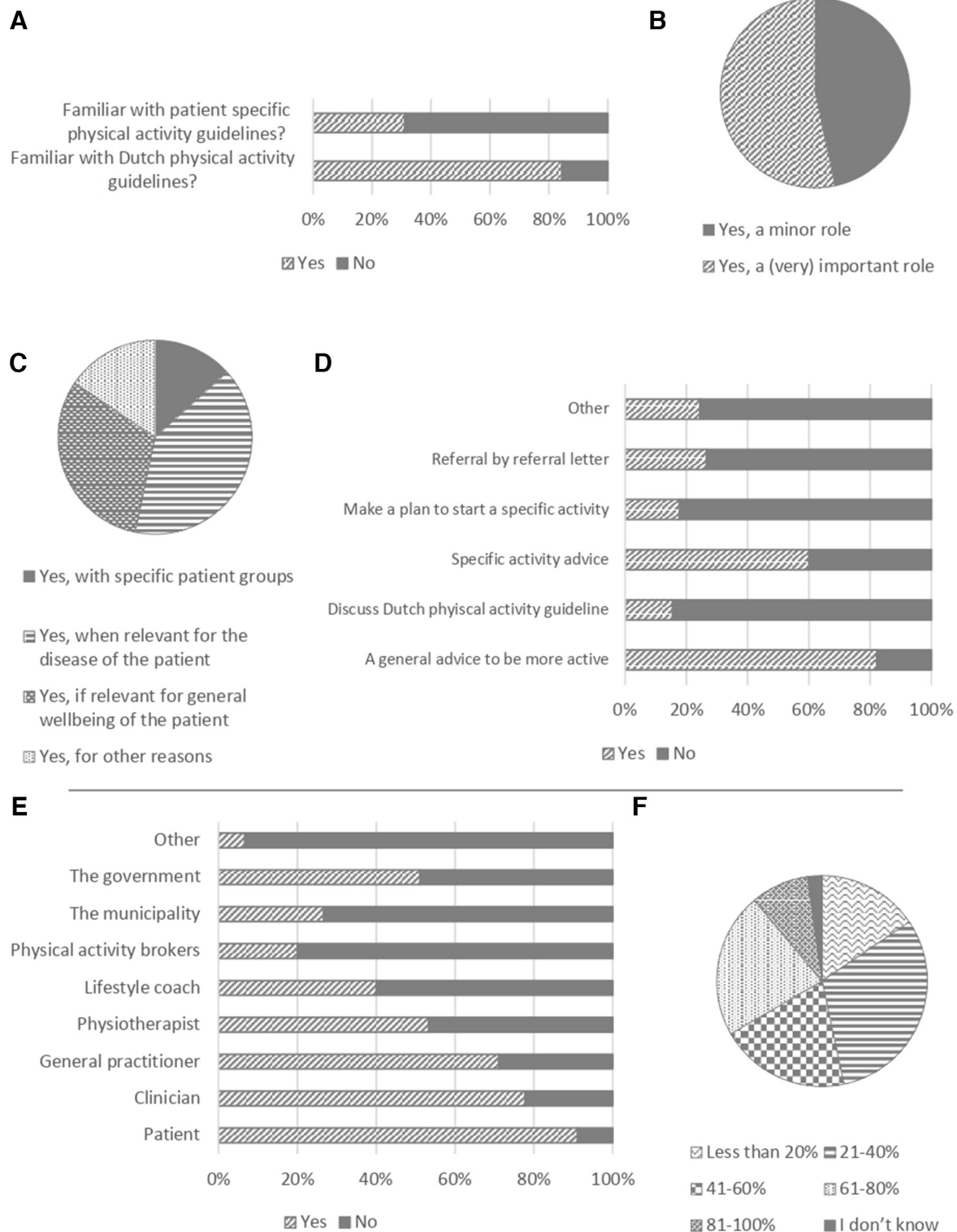


Figure 1 Current status of the implementation of E=M in two Dutch university medical centres. (A) Do you know the Dutch and patient-specific physical activity guidelines? (B) Does a clinician play a role in promoting an active lifestyle? (C) Do you discuss an active lifestyle with your patients? (D) How do you advise patients about an active lifestyle? (multiple answers possible). (E) Who is most responsible for promoting an active lifestyle? (multiple answers possible). (F) What proportion of patients do you discuss a physically active lifestyle with? E=M, exercise is medicine.

treated here. Because if you tell them: “try to be more physically active by yourself”. But they already did not do this in the past, so, yeah, then the conversation

needs to be exceptionally good for [the patient] to become that motivated.

Table 2 The components of the TPB for E=M as perceived by clinicians

	Amsterdam UMC (n=12)		UMCG (n=33)		Quote in disagreement with questionnaire statement	Quote in agreement with questionnaire statement
	Medical oncology	Rehabilitation medicine	Orthopaedics	Rehabilitation medicine		
As a clinician, I think it is important to discuss a physically active lifestyle with my patients	71	100	67	95	'(...) and if I know that physical activity is beneficial for toxicity etcetera, then that empowers me to add [physical activity] to my message.' Department of Medical Oncology, Amsterdam UMC	'I presume, and for [disease X] I know for sure, that physical activity is not associated with negative effects on the development of [disease X]. And I also assume that the health benefits are the same for [disease X] patients as they are for someone else.' Department of Rehabilitation Medicine, Amsterdam UMC
It is my duty/responsibility to discuss a physically active lifestyle with my patients	43	100	67	95	'(...) but for me, I don't see [patients] a limited number of times and often with a diagnostic question. And I do think that you should discuss [an active lifestyle] because it is part of daily functioning and it is important. But then the advice [to be sufficiently physically active] would have a more preventive character, but if I do not start a treatment, I will not give it [as a preventive advice] because in that case, I don't think it is our responsibility.' Department of Orthopaedics, UMCG	'Well, I actually think, that what you gain (...) is the best possible care. I really think that if you don't discuss an active lifestyle you are making a mistake.' Department of Rehabilitation Medicine, UMCG
My colleagues deem it important that I discuss a physically active lifestyle with my patients	0	100	40	74	'So not all the preventive advices come from me. Luckily there are also nurse specialists who interfere with patients.' Department of Medical Oncology, Amsterdam UMC	'We had a discussion among colleagues recently, (...) I guess that 20%-30% does actively discuss an active lifestyle, and the rest occasionally [discusses an active lifestyle] but not that specific.' Department of Rehabilitation Medicine, UMCG
The head of my department deems it important that I discuss a physically active lifestyle with my patients	14	80	33	68	-	
I have sufficient knowledge to discuss a physically active lifestyle with my patients	29	100	60	79	'(...) sometimes you prescribe [a physically active lifestyle] and then [the patient] will just stare at you. And that's maybe because we don't know how to explain [the importance of a physically active lifestyle]. Or that you are not experienced in [giving an advice to be sufficiently active].' Department of Orthopaedics, UMCG	'(...) I think that the new generation [of medical doctors] have more knowledge [of the impact of a healthy lifestyle on health]. But in the past, that was not part of our repertoire.' Department of Orthopaedics, UMCG
I have sufficient skills to discuss a physically active lifestyle with my patients	14	100	35	95	'If I meet a patient for the first time, I find it hard to immediately [discuss a physically active lifestyle]. I don't want to appear to blame them or be judgmental [of the patient].' Department of Rehabilitation Medicine, UMCG	'Yes I think that here in the department of Rehabilitation Medicine there's a lot, everyone is schooled in motivational interviewing. (...) So I guess that there should be enough knowledge [on how to discuss a physically active lifestyle] in the rehabilitation centre. Yes. And we are also schooled in low health skills.' Department of Rehabilitation Medicine, UMCG
I believe that discussing a physically active lifestyle can positively influence the patient	43	80	69	79	'well, you see, some people tell me 'I, did everything! This, and this and this'. They come into the room like that (...) 'nothing works' well, then you are usually done talking.' Department of Orthopaedics UMCG	'But I do believe that patients are more impressed if I say 'well, we know from research that (...) a physically active lifestyle is important and that active people have a lower risk that the disease will ever come back and I think that would be more effective (...) then when I would tell the patient that 'we know an active lifestyle is good for you' because, well, an active lifestyle is good for everything.' Department of Rehabilitation Medicine, Amsterdam UMC

Continued

Table 2 Continued

	Amsterdam UMC (n=12)		UMCG (n=33)		Quote in disagreement with questionnaire statement	Quote in agreement with questionnaire statement
	Medical oncology	Rehabilitation medicine	Orthopaedics	Rehabilitation medicine		
I am motivated to discuss a physically active lifestyle with my patients	86	80	60	89	'And some people, yes I guess that I am probably the uptieeth person who has discussed an active lifestyle]. And those are the people who are really fat and heavy smokers, well eh unhealthy patients, well I don't have the illusion that I'm going to change [their behaviors]. So then I don't always discuss [an active lifestyle.]' Department of Orthopaedics, UMCG	'Well [a physically active lifestyle leads to], a faster and better recovery. Better quality of life. You could have psychological benefits and better mood, more [social] contacts. Yes, there is a lot of evidence that [being sufficiently active] works for any condition. So, umh yes, I could talk for hours on this matter.' Department of Rehabilitation Medicine, UMCG
Discussing a physically active lifestyle with patients is in line with the policy of our team/department	57	100	60	95	'No, we never join [colleagues] during a consultation. And [an active lifestyle] is rarely a theme we discuss during [department] meetings.' Department of Medical Oncology, Amsterdam UMC	'For example, we have a monthly meeting with all rehabilitation specialists, and the topic 'physical activity and sports' (...) is on the agenda on a regular basis to keep us informed and up to date.' Department of Rehabilitation Medicine, UMCG

Responses are illustrated by quotes derived from the interviews. Numbers represent % of agreement with statement. E=M, exercise is medicine; TPB, theory of planned behaviour.

(quote clinician Rehabilitation Medicine UMCG)

Although some clinicians considered discussing a physically active lifestyle with their patients as part of their job prescription, a large majority of the clinicians did not think that discussing physically active lifestyle referral options with patients should be their task. They feel that a physically active lifestyle is the responsibility of the patient. As an orthopaedic surgeon suggested:

[the] activity level you have now will be the same after the prosthesis. So, I cannot operate more activity into [your body during surgery]. That's something you need to do yourself.

(quote clinician Orthopedics UMCG)

Many argued that the general practitioner would be better equipped to support the patient in that regard. Some of the clinicians did state that E=M was one of their tasks, but that their involvement was only minor in hindering implementation:

I think that [medical doctors] have a role in identifying [a need for more physical activity in a patient]. And the execution [of physical activity advice] would be nice because [medical doctors] don't have the time to do that.

(quote clinician Orthopedics UMCG)

Another important topic toward implementing E=M that was expressed is that clinicians need to have the skills to discuss a physically active lifestyle with their patients. When clinicians do have such skills, this is perceived to be a facilitator. One clinician believed that older clinicians might not be sufficiently trained to discuss a physically active lifestyle with their patients. Another clinician mentioned that the skills to discuss a physically active lifestyle might be there. However, it is difficult to start the conversation because the patient could experience themselves as being judged by their clinician. Some clinicians found it challenging to advise on a physically active lifestyle for specific patient groups, such as those with foot ulcers or patients who are wheelchair bound.

The final factor within this theme is the evidence that clinicians are aware of regarding the health effects of E=M. Clinicians in medical oncology reported that evidence for a specific exercise regime or of the beneficial effects for patients with a specific type of cancer was perceived to be a facilitator for implementation of E=M. Some clinicians report to have no evidence that a physically active lifestyle benefits the health of their patients. One clinician reported this to be a barrier toward discussing an active lifestyle:

Many people wonder if they should be active [with a fast progressing muscle disease], do strength training in order to become stronger and stay stronger. The literature has shown that this is pointless. At least not to get better, but also not to decline slower. [...] Well, you know, it may not make people worse, but at least

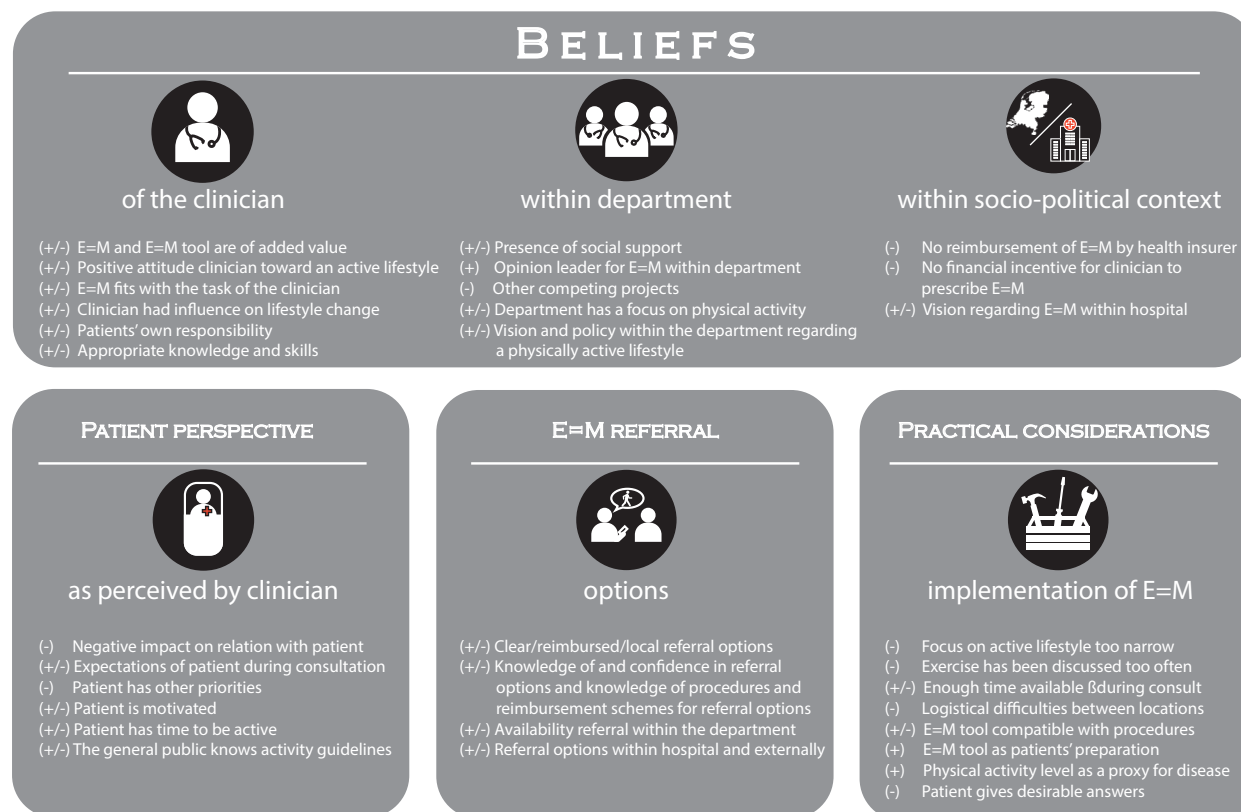


Figure 2 Overview of facilitators and barriers as perceived by Dutch clinicians working in two Dutch university medical centres. (+): facilitator; (-): barrier; (+/-): both facilitator and barrier. For (+/-), the statements are formulated to represent the facilitator, the opposite of the statement represents the barrier. E=M, exercise is medicine.

it's a waste of their time and money and energy which they could better spend on fun things to do.

(quote clinician Rehabilitation Medicine UMCG)

While another clinician perceived the lack of negative effects on the current condition as a facilitator:

I presume, and for [disease X] I know this for a fact, that physical activity does not negatively affect the course of the disease. [...] I did check the patient's [physical status], so I know the activities that a patient can safely participate in. [...] so I have even more reason to advice a patient [to be sufficiently physically active].

(quote clinician Rehabilitation Medicine Amsterdam UMC)

Beliefs within the department

A common facilitator, mentioned by all but a few of the clinicians, for implementing E=M is that the departments' focus is on disorders of the locomotive apparatus. However, clinicians working in the Department of Orthopaedics (UMCG) see many patients who are hampered by comorbidity, which makes it, according to the clinicians, difficult for the patient to be physically active, which in turn hampers the implementation of E=M.

Clinicians also stated that it could be beneficial when the importance of E=M prescription is regularly discussed among their team/within the department.

Several clinicians mentioned within all the departments that incorporating E=M into the strategic plans and department policy would support the implementation of E=M. Implementation would also benefit if E=M was a priority within the department. Some clinicians suggested that uniformity in the routine of E=M prescription within the department would benefit the implementation. If E=M implementation needs to compete with other projects, this was considered a barrier within several departments.

Within the Amsterdam UMC's departments, it was suggested that an initiative to increase the prescription of E=M would benefit if an enthusiastic clinician from within the team would be made responsible for the implementation (ie, appoint a key player).

Beliefs within the socio-political context

This theme comprises all factors that influence the implementation of E=M related to the broader context in which the department needs to operate. This involves the university hospital, insurance climate, as well as the Dutch national political context. The importance of the inclusion of E=M within the strategic policy of the hospital was considered a facilitator, especially in UMCG. On the other hand, if the hospital board does not support E=M, this was considered a barrier. This was illustrated by one of the clinicians by an analogy to a non-smoking policy within the hospital:

Like when you are implementing a [smoke free workspace] within your department, and you go outside, and the people are smoking their cigarette directly around the corner, especially when it's colleagues [who are smoking], then that's really bad.

(quote clinician Medical Oncology Amsterdam UMC)

The financial facilitators and barriers towards the prescription of E=M are related to the Dutch healthcare reimbursement system. The Dutch reimbursement system is developed at a national level, and includes instructions on the duration of a consultation and the reimbursement rules regarding referral to, for example, a physiotherapist. Due to these regulations, many of the clinicians, except those working within the oncology department, reported no financial stimulus to prescribe E=M. They feel that the duration of the consultation is too short for proper discussion of E=M. Another barrier is that referral to a physiotherapist generally is only reimbursed for patients with additional insurances (paid by the patient). Clinicians suggested that patients who cannot afford physiotherapy are usually also those who do not have additional insurance. When physiotherapy is included in the reimbursement schemes, this is considered a facilitator for implementing E=M.

Lastly, clinicians believe that it would benefit the implementation of E=M if more attention would be paid to lifestyle-related factors in primary care and in the curriculum for medical students.

Patient perspective as perceived by clinicians

Many of the facilitators and barriers towards the implementation of E=M pivot around the patient perspective. The motivation of the patient was mentioned by almost all of the clinicians to be an important factor for implementation. If a patient is highly motivated to be physically active, this was considered a facilitator, sometimes to the point that a patient needs to be told to reduce their physical activity intensity, because they are at a risk of overuse. On the other hand, when a patient is not motivated to be physically active, this was considered a barrier:

And we also see [patients] who believe that they don't have to do anything when they are ill, so they don't do any [physical activity].

(quote clinician Medical Oncology Amsterdam UMC)

[...] If a patient tells me 'I did everything I could, this, this and that [...]. Nothing works! [...]' then I get signals of 'Well, I am not planning to make an effort myself to solve my problem'.

(quote clinician Orthopedics UMCG)

Discussing a physically active lifestyle with patients was reported by clinicians of various departments to be too confronting for some patients. Bringing a physically active lifestyle to very unfit patients' attention may

negatively affect the working relationship between clinician and patient. Two clinicians particularly advised against discussing a physically active lifestyle during intake:

Because [discussing a physically active lifestyle] is not the expectation or the question that is on the mind of [the patient]. Suppose the complaints are not directly related to [a physically active lifestyle], uhm. In that case, you need to make sure you have a clear mandate for an opinion on [the patient's inactive lifestyle] because otherwise, you will have a conversation of what the patient thinks: 'that's none of your business, I am here because of my [health condition], and you are complaining that I should be more physically active.'

(quote clinician Rehabilitation Medicine UMCG)

Clinicians of all participating departments reported that other priorities of the patient are a barrier towards discussing a physically active lifestyle. Discussing a physically active lifestyle could give the patient a feeling that the complaint is not taken serious by the clinician:

Because you don't want [the patient] to come home and say: 'I received all kinds of advice on sports, physical activity and diet but I still think that I have a hernia.' Because then we did not convey [our advice for] what [the patient] came for, to begin with.

(quote clinician Rehabilitation Medicine UMCG)

Clinicians suggested that it could also be that there are too few contact moments with the patient to properly discuss a physically active lifestyle, that the patient has a complaint that is not activity related, or some patients have other personal issues that interfere with a physically active lifestyle. Lastly, there is a group of patients who has too few capabilities to be physically active:

If a [patient] is only capable of steering his wheelchair with a spastic hand, it will be impossible for them to reach the Dutch physical activity guideline.

(quote clinician Rehabilitation Medicine UMCG)

According to clinicians, it was difficult for some patient groups to reach the Dutch physical activity guidelines, for example, for patients with non-ambulatory stroke, patients with an upper leg amputation or cancer patients. The physical activity guidelines for people living with a disability state that patients should 'be as active as possible'. This provides little guidance to the clinician on how to have the conversation about physical activity. Some clinicians preferred patient-specific physical activity norms, that is, including information regarding specific types of exercise like strength or endurance training. Lack of knowledge toward a physically active lifestyle, both by the patients and the general public, was perceived as a barrier toward the implementation of E=M. According to the clinicians, many of the patients are not aware of the physical activity guidelines or are afraid to sustain tissue damage while being physically active. Some patients need

guidance to help them implement physical activity into their daily routines:

[...] and that we assume that [patients] can initiate [a physically active lifestyle] on their own, while that is actually too much to ask for some groups. So, when they come back [for a consultation], and you ask them, 'did you already make a plan, or have you started [being more physically active]?' That did not happen, but not because they didn't want to, but simply because they couldn't.

(quote clinician Rehabilitation Medicine UMCG)

E=M referral options

Referral options for clinicians may be organised internally (within the hospital) or externally. Referral options within the hospital, for example, to a lifestyle coach or physiotherapist, are generally considered a facilitator for implementing E=M by the clinicians. The interviewed clinicians argued that those professionals are generally better equipped and connected to primary health-care providers. Within one of the participating medical centres, clinicians could refer their patients for lifestyle counselling within the hospital. Some of the clinicians remarked that they did not use this facility because of restricted opening hours:

[...] I see patients in the afternoon, and I usually try to discuss [a physically active lifestyle], and some [patients] are certainly willing to see [a lifestyle coach]. But the [lifestyle coaches] are not available in the afternoon. And I wonder if [the patient] will make a separate appointment to see a lifestyle coach.

(quote clinician Rehabilitation Medicine UMCG)

One of the clinicians reported that it was difficult to arrange the usage of other departments' facilities for a hospitalised patient.

Clinicians expressed to be reluctant to refer patients to professionals within the neighbourhood of the patient. Lack of insight into the referral options within the neighbourhood of the patient hindered them as they stated that they could not guarantee the quality of the referral.

And that wheelchair, uhm, adapted sports is not available everywhere in the three northern provinces [of the Netherlands]. And another thing is that very few physiotherapists have fitness equipment suitable for people who use a wheelchair.

(quote clinician Rehabilitation Medicine UMCG)

Few clinicians were afraid that physiotherapists would charge unnecessary treatments. However, most clinicians did recognise that the threshold for patients to comply with the referral was reduced in case patients are referred to local health professionals. One clinician always referred patients back to the general practitioner for advice on good quality local physiotherapists. In contrast, another clinician always referred patients to physiotherapists in the neighbourhood of the patient.

Clinicians who do have a network with a physiotherapist they trust are more willing to refer patients. Another facilitator was that patients are referred to 'automatically' as part of the orthopaedic and rehabilitation medicine departments' standard care.

[the advice] is usually more functionally [focused], so uhm ... for example focused on improving endurance to increase walking distance but not [...] in case they usually commute by car to stimulate the use of a bicycle instead.

(quote clinician Rehabilitation Medicine UMCG)

Practical considerations when implementing E=M

The last theme involves all practical factors related to the implementation of E=M. When asked about their ideas on facilitating the discussion of a physically active lifestyle with their patients, clinicians responded that they would prefer an online system for the evaluation of the current physical activity levels of their patients. It would be a facilitator if such a system included other lifestyle factors such as smoking and diet. Clinicians in all departments, except for medical oncology, thought it would facilitate the implementation of E=M if an electronic system would replace questions that are already routinely asked as part of the anamnesis. Automatic notifications within the electronic patient file if a patient is insufficiently physically active may work well as a reminder to start discussing the topic. A translation of the current physical activity level of a patient into personalised advice, including concrete referral options, was also considered to facilitate the implementation of E=M. In order for clinicians to use such a system, it should work smooth and efficient. It would benefit E=M implementation if physical activity outcomes were available for all clinicians who work with the patient, also those working in different disciplines. For the wide implementation of E=M, a uniform approach that can be used within other hospitals would be preferred. An online system to assess physical activity levels could work well in the rehabilitation medicine and orthopaedics departments. However, a clinician working within medical oncology department was unsure if this would work:

That we would distribute a questionnaire [on current physical activity levels] to patients. I don't see that happening. [...] We will not, we may do that during a pilot or something, but we will never do that again after the pilot has ended.

(quote clinician Oncology Amsterdam UMC)

An advantage of an online system for the assessment of physical activity levels was, according to some clinicians, that a patient is primed to think about a physically active lifestyle before the consultation. Such a questionnaire may shift the expectations of the patient during the consultation towards a physically active lifestyle. Another advantage of a physical activity questionnaire, when used longitudinally, is that changes in physical activity levels

can be used as an indicator for the patients' disease state. Some of the clinicians were wary of using self-reported physical activity data, since the patient's wishes may bias these. An orthopaedic patient may only receive a new knee when complaints are very severe, while a patient with cancer may only receive treatment when sufficiently fit to withstand the chemotherapy.

DISCUSSION

In this mixed-methods study, we assessed clinicians' perspective on current practice of E=M implementation in two Dutch university medical centres, and perspectives on facilitators and barriers to implementing E=M. The main findings from the questionnaire were that only a few clinicians reported to routinely discuss an active lifestyle with their patients, although clinicians' intention toward prescribing E=M was positive and many of the clinicians feel a responsibility with respect to prescribing an active lifestyle to their patients. The interviews with clinicians revealed many factors that hinder or facilitate the implementation of clinicians E=M prescription behaviour. These factors were categorised into four main themes: (1) beliefs toward the implementation of E=M, (2) factors related to the patient perspective, (3) factors related to the referral options and (4) practical considerations when implementing E=M.

Current practice of E=M implementation

It is promising that all clinicians do discuss an active lifestyle with their patients at least once in a while. The responses to the statements on attitude, subjective norm and self-efficacy to prescribe E=M in routine care showed large differences between the departments. In general, clinicians working in orthopaedics and medical oncology do not feel that it is their task to discuss an active lifestyle; there is a general lack of social support and they feel they do not have the skills to discuss an active lifestyle with their patients. These differences should be recognised and need specific attention for E=M implementation efforts to be successful.

Factors associated with clinicians' beliefs

We found that most clinicians feel a responsibility for their patients' active lifestyle, but that they do not consider it their task to discuss active lifestyle referral options with, or design training regimes for, their patients. The feeling that it was not their task to discuss an active lifestyle with patients was more pronounced in medical oncology, but even in orthopaedics. This may be related to the relatively low sense of urgency for E=M prescription perceived by their co-workers. Another option could be that clinicians working in rehabilitation medicine see their patients regularly because of the more chronic nature of the patient's condition. Our study's clinicians suggested that primary healthcare professionals may be better equipped to discuss a physically active lifestyle with patients. Primary healthcare professionals, such as general practitioners or

physiotherapists, however, also report barriers toward discussing a physically active lifestyle with patients, which includes lack of knowledge on E=M prescription, lack of time and lack of interest by the patient.^{24 25 29}

A barrier that was also more pronounced in medical oncology and orthopaedics compared with rehabilitation medicine was the feeling of having insufficient knowledge and skills to discuss a physically active lifestyle with patients. While evidence of the benefits of E=M are numerous, some of the clinicians reported that evidence for E=M would facilitate E=M implementation. Increasing knowledge should not only include diagnosis-specific exercise advice²⁴ but also include the patient-specific evidence for E=M prescription. Furthermore, E=M implementation would benefit if clinicians' conversational skills on how to persuasively encourage patients to be sufficiently physically active would be improved, for example, through training in the use of motivational interviewing techniques. Thus, proper training of clinicians in the prescription of E=M is important.³⁵ Because of the differences between clinicians in patient-specific knowledge and patient-specific physical activity advice, the training should be tailored to the local context and the clinician.

The financial facilitators and barriers toward the prescription of E=M were related to the Dutch healthcare reimbursement system. Within the Dutch system, reimbursement is based on provided care, and no extra reimbursement is available for discussing E=M. As a result, clinicians lack a financial stimulus to discuss E=M with their patients. For some patients, the current reimbursement system may pose a major barrier toward E=M since a physiotherapist is only reimbursed for patients with additional insurance (paid by the client). So patients with a low social economic status, who are more likely to have chronic conditions,³⁶ will have their pills and surgery reimbursed but need to pay for a supervised exercise programme by themselves. In order to tackle this barrier, adaptations in the Dutch healthcare reimbursement system are necessary.

Patient perspective as perceived by clinicians

In our study, many of the identified barriers involved the patient's perspective as perceived by the clinician. This perception may, however, not be entirely in line with the patients' actual perspective. Some studies have conducted qualitative studies in patients on the perception of E=M prescription.^{37 38} Some of the barriers, such as lack of knowledge, lack of time and lack of motivation, were indeed mentioned by patients with osteoporosis to hamper a physically active lifestyle.³⁸ The negative impact of discussing E=M on the relationship between patient and clinician, that some clinicians reported, may differ between patient groups. In patients with osteoporosis, this did not seem to be a problem,³⁸ but many patients with type 2 diabetes responded defensively when asked about their physical activity pattern.³⁷ The patients reported that they usually turned to their general practitioner for exercise advice,³⁸ which indicates that not discussing a

physically active lifestyle with clinicians may be a missed opportunity. More insight into the barriers for E=M as perceived by patients could enhance knowledge and skills regarding the prescription of E=M in routine clinical care.

E=M referral options

Our study's clinicians also reported that they were reluctant to refer patients for a physically more active lifestyle if they did not know the options or if they did not trust the provider. Having a lifestyle coach—that is, someone who is thoroughly trained in E=M counselling—working within the department may facilitate the E=M referral of clinicians,³⁹ because they know and trust this person. Another advantage of an in-house lifestyle coach is that the clinician's and the patient's threshold for E=M counselling is reduced. To minimise the threshold, the E=M counselling should preferably take place directly 'next door' after the consultation with the clinician, or as has been suggested in patients living with cancer, to have dedicated exercise professionals work alongside physicians and nurses in medical oncology.⁴⁰

Practical considerations when implementing E=M

Lack of time is a well-known challenge for E=M prescription. It, not surprisingly this, was the most often mentioned practical consideration reported by clinicians in both the questionnaire and the interviews. It has been argued that embedding physical activity questions into the Electronic Patient Dossier may reduce the time burden and facilitate E=M prescription.^{35 41} To reduce the time spent documenting the level of physical activity of a patient, physical activity-related questions could be sent to the patient before the scheduled visit. This approach potentially supports E=M prescription in three ways, as it: (1) reduces administration time, (2) serves as a reminder for the clinician to discuss a physically active lifestyle and (3) primes the patient that a physically active lifestyle may be discussed during the consultation. The feasibility of such an approach in a clinical context has yet to be assessed.

Linking the barriers and facilitators found in this study to implementation strategies may improve the implementation of E=M in hospital care. These strategies could include additional training for clinicians and other members of the medical team to improve knowledge and skills with respect to E=M. Strategies could also focus on improving the confidence of clinicians in local physical activity and primary care providers. Lastly, implementation strategies are needed to reduce practical barriers of which lack of time is arguably the most important one. During a consultation, a clinician prioritises the topics that need to be discussed with their patients. Therefore, support may be needed to ensure that discussing an active lifestyle is high on the priority list of clinicians.

Strengths and limitations

The current study's strength was using mixed methodologies to assess the clinicians' perspectives on the current status of E=M and facilitators and barriers for

implementation. The development of both the questionnaire and topic guide was guided by the Fleuren *et al*'s framework³¹ and the ³⁰TPB and was developed in close collaboration with a broad range of experts from clinical practice, policy and also patient representatives, who were all part of the PIE=M consortium. The codebook was systematically developed in close collaboration with a scientific team. The summaries for the codes based on the quotations were conducted by two researchers. These summaries and codes were then discussed with the research team that also included representatives of the participating department in order to assure that the presented findings were in line with daily practice.

Because the questionnaire's response rate was 51%, we may have had a biased sample that was relatively positive toward E=M. We cannot completely rule out that our sample was biased since we conducted interviews with the clinicians who had agreed to be contacted. This interview sample only included medical specialists and specialist registrars. The results of the interviews may, therefore, not be generalisable to all clinicians working in the departments. In our experience, this sample did not only include so called 'believers' but also clinicians who were more reluctant toward implementing E=M. This finding, combined with the range of clinicians (expertise, age and years of experience) in the questionnaire sample, strengthens our belief that the questionnaire sample represents a broad view on E=M within the included departments.

For both the interviews and the questionnaires, the same very broad definition was used for 'a physically active lifestyle referral'. Even though this definition was provided, during interviews, we sometimes became aware that clinicians' definition of a physical active lifestyle was interpreted differently. Since prescribing E=M as primary treatment option may need a different approach during the consultation than a general advice to be more physically active, this may have biased the questionnaire results since clinicians may have completed the questionnaire without thoroughly reading the instructions. This was less likely during the interviews because the interviewer would remind the clinician of the broad definition for a physically active lifestyle referral employed in the study.

Our study was conducted among clinicians working in two academic hospitals. These clinicians provide specialised care, which usually means treating relatively severe cases or patients with comorbidities. Furthermore, the clinicians included in our sample worked within a limited number of disciplines. Because of these limitations, our results may not be generalisable to all Dutch hospitals. The next step within our project will be to assess facilitators and barriers for the implementation of E=M as perceived by clinicians working in other disciplines and assess differences between academic and non-academic hospitals regarding facilitators and barriers for the implementation of E=M. Also, better understanding of the facilitators and barriers toward discussing a physically active lifestyle as perceived by patients with varying

diagnosis is needed to better support clinicians' E=M skills.

CONCLUSION

In this study, we identified several barriers and facilitators regarding the implementation of E=M in two Dutch academic hospitals. The main themes were (1) beliefs toward the implementation of E=M, (2) factors related to the patient perspective, (3) factors related to the referral options and (4) practical considerations when implementing E=M. We found important differences between the opinions of the clinicians working within different departments; it is, therefore, suggested to first explore barriers and facilitators of the clinicians working in the specific department, and to take these into account in the future implementation process.

In order for clinicians to effectively implement E=M, strategies should focus on increasing clinicians E=M referral skills, improving clinicians knowledge of E=M referral options and develop a support system to ensure that E=M is high on the priority list of clinicians.

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REFERENCES

- Warburton DER, Bredin SSD. Health benefits of physical activity: a systematic review of current systematic reviews. *Curr Opin Cardiol* 2017;32:541–56.
- Barberan-Garcia A, Ubré M, Roca J, *et al*. Personalised prehabilitation in high-risk patients undergoing elective major abdominal surgery: a randomized blinded controlled trial. *Ann Surg* 2018;267:50–6.
- Kalisch BJ, Lee S, Dabney BW. Outcomes of inpatient mobilization: a literature review. *J Clin Nurs* 2014;23:1486–501.
- van der Leeden M, Balland C, Geleijn E, *et al*. In-hospital mobilization, physical fitness, and physical functioning after lung cancer surgery. *Ann Thorac Surg* 2019;107:1639–46.

- 5 Billinger SA, Arena R, Bernhardt J, *et al.* Physical activity and exercise recommendations for stroke survivors: a statement for healthcare professionals from the American heart Association/ American stroke association. *Stroke* 2014;45:2532–53.
- 6 Buffart LM, Kalter J, Sweegers MG, *et al.* Effects and moderators of exercise on quality of life and physical function in patients with cancer: an individual patient data meta-analysis of 34 RCTs. *Cancer Treat Rev* 2017;52:91–104.
- 7 VAN Vulpén JK, Sweegers MG, Peeters PHM, *et al.* Moderators of exercise effects on cancer-related fatigue: a meta-analysis of individual patient data. *Med Sci Sports Exerc* 2020;52:303–14.
- 8 Holmes MD, Chen WY, Feskanich D, *et al.* Physical activity and survival after breast cancer diagnosis. *JAMA* 2005;293:2479–86.
- 9 Moore G, Durstine JL, Painter P. *Acsms exercise management for persons with chronic diseases and disabilities*. 4th ed. Human Kinetics, 2016.
- 10 Rimmer JH, Marques AC. Physical activity for people with disabilities. *The Lancet* 2012;380:193–5.
- 11 van den Berg-Emons RJ, Bussmann JB, Stam HJ. Accelerometry-based activity spectrum in persons with chronic physical conditions. *Arch Phys Med Rehabil* 2010;91:1856–61.
- 12 Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. *Scand J Med Sci Sports* 2015;25(Suppl 3):1–72.
- 13 Sharif K, Watad A, Bragazzi NL, *et al.* Physical activity and autoimmune diseases: get moving and manage the disease. *Autoimmun Rev* 2018;17:53–72.
- 14 World Health Organization. *WHO guidelines on physical activity and sedentary behaviour: at a glance*. WHO, 2020.
- 15 Arsenijevic J, Groot W. Physical activity on prescription schemes (PARS): do programme characteristics influence effectiveness? Results of a systematic review and meta-analyses. *BMJ Open* 2017;7:e012156.
- 16 Whitlock EP, Orleans CT, Pender N, *et al.* Evaluating primary care behavioral counseling interventions: an evidence-based approach. *Am J Prev Med* 2002;22:267–84.
- 17 Gustavsson C, Nordqvist M, Bröms K, *et al.* What is required to facilitate implementation of Swedish physical activity on prescription? - interview study with primary healthcare staff and management. *BMC Health Serv Res* 2018;18:196.
- 18 Bluethmann SM, Basen-Engquist K, Vernon SW. Grasping the 'teachable moment': time since diagnosis, symptom burden and health behaviors in breast, colorectal and prostate cancer survivors. *Psychooncology* 2015;24:1250–7.
- 19 Barnes PM, Schoenborn CA. Trends in adults receiving a recommendation for exercise or other physical activity from a physician or other health professional. 2012.
- 20 Gabrys L, Jordan S, Schlaud M. Prevalence and temporal trends of physical activity counselling in primary health care in Germany from 1997–1999 to 2008–2011. *Int J Behav Nutr Phys Act* 2015;12:136.
- 21 Persson G, Ovsted I, Hansson EE. Simplified routines in prescribing physical activity can increase the amount of prescriptions by doctors, more than economic incentives only: an observational intervention study. *BMC Res Notes* 2010;3:1–5.
- 22 Leemrijse CJ, de Bakker DH, Ooms L, *et al.* Collaboration of general practitioners and exercise providers in promotion of physical activity a written survey among general practitioners. *BMC Fam Pract* 2015;16:96.
- 23 Meester SB, Wagenmakers R, van den Akker-Scheek I, *et al.* Sport advice given by Dutch orthopaedic surgeons to patients after a total hip arthroplasty or total knee arthroplasty. *PLoS One* 2018;13:e0202494.
- 24 Clark RE, McArthur C, Papaioannou A, *et al.* "I do not have time. Is there a handout I can use?": combining physicians' needs and behavior change theory to put physical activity evidence into practice. *Osteoporos Int* 2017;28:1953–63.
- 25 Das BM, DuBose KD, Peyton A. Active health care providers' practices and views on counseling patients to be active. *Transl J Am Coll Sports Med* 2018;3:190–5.
- 26 Pojednic R, Bantham A, Arnstein F, *et al.* Bridging the gap between clinicians and fitness professionals: a challenge to implementing exercise as medicine. *BMJ Open Sport Exerc Med* 2018;4:e000369.
- 27 Smaradottir A, Smith AL, Borgert AJ, *et al.* Are we on the same page? Patient and provider perceptions about exercise in cancer care: a focus group study. *J Natl Compr Canc Netw* 2017;15:588–94.
- 28 Krops LA, Bouma AJ, Van Nassau F, *et al.* Implementing individually tailored prescription of physical activity in routine clinical care: protocol of the physicians implement exercise = medicine (PIE=M) development and implementation project. *JMIR Res Protoc* 2020;9:e19397.
- 29 Schurink-van't Klooster T, Loyer A, Proper K. *Meer bewegen: doorverwijzing naar activiteiten door eerstelijnszorgverleners*, 2019.
- 30 Francis J, Eccles MP, Johnston M. . constructing questionnaires based on the theory of planned behaviour: a manual for health services researchers.. *Centre for Health Services Research, University of Newcastle upon Tyne* 2004.
- 31 Fleuren M, Wiefferink K, Paulussen T. Determinants of innovation within health care organizations: literature review and Delphi study. *Int J Qual Health Care* 2004;16:107–23.
- 32 Flottorp SA, Oxman AD, Krause J, *et al.* A checklist for identifying determinants of practice: a systematic review and synthesis of frameworks and taxonomies of factors that prevent or enable improvements in healthcare professional practice. *Implementation Science* 2013;8:1–11.
- 33 Braun V, Clarke V. Using thematic analysis in psychology. *Qual Res Psychol* 2006;3:77–101.
- 34 Gezondheidsraad. *Beweegrichtlijnen* 2017. Den Haag, 2017.
- 35 Bowen PG, Mankowski RT, Harper SA, *et al.* Exercise is medicine as a vital sign: challenges and opportunities. *Transl J Am Coll Sports Med* 2019;4:1.
- 36 Bleich SN, Jarlenski MP, Bell CN, *et al.* Health inequalities: trends, progress, and policy. *Annu Rev Public Health* 2012;33:7–40.
- 37 Stuij M, Elling A, Abma T. Negotiating exercise as medicine: narratives from people with type 2 diabetes. *Health* 2021;25:86–102.
- 38 Ziebart C, McArthur C, Lee L, *et al.* "Left to my own devices, I don't know": using theory and patient-reported barriers to move from physical activity recommendations to practice. *Osteoporos Int* 2018;29:1081–91.
- 39 Wolever RQ, Caldwell KL, McKernan LC, *et al.* Integrative medicine strategies for changing health behaviors: support for primary care. *Prim Care* 2017;44:229–45.
- 40 Schmitz KH, Campbell AM, Stuij MM, *et al.* Exercise is medicine in oncology: engaging clinicians to help patients move through cancer. *CA Cancer J Clin* 2019;69:468–84.
- 41 Lobelo F, Rohm Young D, Sallis R, *et al.* Routine assessment and promotion of physical activity in healthcare settings: a scientific statement from the American heart association. *Circulation* 2018;137:e495–522.