Self-consciousness of health status for type 2 diabetes mellitus with chronic complications: instrument development and psychometric test

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Abstract

Self-consciousness regarding health status is crucial for individuals with Type 2 Diabetes Mellitus (T2DM) to engage actively in lifelong diabetes self-management. However, existing instruments have not fully incorporated aspects of nurse partnership, dialogue, and pattern recognition related to diabetes knowledge, self-management skills, and self-care abilities. This study aimed to develop and validate the Self-Consciousness of Health Status (SCHS) instrument for patients with T2DM and chronic complications. Instrument development occurred in three phases: Phase One involved a literature review and a three-round e-Delphi to generate the item pool. Phase Two tested content validity with five experts, and construct validity with confirmatory factor analysis (CFA) among 602 participants. Internal consistency and test-retest reliability were also assessed. Phase Three finalized the scale and score interpretation. CFA confirmed the SCHS structure, consisting of 77 items across four dimensions. The scale demonstrated strong model fit (Chi Square $p > 0.05$, RMSEA $p > 0.05$) and standardized factor loadings between 0.516–0.908 ($p < 0.05$). SCHS is a valid and reliable tool to measure health self-consciousness in patients with T2DM and chronic complications.

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Introduction

Instrument development and psychometric testing have gained increasing attention in health care research. The availability of validated instruments allows researchers, managers, and educators to assess health-related problems accurately and produce reliable evidence. These instruments strengthen quantitative methodologies, support empirical testing of complex models, and contribute to new theoretical perspectives and effective interventions in clinical practice, nursing management, and health care education. Many health care constructs, such as caring, mentoring, clinical learning environments, and self-directed learning, are latent and measured through observable perceptions and behaviors. The development process therefore requires clear operationalization of constructs, followed by validity and reliability testing to ensure measurement accuracy.

Psychometric testing is essential for establishing instrument quality. Because health care education involves cognitive, emotional, relational, and behavioral components, psychometrically sound instruments are necessary to capture learning processes and outcomes. Ensuring appropriate psychometric procedures leads to valid and reliable data.[1]

This article outlines the key phases of instrument development, emphasizing theoretical frameworks, concept operationalization, validity testing, and reliability assessment. Type 2 Diabetes Mellitus (T2DM) is a chronic metabolic disorder characterized by hyperglycemia due to insulin resistance or relative insulin deficiency. Its global prevalence continues to increase, making it a significant public health issue.[2] T2DM affects health status across eight core domains, with cardiovascular complications remaining the leading cause of morbidity and mortality.[3]

Kariasa identified diabetes as the second highest risk factor for recurrent stroke, highlighting the urgency of continuous monitoring and comprehensive management.[4]

Self-consciousness of health status is essential for individuals with T2DM because it facilitates awareness of disease progression and its physical and psychological consequences. Depression is also common, with Pouwer reporting a 9.3% prevalence of depressive symptoms through self-reports. [5] Jasim additionally found high rates of unhealthy behaviors and poor compliance with blood glucose monitoring associated with functional limitations such as mobility, self-care, pain, discomfort, anxiety, and depression.[6] Effective nurse–patient partnerships support self- management and require active patient participation and measurable nurse assistance. The most effective time to engage individuals with T2DM is when they are receptive and motivated to adopt self-care behaviors.[7] However, over the past 25 years, there has been limited progress in advanced care planning for chronic diseases due to lack of relational autonomy between patients and providers.[8] This indicates that healthy behavior is influenced by the evolving development of autonomy in diabetes self-management.

Health literacy is another key determinant of health outcomes. It reflects the ability to access, understand, evaluate, and apply health information. Lee developed the Diabetes Health Literacy Scale to measure this construct.[9] Self-care and self-management have also been assessed using instruments such as the Self-Care of Diabetes Inventory (SCODI) and the Assessment of Barriers to Self-Care in Type 2 Diabetes Mellitus. Ausili *et al.* developed SCODI based on the middle-range theory of chronic illness, while Caro-Bautista developed the Assessment of Barriers to Self-Care using the theory of planned behavior.[10–12] However, none of these instruments measure behavioral constructs related to nurse–patient partnership in expanding patients' consciousness in diabetes management. This represents an important gap in existing measurement tools. Therefore, this study aims to develop an instrument to measure partnership behaviours that support self-consciousness of health status among individuals with T2DM, and Psychometrically test the instrument to determine its validity and reliability.

Materials and Methods

The theoretical framework of an instrument

A frequent limitation in nursing and health education research is initiating instrument development without establishing a clear theoretical framework. Instrument development is a long and structured process that should begin with identifying the research gap and reviewing validated instruments to determine whether they adequately address that gap. When existing tools and their theoretical foundations have been evaluated, the next step is to define the core concepts representing the phenomenon of interest.[13]

Instrument development may follow an inductive or deductive approach. The inductive approach starts from unstructured reality, in which concepts must be explored, analyzed, and operationalized through qualitative studies, content analysis, systematic reviews, or concept analysis.[13] This process requires time and careful interpretation. Once the concepts are clarified, they can be translated into measurable items, allowing theoretical constructs to be empirically tested. A deductive approach, on the other hand, begins with structured concepts derived from theories or empirically tested models. Many instruments have been developed in this way to examine theoretical structures and relationships among variables. After researchers define their concepts and theoretical stance, measurement items can be operationalized and validated through psychometric testing.

In relation to this study, existing instruments such as SCODI, the Diabetes Health Literacy Scale, and the Assessment of Barriers to Self-Care do not measure behavioral constructs of nurse–patient partnership in enhancing consciousness of health status among individuals with T2DM. Therefore, a new instrument grounded in a sound theoretical framework is required, followed by empirical validation to ensure accuracy, reliability, and relevance in diabetes care. The cross-sectional survey design was conducted to develop and test the scale psychometric properties in two phases. Literature review and three-round e-Delphi were conducted for the pool development of the SCHS items in the first phase, while in the second phase, the psychometrics of SCHS were assessed in Figure 1.

First phase: SCHS items development

The item pool was generated through a literature review and six round e-Delphi among the five experts. The initial round of e-Delphi sought to elucidate the concept and components of SCHS by soliciting insights from experts through two semi-structured open-ended questions. These questions were "How do you define the SCHS?" and "How do you define each dimension of the SCHS?". Following content analysis from experts' opinions and the integration of literature review items, a total of 241 items across four dimensions and five sub- dimensions were identified, including: i) the nurse partnership dimension; ii) the dialog dimension with sub- dimensions of knowledge diabetes mellitus, development of diabetes mellitus conditions related to signs and symptoms of chronic complications, development of emotional conditions as people with T2DM; iii) the dimension of self-consciousness patterns with sub-dimensions of knowledge of diabetes self-management targets to avoid chronic complications, health history patterns in the last 12 months, self-consciousness to carry out diabetes self- management; and iv) the dimension of health status.

Subsequently, these items were presented to the same panel of experts for the second round of e-Delphi, where they were asked to evaluate the importance of each item using true or false scale and yes or no scale. At this stage, the instrument of 241 items became 100 items. The expert determined the instrument items after comparing the results of the literature review and the results of the interviews with people with T2DM qualitatively with a CVI result of 1. The expert agreed to change the items from 241 items to 100 items. The reason for the agreed change is the change in the answer response from the previous Likert scale, namely i) disagree, ii) disagree, iii) agree, and iv) strongly agree in version 1 of the instrument was changed to a nominal scale, namely true/false on the knowledge aspect, and yes/no on the behavioral aspect. The statements in the previous instrument were modified again according to the understanding of people with T2DM so that they were shorter and easier to understand so that it did not take a very long time to answer them. The average time needed to fill in is 15-30 minutes. Comparison of the Number of Items of Content Validity Results shown in *Supplementary materials, Table 1*.

Expert review was conducted twice, namely on the initial draft of health status self- consciousness attributes and the draft health status self-consciousness instrument. The initial draft of health status self-consciousness attributes from the results of the literature study was followed by expert review. Through expert judgement, researchers asked for consideration, correction, and validation of experts in the fields of nursing, diabetes, endocrine metabolic medicine, and psychometrics. Expert review aims to validate the operational definition of the dimensions of health status self-consciousness that have been

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compiled by researchers. The resource persons at this stage were experts related to the topic, totaling six experts, namely four nursing experts, 1 expert in diabetes endocrine metabolic medicine, 1 expert in psychometrics. Expert criteria are based on recognized expertise from the institution where the expert works, at least a doctoral degree and has worked in their expertise for more than five years. An acceptable CVI value from three to five experts should be one.[14] CVI has two forms, namely CVI for items (I-CVI) and CVI for scales (S-CVI). Two methods for calculating the S-CVI are the average of the I-CVI scores for all items in the scale (S-CVI/Ave) and the proportion of items in the scale that achieve a relevance rating of one from all experts (S-CVI/UA). The relevance ratings were coded as one (relevance) and null (no relevance). The CVI on the SCHS instrument had a value of one.

Second phase: SCHS psychometric testing

One way to test the construct validity of an instrument is to use the Confirmatory Factor Analysis (CFA) method. The CFA test results per dimension include a table of CFA model test results, which contains model fit results with varying item factor load values and model fit results with parallel factor load values. CFA can clarify the structures of instruments. In this case, the SCHS was hereby evaluated using the CFA method, and the Internal Consistency Reliability (ICR) of SCHS was reported by Cronbach's alpha. Researchers used the Confirmatory Factor Analysis (CFA) model in testing the construct validity of the health status self-consciousness measuring instrument. The validity test is to determine whether a construct correctly measures the construct being measured. The output of the stage in addition to testing the

Initial stage: defining the dimensions (constructs) of the instrument		
Literature review, Expert interviews	Proving the concept analysis of nurse partnership, dialogue, self-consciousness pattern, and health status from the literature study that has been conducted with content validation by 3 experts involved.	Agreement on the number of dimensions to be measured
		Four dimensions were

Phase I: Instrument Development		
Systematic literature review, Interviews with people with T2DM, and expert review	Instrument I: formed a matrix of statement (item generation from 241 items) items	The 6 experts involved in content validity
	Instrument II: Formed statement items and measurement scales for the 100-item Health Status Self-Consciousness instrument.	
		CVI value: 1

Phase II: Construct validity test		
Construct validity test: Confirmatory Factor Analysis:	Instrument III: formed valid and reliable statement items	602 people with type 2 diabetes melitus
		Inter-item correlation & item-total correlation Dimensional results: 77 unidimensional items

Phase III: Formulation of instrument norms and interpretation of measurement results		
Readability test: parallel test with CFA: 77 parallel items	Instrument IV: a valid and reliable instrument including interpretation of scales and scores and easy to use for people with type 2 diabetes mellitus.	602 people with type 2 diabetes
		Easy to use norming and interpretation scores

Figure 1. Research design and procedures.

validity of the instrument (which items measure the formulated construct), is also to get a true score where this score is then processed again for the next testing stage, namely multiple regression analysis. The dimensions that were tested for validity were 8 dimensions, namely i) the nurse partnership dimension (K), ii) the dimension of dialogue, with sub-dimensions a) knowledge of diabetes mellitus and chronic complications (DA), b) development of physical conditions (DB), c) development of emotional conditions (DC), iii) Dimensions of Self- Consciousness Patterns, with sub-dimensions a) knowledge of self-management targets (PA), b) consciousness history patterns (PB), c) self-consciousness patterns in performing diabetes self-management (PC), and iv) Dimensions of Health Status (S). The analysis steps in using CFA to test construct validity in this study are i) conducting a fit model test on the unidimensional model and the results are reported as preliminary results of the analysis, ii) if the model does not fit, then the analysis is carried out to find out the items that cause it by analyzing the residuals. If the correlation between these residuals is released, the chi-square index or RMSEA will be smaller. This is done repeatedly until a model fit is obtained, iii) After obtaining a model fit, problematic items are dropped using the criteria if the factor load is negative, the partial correlation between residuals is three or more, and the factor load is not significant. Conceptual framework for phase 2 research is shown in Figure 2.

The second stage of the research conceptual framework has identified nine dimensions. Nine dimensions became the hypotheses tested in this model. The first to eighth hypotheses are related to nurse partnership, dialogue: knowledge of diabetes mellitus knowledge, dialogue: development of diabetes mellitus conditions related to signs and symptoms of chronic complications, dialogue: development of emotional conditions as a person with type 2 diabetes mellitus, self-consciousness patterns: knowledge of diabetes self-management targets to avoid chronic complications, self-consciousness patterns: health history patterns, self-consciousness patterns: self-consciousness to carry out diabetes self-management and health status. Then, the ninth hypothesis is the measurement of self-consciousness which is a second order factor. The details are as follows: i) the nurse partnership factor is measured by 7 statement items; ii) the dialogue factors: knowledge of diabetes mellitus factor is measured by 15 statement items; iii) the dialogue factors: the development of diabetes mellitus conditions related to signs and symptoms of chronic complications measured by 14 statement items; iv) the dialogue factors: the development of emotional conditions as people with type 2 diabetes mellitus measured by 10 statement items; v) self-consciousness pattern factor: knowledge of diabetes self-management targets to avoid chronic complications measured by 8 statement items; vi) self-consciousness pattern factor: health history patterns in the last 12 months, measured by 7 statement items 6; vii) self-consciousness pattern factor: self-consciousness to carry out diabetes self- management, was measured by 29 statement items; viii) health status factor measured by 10 statement items; ix) self-consciousness factor (second order factor) was measured using all eight factors.

Participants and setting

The population in phase 2 of the study were people with T2DM with chronic complications as users of the health status self-consciousness instrument The samples in this study were selected with the inclusion criteria of patients seeking treatment at the Hospital and Primary Health Care in Jakarta for the past 1 year or more, experiencing T2DM for more than 1 year and/or with at least one chronic complication, and are over 18 years old, and can read and

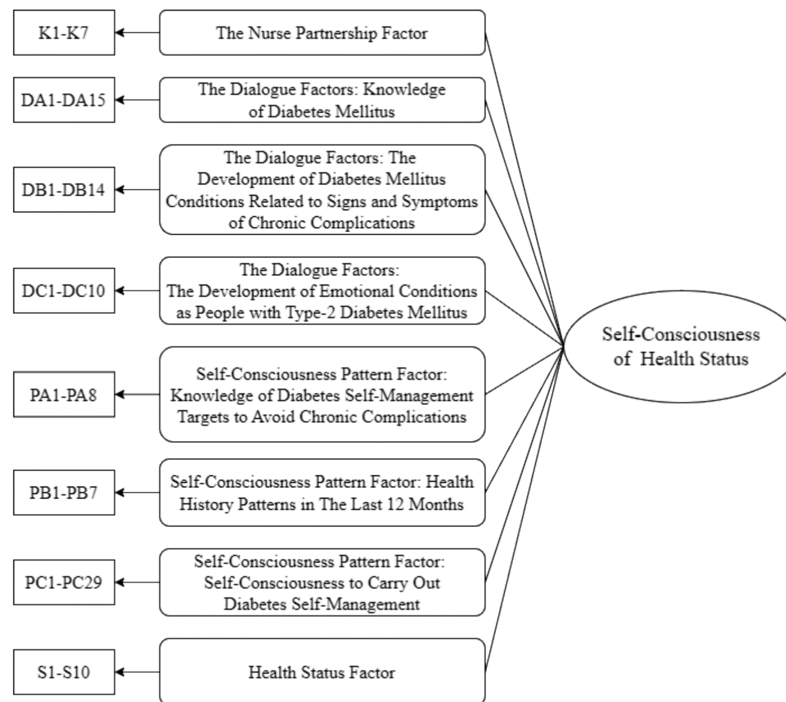

Figure 2. Conceptual framework for Phase 2.

understand Indonesian, do not experience cognitive impairment and decreased consciousness, agree to informed consent. Exclusion criteria in this study were people with T2DM who were experiencing emergency conditions, unstable hemodynamics and experiencing acute complications.

The validity test using CFA requires a large sample size. The sample size is obtained from the minimum sample size rules of thumb for CFA such as 5-10 cases per variable. Likewise, the sample size for multivariate analysis is 5-10 cases per variable. With the basis for the CFA test on the valid health status self-consciousness questionnaire as many as 77 items, 385-770 samples. The minimum sample size for multivariate analysis is 100-200 samples. This number has been met by calculating the sample size for the construct validity test. In this study, researchers obtained a sample of 602 respondents. Sampling is non-probability sampling with purposive sampling technique, because this research aims to test the validity of the instrument so that the conclusions obtained about the items, not the population. However, to obtain more varied data, researchers took samples that represented the diversity of people with T2DM in Indonesia, namely in East Jakarta, Central Jakarta, and South Jakarta.

Data collection and ethical consideration

The research has received ethical approval from the Health Research Ethics Commission, Faculty of Nursing, Universitas Indonesia, based on ethical certificate Number:177/UN2.F12.D1.2.1/PPM.00.02/202. During the research, the researcher pays attention to the ethical principles of information to consent, respect for human rights, beneficence and non-maleficence. Patient consent for publication: informed consent was obtained for anonymized patient information to be published in this article. The data collection process was composed of the following steps: i) after obtaining a research permit, the researcher contacted the relevant hospitals and health centers to get respondents with T2DM to test the statement items on the instrument that had been prepared, ii) researchers met prospective respondents and gave an explanation of the research; if the respondent agrees, the respondent is asked to sign a consent form to participate in the study, iii) after obtaining approval, the researcher gave the questionnaire to be filled in by the respondent and accompanied the respondent during the filling, iv) after the respondent returned the questionnaire, the researcher checked and ensured that the questionnaire had been filled in completely, then the researcher expressed his gratitude and gave souvenirs to the respondents; v) the data obtained was entered into a computer program for further processing and analysis.

Statistical analysis

The frequencies, percentages, Standard Deviations (SD), median and means of the participants were described using the Muthen Plus program. The construct validity test requires the chi-square index and the RMSEA index to determine the model fit with the data. If the chi-square index output meets the criteria (p value > 0.05) then the model is said to be fit, but if the chi-square value does not meet the criteria then the RMSEA index can be seen because the chi-square index has limitations in a large sample size. If the data RMSEA index output meets the three criteria above, then it is said that the model is valid. Although, in general, two of the three criteria have been met, it can also be said to be valid. As for the Comparative Fit Index (CFI)/Tucker-Lewis Index (TLI) index, the closer it is to 1.00, the model fit can be said.

Results

Unidimensionality test

The results of the unidimensionality test have been obtained according to *Supplementary materials, Table 2.* Supplementary materials, Table2 presents the Confirmatory Factor Analysis (CFA) model used to test construct validity and one-dimensionality, ensuring model fit with the data. The chi-square index meets the criteria (p>0.05), indicating a good fit between the theoretical model and empirical data. *Supplementary materials, Table 2* also confirms that the dimensions of the Self-Consciousness of Health Status instrument exhibit one-dimensionality.

Item significance test

The Result of Item Significance test has been obtained according to *Supplementary materials, Table 3. Supplementary materials, Table 3* presents the significance test results for each statement in the Self-Consciousness of Health Status instrument, ensuring they accurately measure the intended construct. Items with a p-value < 0.05 are considered significant, indicating their effectiveness in assessing the construct.

Reliability test

The Result of Reliability Test has been obtained as described in *Supplementary materials, Table 4. Supplementary materials, Table 4* presents the reliability test results for raw scores. The Confirmatory Factor Analysis ensures item parallelism, allowing each item to have an equivalent score for easy summation. This parallel test helps individuals with type 2 diabetes mellitus calculate their self- consciousness scores more easily**.** A total of 77 items measure Health Status Self-Awareness. The Nurse Partnership dimension includes seven items: Dialogue: Knowledge of DM and Chronic Complications has 15 items, Dialogue: Physical Condition Development has eight items, and Dialogue: Emotional Condition Development has six items. Self-Awareness Patterns: Knowledge of Self-Management Targets consists of 6 items, Health History Pattern has five items, and Ability to Perform Self-Management includes 22 items. Lastly, the Health Status dimension has eight items.

Discussion

The partnership dimension is represented by 7 items that measure self-consciousness to have a trusting and respectful relationship between people with T2DM and nurses who are empowered, providing that people with T2DM can consciously change and develop independently. The partnership dimension is a unique instrument in measuring health status self-consciousness because it is the core of the partnership relationship to obtain healthy coping in people with T2DM. The seven items in the partnership dimension have a p-value of 0.1902 ($\alpha > 0.05$) that this theoretical model is said to fit the empirical data.

The first item of the partnership dimension (K1) is related to self-consciousness in finding out the latest information developments about diabetes mellitus and chronic complications with the assistance of nurses (knowledge is power). This item has a coefficient of 0.74, with $\alpha<0.05$, which interprets that item K1 measures the construct of nurse partnership. Health education is a growing method of providing information. Although health education effectively improves chronic disease management, diabetes remains one

of the most challenging chronic diseases to self-manage, so finding out the development of information responsibly requires nurse assistance. The results of a study conducted by Chen showed that health education interventions through online chat room groups can improve blood sugar control efficacy in the short term (0- 3 months), medium term (3-6 months) and long term (6-12 months) compared to conventional face-to-face health education.[15]

The second item of the partnership dimension (K2) is self-consciousness to motivate oneself to perform diabetes self-management with the assistance of a nurse. This item has a coefficient of 0.88 with p-value of $\alpha < 0.005$, which indicates this item measures the nurse construct. This item supports research conducted by Verma that peer coaching can help in controlling HbA1c levels, quality of life, self-efficacy, diabetes distress, and active involvement of people with diabetes.[16] Assistance in the peer coaching method has a way of involving people with diabetes with HbA1c levels that are not optimal with those who have succeeded in controlling HbA1c. This method is more efficient compared to usual care that motivates to improve diabetes self- management.

The third item of the partnership dimension (K3) is self-consciousness to take responsibility so as to be able to perform self-care activities with the assistance of nurses. This item has a coefficient of 0.91 and p value $\alpha < 0.005$ indicating that this item measures the construct of nurse partnership. The ability to care for oneself through self-consciousness, self-control, and independence to achieve, maintain, or improve optimal health and well-being is needed for chronic disease patients.[17] Independent self-care is an active decision-making process that enables individuals to effectively engage in their self-care. Research conducted by Iovino showed that patients with multiple chronic conditions and their care partners (children or grandchildren) had adequate involvement in self-care monitoring, but had low involvement in self-care maintenance and management of self-care behavior when controlled for the level of dependence between people with T2DM and their partners.[18] The self-care ability of people with diabetes with partners is influenced by sociodemographic conditions and clinical conditions. Clinical conditions affect the involvement of people with diabetes in their self-care behavior such as cognitive status, amount of medication therapy and type of chronic condition. Meanwhile, the determinants of the contribution of care partners in self-care include age, gender, education, income received, care partner burden, care hours per week and the presence of secondary care partners.

The fourth item (K4) of the partnership dimension is self-consciousness to have independence in deciding actions with the assistance of nurses. It has a coefficient of 0.93 and a p value of $\alpha < 0.005$ indicating that this item measures the partnership construct. This relates to people with diabetes being able to exercise their autonomy. Research conducted by Lee shows that people with diabetes have changes in the aspect of autonomy.[19] Autonomy in people with DM means that autonomy involves considering current circumstances as a frame of reference for organizing their lives. Diabetes interferes with autonomy by limiting opportunities and encouraging reassessment of current health status to carry out daily activities**.**

The second dimension in the SCHS Instrument is Dialogue. The dimension of dialogue in expanding self-consciousness is self-consciousness to find out the development of self- response from diabetes by conveying information between people with T2DM and nurses related to feelings, ideas, roles and functions, as well as hopes so that they can find meaning. The total items in the dialog dimension are 29 items. This item has a sub-dimension, namely diabetes mellitus knowledge as many as 15 items, the development of physical symptoms of diabetes mellitus as many as 8 items, and emotional development as many as 6 items. These items are arranged so that dialogue is a process that involves self-consciousness, disorganization and reorganization in receiving information.

The third dimension in the SCHS instrument is the pattern of self-consciousness. The dimension of the self-consciousness pattern measures a number of efforts, both ideas or activities carried out to respond to physical, psychosocial, existential conditions until the formation of an expansion of health consciousness that is appreciated and recognized by people with Type 2 DM. The self-consciousness pattern dimension has a total of 33 items. The dimension of self-consciousness patterns consists of 6 items of self-management target knowledge, 5 items of health history patterns, and 22 items of self-management ability. This dimension is arranged in relation to patient care parameters, namely the perception of diabetes self-knowledge, diabetes self-care ability and diabetes self-management.

A sense of bodily belonging, defined as the sensation that one's body is one's own, is a fundamental component of bodily self-consciousness. Several studies have shown the importance of multisensory integration for the emergence of a sense of bodily belonging, along with the involvement of the parieto-premotor cortex and extrastriata in bodily consciousness. However, whether the sense of bodily belonging evoked by different signal sources, especially visuotactile and visuomotor inputs, is represented by the same neural pattern remains to be explained.[20]

The fourth dimension in the SCHS instrument is health status which has a total of 8 items. This item measures how related to the extent to which the level of self-consciousness efforts of people with T2DM recognizes health conditions periodically, responds to them and recognizes the environment and support systems so that they could live their daily lives both physically and psychosocially. Diabetes management requires significant efforts, which involve maintaining the health of diabetic patients and the community and minimizing the workload of emergency departments.[21]

Health status is the most realized and understood dimension. Health status related to periodic efforts is the first point in assessing self-consciousness, because it is related to functional status and consciousness in assistance efforts. After that, the self-consciousness assessment can be continued with a self-management target that has a correlation of 0.599 as part of the self- consciousness pattern dimension. Self-management targets are related to metabolic indicators such as blood sugar, blood pressure and cholesterol. After the respondents knew what the self- management target was, the assessment could be continued with self-management skills as part of the self-consciousness pattern dimension which had a correlation of 0.586.

Self-management ability measures self-consciousness in conducting diabetes self-management in the form of diet, exercise, medication adherence, and self-monitoring of blood sugar. Self-management skills are a picture of self-consciousness in health behaviors that have been carried out by respondents. The next fairly good correlation is shown in the sub-dimension of DM knowledge which is part of the dialogue dimension. DM knowledge had a correlation of 0.549 to self-consciousness. High self-consciousness requires a foundation in the form of knowledge of DM which can be a strength in living life as a person with DM so that the quality of life becomes more quality.[22] After knowing self-consciousness in DM knowledge, the next fairly good correlation is the nurse partnership dimension which has a correlation of 0.471. Nurse partnerships can be reviewed after respondents know the DM's knowledge by measuring their consciousness related to nurse partnerships. Nurse partnerships are at the heart of Newman's theory.

In addition, Newman emphasized that consciousness includes not only cognitive and affective consciousness, but also the interconnectedness of all life systems which include the maintenance and growth process as well as the immune system. Each system in the human body has specific information and can interact with environmental systems to live. This self- consciousness instrument supports that there is a need for an instrument that tracks changes in health status self-awareness over time so that the dynamics and long-term effects of health interventions can be understood.[23] People with diabetes and their caregivers need information about the patient's health status, as hypoglycemia events often occur outside the healthcare environment and patient care depends on caregivers.[24] This instrument can be a solution as a tool for ongoing conversations between carers and people with diabetes. This instrument can be continued in future studies to determine its effectiveness in providing education, support and strategies in preventing hypoglycemia and chronic complications.

Several instruments assess diabetes self-management, including the Vietnamese Version of the Diabetes Self-Management Instrument by Dao-Tran and the Diabetic Foot Self-Care Questionnaire (DFSQ-UMA) from the University of Malaga.[25,26] Janssen developed a choice experiment instrument to measure self-regulation in benefit-risk assessments, focusing on A1c reduction, blood glucose stability, nausea, additional medication, and cost.[27] Tawfik created the Hospital Admission Risk Profile (HARP) risk calculator to predict hospital admissions for chronic disease patients.[28] However, no instrument currently measures the relationship between dialogue skills in self-management and long-term behavioral patterns in individuals with T2DM. Wildeboer developed the International Classification of Functioning, Disability, and Health (ICF) for T2DM patients from the perspective of specialist nurses.[29] Silva identified common nursing diagnoses in T2DM, such as inadequate knowledge of diabetes management, fatigue, mobility impairments, overweight, impaired skin integrity, diabetic foot risk, and hyperglycemia.[30] These diagnoses emphasize the need for a strong therapeutic relationship between nurses and T2DM patients.

Limitation

Although this study offers valuable insights, certain limitations should be considered when interpreting the results. External aspects like social support and spiritual aspects may also influence self-consciousness of health status, not only physical and emotional state. The developed instrument may require further customization or calibration to accommodate this variability. In addition, limitations in construct validity and internal reliability could be a challenge that requires additional research for instrument refinement. Longitudinal studies that track changes in self-consciousness of health status over time are needed to understand the dynamics and long-term effects of health interventions, which may not be covered in this study.

Conclusions

The SCHS instrument with 77 items that can measure self-consciousness of people with T2DM with chronic complications has been proven to be valid and reliable. The SCHS score is divided into three categories: low self-consciousness (0-23), medium self-consciousness (31-50), and high self-consciousness (58-77) The SCHS score can help risk analysis in four dimensions, namely the dimensions of nurse partnerships, dialogue, self-consciousness patterns and health status. The need for T2DM educational assistance and self-management skills by nurses using SCHS instruments. Further research can adopt the SCHS instrument by measuring criterion validity. for the development of nursing, the SCHS instrument focuses on the validity of the construct of Newman's theory as the beginning of the development of nursing.

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Online supplementary materials

Table 1. Comparison of the number of items of content validity results.
Table 2. The results of the Unidimensionality Test.
Table 3. The result of item significance test.
Table 4. The result of the reliability test.