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ORIGINAL RESEARCH ARTICLE

An Instrument to Assess the Needs of Patients with Type 2 Diabetes Mellitus for Health-Promotion Activities

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Abstract

Background: Health promotion has become an integral part of primary healthcare for patients with chronic illness. A practical instrument to identify patient needs in health promotion will support patient-centered health counseling.

Objective: The objective of the study was to develop and pilot test the 'Health Promotion Diabetes' (HEPRODIA) instrument, which aims to identify the needs of patients with diabetes mellitus for health-promoting activities with regard to their preferred lifestyle behavior change.

Methods: Scale development of the instrument was guided by existing insights and expert opinion. Questionnaire data were collected in a sample of patients (n = 221) from eight primary care practices in the southern part of the Netherlands.

The resulting instrument comprised a fixed set of 14 items to elicit patients' preferred lifestyle change, plus a variable set of 4–20 items concerning specific barriers and support needs regarding the chosen change. The instrument provides a starting point for discussion with a practice nurse about healthy lifestyle changes.

Internal consistency (Cronbach's α) and feasibility of the instrument, as well as experiences of the practice nurses using the instrument, were evaluated.

Results: Cronbach's α of the different scales ranged from 0.46 to 0.74. The practice nurses perceived the instrument as useful in daily practice and that it may be improved by further adjustment of patient segments.

Conclusion: The HEPRODIA instrument is an aid to assess patient needs concerning health-promoting activities and to facilitate health counseling. Patients and practice nurses can benefit from using the instrument for patient-orientated health-promotion counseling. The psychometric properties of the instrument can be further improved.

Background

As a result of aging populations, early diagnostics, an increase in obesity rates, and a predominant sedentary lifestyle, recent decades have seen a strong increase in the number of people diagnosed with type 2 diabetes mellitus. Lifestyle interventions to prevent or delay type 2 diabetes have the potential to improve health and reduce morbidity and mortality.[1,2]

Common health-promoting behaviors include smoking cessation, healthy eating, and regular physical activity. In combination with diabetes self-management behaviors (e.g. self-monitoring of glucose levels and adherence to medication), these healthy behaviors may limit the progression of diabetes. However, the adoption of healthy lifestyle changes can be complex and difficult to achieve.[3]

Promoting a healthy lifestyle has become an integral part of care of people with chronic illnesses.[2] Primary healthcare providers play a significant intermediary role in prevention and cure.[4,5] Brief lifestyle behavior interventions that are integrated in routine primary care are effective as the patient is relatively physically close to primary care facilities, the care is easily accessible, and contact occurs repeatedly over a number of years.[1] Nevertheless, many activities in primary healthcare are still reactive, not proactive. A systematic proactive approach would be more effective as it can create an ongoing awareness in patients concerning risky lifestyle behaviors.[4,6,7] It also needs to be patient-centered and collaborative during routine consultations.[8]

In primary healthcare, there are several instruments addressing health behavior that can be applied to diabetes care. Some of these instruments (e.g. the Diabetes Obstacles Questionnaire [DOQ]) have a more general focus, with subtopics that specifically address changing health behavior.[3] Other instruments focus primarily on a specific health behavior.[9-12] Glasgow et al.[5] have an integral approach, as they assess physical activity, smoking, alcohol use, and eating patterns. The questionnaires they recommend for each target behavior only measure recent behavior and not motivational factors. To our knowledge, there is currently no valid instrument that specifically aims to identify the needs of patients in health-promoting lifestyle changes.

This study describes an assessment instrument (Health Promotion Diabetes [HEPRODIA]) to measure the needs of diabetes patients for health-promoting activities in order to change their lifestyle on a preferred domain (smoking, eating patterns, physical activity, or any other health-promoting change). The tool aims to structure and support health counseling in primary healthcare. Needs for health-promoting activities are defined in this study as all possible interventions that patients could undertake or services they could use for healthy lifestyle change (e.g. personal advice, education, facilities in which to exercise with other patients). Such needs are related to recent health behavior, motivational factors, self-efficacy, and barriers to lifestyle change.

From a scientific point of view, the instrument must be valid and reliable. An instrument that considered all possible determinants concerning healthy lifestyle behavior would be extensive. On the other hand, to be useful in practice, the tool needs to be brief and easy to administer, score, and interpret. We addressed the following research questions: (i) to what extent is the HEPRODIA instrument valid and reliable in measuring patient needs for health-promoting activities? and (ii) to what extent is the HEPRODIA instrument contributive to health promotion counseling in daily practice?

Methods

Questionnaire Design

We first carried out a qualitative review of the literature to get a thorough overview of relevant theories and existing measurements regarding the needs of diabetes patients in health-promoting behavior change.

Several theoretical models explain behavior change.[13] Patient needs for health-promoting activities regarding smoking, diet behavior, and physical activity depend on their intentions as well as specific barriers to successful behavior change.[14-16] Therefore, the HEPRODIA instru-

ment contains two sections. The first measures the intentions to change health-related behavior and comprises 14 items, explained in section 1, and takes approximately 7 minutes to complete. At the end of this first section, patients indicate which health-promoting topic(s) they would like to discuss during consultation (smoking cessation, dietary behavior, physical activity, no/other health-promoting activities). The second section measures the patient's level of self-efficacy and their needs for support to overcome obstacles.

Section 1

In the first section, the intention to quit smoking was identified by the 'smoking: stage of change (short form).'[17] This instrument is based on the Transtheoretical Model of Behavior Change, which suggests that individuals move through five stages when changing behavior (pre-contemplation, contemplation, preparation, action, and maintenance). Each phase designates a period of time in which people desire behavioral change.[15]

With respect to eating and exercise, patients were first asked to report their current patterns. The items concerning healthy food choices and physical activity are formulated as statements with a 5-point scale from 'totally disagree' to 'totally agree'. A healthy diet was defined as a low-fat diet with regular meals evenly spread throughout the day. According to the Dutch standards for healthy physical activity, regular exercise is defined as 'a minimum of 30 minutes for at least 5 days a week' for normal weight individuals and at least an hour a day for those who are overweight (body mass index [BMI] not specified).[18]

Ajzen's Theory of Planned Behavior[16] was applied in this study to measure the intention to adopt a healthier diet and exercise. Intention is assessed by measures of attitude, subjective norm, and perceived need.[19] Two items on a 5-point scale ('totally disagree' to 'totally agree') were used to evaluate the instrumental and affective aspects of attitude towards a more healthy diet and more physical activities. The subjective norm was rated by one item: "In comparison with people of the same age, I eat a healthy diet/am very physically active" ('totally disagree' to 'totally agree'). Patients were asked to point out

their specific interest in a healthier lifestyle. Perceived need was assessed via the following questions: "I want to have more weight control" and "I want to exercise more regularly" ('totally disagree' to 'totally agree').

Finally, subjects were asked to indicate their interests in and needs for existing health-promoting activities (e.g. education or specific programs for diabetes patients).

Section 2

The second section is divided into four forms (each taking a maximum of 10 minutes to complete) corresponding to these topics: smoking cessation, dietary behavior, physical activity, and no/other health-promoting activities (each containing 4–20 items). It measures the patient's level of self-efficacy and their needs for support to overcome obstacles. Respondents only completed the form(s) that corresponded to the topic(s) they had chosen in the first section.

Self-efficacy is also seen as a function of intention; it is an individual's belief in his/her capability related to specific situations and tasks.[20] It is included in the second section of the questionnaire due to the link with barriers and support needs. Self-efficacy is measured by the phrase "I think I'm able to …" with a 5-point scale (possible answers: 'probably not', 'maybe yes/maybe no', 'probably yes', 'most probably yes', 'surely yes').[20] We used a measure for self-efficacy and temptation that assessed the situations likely to elicit smoking behavior.[21] This measure was translated into Dutch and its scale was divided into three categories of six items: positive/social situations, negative/affective situations, and habit/addictive factors.

In respect to a healthy diet, eight barriers were formulated by the first author (AVD) and independently assessed by a dietician. The Physician-based Assessment and Counseling for Exercise was used to include questions about barriers to physical activity (ten items).[11]

Demographic Data

To characterize the population, the following patient demographic data were collected via self-report: age, sex, ethnicity, marital status, height

and weight (to calculate BMI), and educational level. Furthermore, the practice nurses (nurses who deliver general care to chronic patients according to written protocols and under supervision of the general practitioner [GP]) reported for each patient the year of diagnosis of type 2 diabetes, the presence of diabetes complications, and the prescribed therapy (diet, tablets, and/or insulin). After each consultation, the practice nurses completed a feedback form that registered what decision was made, if the patient was referred to a health-promoting activity, and what reason(s) the patient gave for rejecting any advice regarding health promotion.

Participants and Procedure

Eight GP offices in the southern part of the Netherlands were approached to participate. Eight practice nurses, one based in each office, each invited approximately 50 patients with type 2 diabetes who were already scheduled to visit the practice nurse for their quarterly diabetes consultation. Patients (n = 403) received the HEPRODIA instrument by mail a week prior to their appointment along with an introductory letter explaining the study and an informed consent form. Patients were asked to complete the instrument and bring it to the diabetes consultation. During the consultation, practice nurses and patients discussed healthy lifestyle changes according to the identified preferred healthy lifestyle change and needs of patients as indicated by the instrument. The practice nurse was provided with a digital database of all local health-promoting activities and programs (from the Municipal Health Services website) so they could refer patients to appropriate health-promoting activities.

The practice nurses specialized in diabetes care and were trained in Motivational Interviewing as part of the study. The practice nurses evaluated the value and usefulness of the HEPRODIA instrument during individual telephone interviews with the first author (AVD). Nurses were interviewed for the following feedback: (i) what were the positive experiences in using the questionnaire during diabetes consultations; (ii) which aspects of the instrument were not usable; and (iii) do you have any suggestions to improve the instrument? The interviews were digitally recorded, transcribed, and analyzed on emergent themes. These themes were put forward during a focus group interview to facilitate discussion about further improvement of the instrument.

Face Validity

The questionnaire was judged for face validity by seven diabetes patients and six experts in primary care health promotion (e.g. dietician, scientist), before it was implemented. Their feedback led to minor changes in the format and wording of the questionnaire.

Statistical Analysis

To determine internal consistency, Cronbach's α was calculated using SPSS 12.0 (SAS Institute, Inc., Cary, NC, USA). This was executed for all the items based on the Theory of Planned Behavior. Cronbach's α was also calculated for the barriers to successful behavioral change. The mean inter-item correlation was included in the analysis. Clark and Watson[22] recommend using this mean inter-item correlation as a criterion for internal consistency. It should be between 0.15 and 0.50 to ensure uni-dimensionality of the scale. Pearson correlation coefficients (r) evaluated the strength between constituting items ($p < 0.01$). These were calculated for items from the Theory of Planned Behavior in relation to the patient's topic of interest. According to Cohen,[23] the following guidelines were used to interpret Pearson correlation coefficients: r = 0.10–0.29 (positive or negative) means a weak relationship between items; r = 0.30–0.49 is a medium relationship, and r = 0.50–1.0 means a strong relationship. Analyses also included an outline of patient needs in health-promoting activities.

The Medical Ethical Committee (MEC) of the Maastricht University Medical Centre judged this evaluation study as not needing formal ethical approval with regard to the Medical Research Involving Human Subjects Act (WMO), as subjects were not required to follow rules of behavior. Nevertheless, the MEC granted their approval for our study protocol.

Results

Sample Characteristics

A total of 403 patients with type 2 diabetes were asked to participate in the study; 221 completed the instrument and discussed it with the practice nurse (response rate of 55%). Their demographic characteristics are summarized in table I. The average age of respondents was 65.0 (±10.6) years and they had had diabetes for an average of 5 years. Most of the patients (64%) reported that they had graduated from primary school or lower vocational education, 22% had completed intermediate vocational education, and 14% had higher vocational training or had graduated from university. A total of 85 (41%) patients were overweight and 83 (40%) of the respondents were obese accord-

Table I. General characteristics of study participants (n = 221)[a]

Patient demographics	n (%)
Sex	
Male	121 (55)
Female	100 (45)
Marital status	
Single	19 (8.6)
Married/co-habiting	154 (70.0)
Widowed	23 (10.5)
Divorced	24 (10.9)
Age (y)	
<40	4 (1.8)
40–49	15 (6.8)
50–59	41 (18.7)
60–69	84 (38.2)
70–79	59 (26.8)
≥80	17 (7.7)
Education	
Primary school education	70 (32.4)
Lower vocational education	68 (31.5)
Intermediate vocational education	47 (21.8)
Higher vocational or university education	31 (14.3)
Body mass index (kg/m^2)	
Normal weight (18.5–24.9)	40 (19.2)
Overweight (25.0–29.9)	85 (40.9)
Obese (≥30)	83 (39.9)

a Missing data in each category are due to some patients failing to answer all questions.

ing to their BMI. Amongst the patients in this study, 35 respondents (16%) were smokers; one respondent indicated he/she was in the preparation stage to quit smoking, 14 respondents were in the contemplation stage, and the remaining 20 did not intend to stop smoking.

Psychometric Properties of the Health Promotion Diabetes (HEPRODIA) Instrument

Cronbach's α for all items of the Theory of Planned Behavior was $\alpha = 0.74$ (n = 35; 14 items). As a limited part of the population chose both healthy eating and physical activity from section 1 as behaviors to modify, the analyses cover just a select group. Cronbach's α for the items in the first section of the questionnaire was $\alpha = 0.61$ (n = 199; ten items).

The scale 'diet behavior' showed a Cronbach's α of 0.70 (n = 72; eight items) and a mean inter-item correlation of 0.30. The scale 'physical activity' resulted in a Cronbach's α of 0.46 (n = 90; six items) and a mean inter-item correlation of 0.06. The barriers to healthy food choices resulted in a Cronbach's α of 0.62 (n = 69; eight items). Cronbach's α of the barriers to exercise was 0.75 (n = 79; ten items).

All positive and negative relationships corresponded to the theoretical background: a more positive perception of current lifestyle had a positive correlation with a choice of 'no activity,' while perceived need and attitude correlated positively with a choice of a healthier diet and more physical activity, except for the affective attitude towards more physical activity (table II). Nevertheless, the relationships were mainly $r \leq 0.3$. The overall attitude towards a healthier lifestyle had a strong positive relationship ($p \leq 0.01$) with the preference towards exercise ($r = 0.5$) and a strong negative relationship with no/other activities ($r = -0.5$).

The items concerning smoking cessation could be not analyzed, as only 12 respondents (5%) completed the questions about self-efficacy, temptations, and need for support. There were 74 respondents (33%) who wanted to change the kind of food they eat and drink, and/or the quantity, and/or the frequency of consumption. The mean

Table II. Pearson's correlation coefficients (n = 221)

Section 1	Choice		
	healthier eating	more physical activity	no/other activities
Diet			
Current eating pattern	–0.2*	–0.1	0.2*
Subjective norm	–0.2*	–0.1	0.2*
Perceived need	0.2*	0.3*	–0.3*
Affective attitude	0.2*	0.2*	–0.4*
Instrumental attitude	0.2*	0.2*	–0.4*
Exercise			
Current physical activity pattern	–0.0	–0.2*	0.1
Subjective norm	–0.0	–0.2	0.2
Perceived need	0.1	0.5*	–0.3*
Affective attitude	–0.0	0.1	–0.1
Instrumental attitude	0.1	0.4*	–0.3*
Diet + exercise			
Current lifestyle	–0.1	–0.2*	0.2*
Attitude towards a healthier lifestyle	0.2*	0.5*	–0.5*
*Correlation significant p < 0.01.			

score on their self-efficacy for these three health behavior changes was 3.30–3.48 (±1.17). Most often, respondents wished to get more information and individual advice about healthy diet behavior. Some respondents were directed to a dietician, while others made an agreement with the practice nurse about healthy diet behavior. The form concerning 'more physical activity' was completed by a total of 90 respondents (41%) who came from all age groups. The mean self-efficacy score was 2.74 (±1.12). Patients were mostly interested in walking and biking; swimming and fitness training were also popular activities for patients aged <60 years. Five patients were directed to a specific exercise program for elderly people or diabetes patients. In all, 76 respondents (35%) completed the form 'no/other health activity' and, of that subgroup, 30 (14%) were interested in another health-promoting opportunity such as diabetes self-management or coping with stress. On the evaluation forms, practice nurses briefly noted the intentions of patients to make a healthy lifestyle change. The 80 notes indicated diverse intentions, for example 'eating fewer cookies' or 'going to a dietician.'

Feasibility of the HEPRODIA Instrument

The HEPRODIA instrument supported the eight practice nurses in giving explicit attention to healthy lifestyle behavior during the consultation. The practice nurses were enthusiastic about the encouraging effect the questionnaire had on some patients concerning (re)starting healthy lifestyle changes. Nevertheless, there were also patients who showed no interest or who were even resistant to completing the questionnaire. Therefore, practice nurses suggested two ways in which the HEPRODIA instrument could be improved. The first was that the instrument should be adjusted so that it is relevant to recently diagnosed diabetes patients. In so doing, recently diagnosed diabetes patients can be made aware of healthy behaviors and preferred lifestyle changes in the early stages of their condition. After some time, the instrument could also be used to alert patients once again to the possibilities of health-promoting behavior change. The second suggestion was that the instrument could be separated into different parts, with the agenda-setting phase (currently section 1 of the questionnaire) taking place during a regular 3-monthly diabetes consultation and patients then given the relevant subsequent form. The practice nurse can explain the relevance of considering and completing the questionnaire at home. This may potentially increase the response rate and the data quality of the instrument. The practice nurse could then discuss the form and results during the next 3-monthly diabetes consultation. However, the practice nurses did note that the long duration between consultations could be problematic as patients could find it difficult to recall the instrument and are likely to develop different needs over time.

Discussion

In this study, the HEPRODIA instrument, a tool to identify the needs of patients with diabetes in respect to health promotion, was developed and pilot tested. This is important, as there was no such instrument at the time of writing that specifically measures whether and how people

want to perform health-promoting activities. The need is high for such an instrument, implemented in usual care, which helps practice nurses to motivate diabetes patients to make and maintain healthy lifestyle changes. This study operates on the premise that practice nurses can be uniquely influential catalysts for patient behavior change.[1] The HEPRODIA instrument could be regarded in addition to other tools, such as a diabetes self-management support package and literacy-appropriate education material,[24] as education material may help patients to consider and voice their preferences and needs. Training of practice nurses in motivational communication is also required.[8] The added value of the HEPRODIA instrument is that it enables patient input during brief health-promotion counseling.

In developing an instrument such as HEPRODIA, the user friendliness of the instrument can conflict with the need for scientific validity. The latter requires an extensive instrument to identify and verify that patients' answers truly reflect their needs regarding health promotion. To create a practical instrument, we chose to bundle different valid scales that measure stages of change, intention, self-efficacy, and individual aspects of lifestyle change to get insight into patients' needs regarding health-promoting activities.

In this study, the validity is partly verified by measuring the internal consistency (Cronbach's α) and inter-item correlations. The Cronbach's α that applies to the topics of physical and dietary behaviors lies between 0.6 and 0.7, indicating a minimal clear internal consistency. Activity behaviors, which have the same format as dietary behaviors, have low internal consistency ($\alpha = 0.46$). This can possibly be attributed to patients' perception of the concept 'physical activity' (e.g. one patient may perceive physical activity as 'any' physical activity, whilst another may see it as 'intensive exercise'). Perception is also influenced by the physical capabilities of the respondent. Further adjustment of the HEPRODIA instrument needs to define more clearly what is understood by 'physical activity' to increase the internal consistency of this section.

According to Malpass et al.[25] it is important to provide a combination of diet and physical activity information as most patients find it helpful to undertake multiple lifestyle changes (35 patients did so in our study). This may be more valued in the HEPRODIA instrument if the ability to choose dietary change simultaneously with activity lifestyle change is emphasized. This may encourage patients to use physical activity in strategic ways to maintain dietary changes. Furthermore, the item about other activities turned out to be important in prompting a dialogue about several health-related issues patients wanted solved.

The relatively low internal consistency relates to the first part of the instrument, in which the patient identifies his/her own preferences in respect to healthy lifestyle changes. The second part of the instrument reflects the consultation between the patient and practice nurse about these preferences in respect to self-efficacy, barriers, and support needs. It is the latter part of the instrument that is most valued by the practice nurses as a useful tool in motivating patients to undertake health-promoting activities.

Although the response rate (55%) is similar to that of other studies among patients with diabetes,[26] it limits the usefulness of the instrument as no information about non-responders is available. Not all diabetes patients will be interested in a questionnaire about health promotion. The scientific necessity of asking respondents to sign an informed consent form could have been a barrier to participation. That more than one-third of patients selected 'no/other health activity' shows that HEPRODIA provides a tool to differentiate between patients who are open for a discussion about smoking cessation and dietary and/or physical behavior change, and patients who want to deal with other topics during diabetes counseling. According to Maibach et al.,[27] four different segments of respondents can be discerned based on their degree of engagement in health enhancement ('active' or 'passive') and their degree of independence in health decision making ('doctor-dependent' or 'independent'). It is relevant to investigate the extent to which the 'independent active' or 'independent passive' patient is open to consultative health decision making.

Conclusions

The HEPRODIA instrument provides a sound basis for an assessment tool that measures patient needs regarding health-promoting activities. It should be regarded as a starting point for further improvement of the theoretical dimensions and ways of expressing items to meet psychometric criteria. Practice nurses and patients can already benefit from using the instrument for systematic and patient-orientated health-promotion counseling. Certain patients were motivated to begin or maintain a healthier lifestyle and/or to participate in specific health-promoting activities that fit their needs after completing the instrument; however, the approach appears to not suit all patients. Further research is required to analyze which patients have the highest potential to benefit from the application of this instrument.

Acknowledgments

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