A multi-criteria decision model for assessing health and self-care ability

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Abstract
Population ageing together with the greater prevalence of multimorbidity add to the need for and complexity of healthcare services. This makes it important to encourage and empower patients with chronic diseases to take care of themselves. An associated goal of such efforts is to significantly reduce the burden on healthcare systems and positively impact patients’ health outcomes and quality of life. The paper presents a multi-criteria decision model for assessing the health and self-care of patients with chronic diseases in the home environment. The model is based on the DEX methodology and was tested on ten cases. The model assists with the timely recognition of relevant symptoms and signs in decision-making about health and self-care. It can be used to promote patients taking on an active role with respect to caring for their health and well-being. The model could be integrated into self-care processes. It might also serve as a basis for an interprofessional approach to supporting older patients with chronic diseases living as fully and independently as possible in the environment in which they feel most comfortable.

Keywords  Multi-criteria decision-making · DEX methodology · Healthcare · Self-care · Home environment · Patient empowerment

1 Introduction
Both the evolution of society and achievements made by science are leading to extended life expectancy in Europe, thereby increasing the proportion of older adults

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(Welsh et al. 2021), particularly those with more health-related problems and chronic non-communicable diseases (CNDs). Multimorbidity and the higher number of disease symptoms they express affect the complexity of patient care (Eckerblad et al. 2015), which with an ageing population is adding to burden of CNDs in developed countries (Vos et al. 2020). Patients with CNDs are most often alone in their home environment. On average, they receive only 1 h of professional care per year, otherwise relying on themselves and their self-care ability (Racine 2017). Self-care-based interventions are thus a cornerstone approach to reducing the burden created by CNDs. Self-care is defined as the ability of individuals, families and communities to promote and maintain health, prevent disease, and successfully cope with illness and disability with/without the support of healthcare providers (Riegel et al. 2021; World Health Organization 2021). Operations research can also be utilised to support patients with CNDs in their home environment.

Operations research uses analytical and scientific approaches to aid decision-making regarding complex problems. Some of its approaches have been applied in healthcare since the mid twentieth century (Royston 2009) and been used in decision-making about numerous complex health- and healthcare-related problems (Kumar et al. 2020; Kumar 2019; Saville et al. 2019). A recent and systematic literature review of operations research applied to decisions in home healthcare noted the lack of both research on home care planning and the reassessment of patients’ needs (Grieco et al. 2021).

The complexity and multidimensionality of the decision-making challenges patients with CNDs face can mean their decisions are often based on simplistic intuitive or heuristic foundations, characterised by automaticity, impulsivity and contextualisation (Riegel et al. 2012). Such decision-making can cause them to overlook important information, under-consider or exclude it from the decision-making process, producing decisions based on incorrect priorities (Baltussen and Niessen 2006). The use of decision-making support can hence play an important role in the implementation of self-care-based interventions (Riegel et al. 2021; Riegel and Jaarsma 2019).

Transparent and more accurate decisions for health- and care-related problems can be achieved through use of multi-criteria decision-making methods (Mühlbacher and Kaczynski 2016) including those that digitally support decision-making processes (Diaby et al. 2013; Mühlbacher and Kaczynski 2016). This should also involve patients who actively engage in healthcare processes since active participation in decision-making regarding their health and well-being is associated with empowerment and self-efficacy, which positively impact patients’ health outcomes and quality of life (Jimison and Gordon 2016).

In this study, we address a complex decision problem encountered by patients with CNDs in their home environments. Patients and family members (lay caregivers) lack sufficient knowledge or experience to adequately assess a patient’s health status and take the appropriate course of action. The decision problem is made complex by the large number of intertwining factors that affect patients’ health and well-being at any given time. Multi-criteria decision support can be utilised to aid decision-makers while making a decision about a patient’s health and to support them in self-care-related endeavours. The decision-makers in this case are patients with CNDs or their relatives who make decisions on their behalf. Professional support for patients concerning
self-care is vital in treatment because it represents an important starting point for interventions to reduce the need for formal care (Martin and Finn 2011).

The aim of this paper is to present a developed, verified and validated multi-criteria decision model for assessing the health and self-care ability of patients with CNDs. The model is designed to support patients or their lay caregivers with the regular assessment of a patient’s health in their home environment. The presented decision model includes specific symptoms and signs that must be considered while deciding whether to perform additional self-care-related activities or seek professional help.

2 Methods

2.1 The multi-criteria decision methodology DEX

The DEX (Decision Expert) methodology was used given its successful application in similar decision support models in the health care field (Bohanec et al. 2018, 2021; Drnovšek et al. 2020). The DEX method follows the multi-attribute utility theory and is an extension of utility theory based on the resolution of multiple small problems to solve a more complex decision problem (Mateo 2012). The method combines the concepts of multi-criteria decision-making and expert systems (Figueira et al. 2016).

Multi-criteria decision methodologies aim to evaluate and analyse a set of alternatives \( A = \{a_1, a_2, \ldots, a_m\} \). Alternatives are described according to a set of criteria \( X = \{x_1, x_2, \ldots, x_n\} \). With the DEX methodology, the criteria are hierarchically structured in a tree-like structure (Bohanec 2021a). In this structure, the topmost criterion represents the final assessment of an alternative, which is the result of a model and input values for an alternative. Its value is calculated from the value of the sub-criteria using a predefined utility function. A criterion that has sub-criteria and a utility function that calculates its value from the values of sub-criteria is called an aggregate criterion. Each branch in the tree structure represents an aggregate criterion. Criteria, which have no sub-criteria, are the basic criteria. They represent a set of measurable criteria for which we collect input data.

Unlike many other multi-criteria decision-making methods, the DEX methodology is qualitative in nature (Bohanec 2021a). That is, for each criterion we determine qualitative value domains: \( D_x = \{d_{x-1}, d_{x-2}, \ldots, d_{x-p}\} \). Domain values are represented as ordered sets of qualitative discrete values describing characteristics of alternatives. They can be descriptive and therefore preserve natural-like values without the need for converting to numbers. This methodology is particularly appropriate while dealing with less accurate or non-numerical data. When using numerical data, domain values should be set such that classes do not overlap. In this way, any alternative can be assessed by a single value for each criterion.

We define utility functions for aggregated criteria by defining simple rules for all possible combinations of domain values of their sub-criteria. A set of combinations represents the Cartesian product of the domain values of the sub-criteria. To keep the number of rules manageable, since experts must define each and every one of them, an aggregated criterion should have a small number of sub-criteria (usually no more
than three) and special attention is paid to determining domain values to represent the key differences among them.

Simple rules are given in *if–then* form. For example, consider an aggregate criterion $x_1$, which has two sub-criteria $x_2$ and $x_3$. Together, we define $D_2 \times D_3$ rules in the form:

$$\text{IF } \forall (a, x_2) = d_2 - r \text{ AND } \forall (a, x_3) = d_3 - s \text{ THEN } \forall (a, x_1) = d_1 - t$$

where $\forall (a, x)$ represents a value of an alternative $a$ for criterion $x$.

Contrary to using fixed weights, the utility functions in DEX allow for more complex functions, such as when the weight of a criterion depends on its value. An approach of this nature to decision problems has proven to be better than model building through data mining or other approaches (Bohanec et al. 2018).

The DEX methodology is supported by freely available software DEXi (Bohanec 2021b). We used DEXi version 5.05. Since this is Windows-based software, we added the compatible free software DEXi HTML Evaluator, version 1.0, which allows assessing alternatives in a web browser (Bohanec 2021b). This was especially useful for collecting data to test the model.

### 2.2 Model development process

Community nurses in Slovenia envisioned a decision support tool for patients in healthcare environment. The idea was to support patients’ health-related decisions in the field of health care. We started the project by establishing a group of experts. It included three registered nurses, a general practitioner, a psychologist, a sociologist, and three experts with respect to multi-criteria decision-making. Some of their background information is presented in Table 1.

The criteria selection built on Engel’s biopsychosocial model of health. The model is a response to limitations to the biomedical model and combines the somatic and mental paradigms of disease (Engel 1977). The model was chosen for its holistic approach and improved capability for chronic conditions management in home environment. For criteria selection, we firstly conducted a literature review with the aim of identifying relevant variables for the decision problem of patients self-assessing their health status in the home environment. These variables were transformed in the criteria of the decision model. The model consists of criteria that can be measured or observed by patients in their home environment unaided by healthcare professionals or specialised technology. The result was a list of clinically important symptoms and signs that according to the literature are relevant and can be understood and assessed by patients or their lay caregivers. These criteria were combined, based on similarity, by adding aggregate criteria to build a tree of criteria. Each criterion had its value domain defined. The basic criteria also have explanations for each value to help decision-makers (patients) input the correct values. Utility functions were constructed based on the team members’ expertise.

The model’s theoretical and conceptual verification was carried out by independent members of the expert group. Each member of that group was asked to provide an
Table 1 Background information of team members

| Field of expertise | Field of occupation | Professional experience (years) | Main contribution |
|--------------------|---------------------|--------------------------------|-------------------|
| Nursing            | Community nursing   | 17                             | CS, MS, RF, DPE and MT |
| Nursing            | Intensive care unit | 5                              | CS and MS         |
| Nursing            | Primary care        | 13                             | CS                |
| General medical practice | Primary care | 22                             | CS, MS and RF    |
| Psychology         | Secondary care      | 10                             | CS, MS and RF    |
| Sociology          | Academic research   | 11                             | MS and MT        |
| Decision support   | Academic research   | 21                             | RF, DPE and MT   |
| Decision support   | Academic research   | 35                             | RF and DPE       |
| Decision support   | Academic research   | 18                             | RF and DPE       |

*CS criteria selection, MS model structuring, RF rule formulation, DPE decision process evaluation, MT model testing*

opinion on the appropriateness and scope of both the model and decision criteria. The feedback was used to improve the decision model.

By validating the model, we aimed to determine whether the model had satisfactory accuracy in its domain of use as well as its consistency regarding the intended use. The validation process was performed by independent individuals (patients/lay caregivers) in an environment of their choice. We first explained to them the basic purpose of testing the model, familiarised them with its structure and operation, and asked them to enter values for the input parameters that best reflected their actual health status and how they were feeling. For this purpose, the DEXi HTML Evaluator was used.

### 3 Results

This section presents the developed multi-criteria decision model for patients’ self-assessment of their health status and self-care ability in the home environment.

#### 3.1 Tree of criteria

The model consists of 60 (34 basic and 26 aggregated) criteria organised hierarchically in a tree-like structure. They cover all aspects of health identified by the expert team.
that contribute to patients’ ability to take care of themselves. The model is intended for use by non-professionals—patients or their lay caregivers.

Criteria closest to the root are presented in Fig. 1. Self-care assessment is first divided into two branches: Physiological and Psychosocial health, namely the main dimensions of health. Both have three sub-criteria. Physiological health encompasses Main organs, systems, which covers the cardiovascular system, lungs, digestive and urinary systems, Skin and sense concern skin, mucosa, perception and sensation, while Movement and rest relate to physical strain, fatigue and sleeplessness. Psychosocial health incorporates Psychological status (emotions and distress), Cognitive abilities like memory, orientation and attention, and Social inclusion that deals with social support and loneliness. The entire structure of the tree of criteria is presented in Fig. 2.

The selection of the basic criteria was adjusted to our target population. For physiological health, recommendations for adults were acknowledged as the most strongly desired input values (Ponikowski et al. 2016). Our model is additionally focused on the older population and thus includes symptoms like vertigo and dizziness, which among older people are especially important for preventing falls (Iwasaki and Yamasona 2014), and the symptoms of problems with mental abilities, such as dementia, which are important for timely treatment (Robinson et al. 2015; Neal et al. 2021).

The precise selection of the decision criteria is intended to ensure that the self-care decision model is able to make the correct suggestions to patients and/or their lay caregivers depending on the input parameters’ values.

3.2 Domain values definition

Criteria represent assessments of specific symptoms and signs related to an individual patient’s physical and psychosocial health. Alternatives represent older patients with CNDs living at home. Each basic criterion is an input to the model. Input data are collected by asking patients a question or telling them a statement (with a short explanation) they can respond to by choosing the value that best reflects their current situation. Values are chosen from the domain values predefined for each criterion separately. Values are ordered from most to least desirable. The number of domain values used depends on the type of criterion.
Fig. 2 The entire structure of the tree of criteria
Table 2 Domain values with descriptions for the Pain criterion

| Desirability | Domain value          | Description* |
|--------------|-----------------------|--------------|
| Most         | No pain               | 0            |
|              | Mild pain             | 1–3          |
|              | Moderate (bearable)   | 4–6          |
| Least        | Severe (unbearable)   | 7–10         |

*Score on the Numerical Pain Rating Scale

Detailed descriptions of the domain values of the basic criteria are key to understanding the criteria. The aim is to build a model that is independent of the evaluators (patient and lay caregivers). Descriptions should be clear enough for patients and/or lay caregivers to enter data correctly.

An example of domain values with descriptions for the Pain criterion is given in Table 1. Pain is typically assessed using the Numerical Pain Rating Scale (Faculty of Pain Medicine and The British Pain Society 2019) where a patient is asked to assess pain on a scale from 0 (no pain) to 10 (most severe pain). The same scale is used in professional healthcare settings. Numerical values are converted to a four-class scale as defined in the literature (Table 2).

The assessments of the symptoms and signs expressed are aggregated to create a final assessment of the self-care level. The aggregated criteria have domain values defined a way that reflects the positive and negative effects of their sub-criteria.

The designed multi-criteria self-care decision model seeks to support patients’ decisions regarding the timely seeking of help or performing of activities on their own to improve or maintain their health and well-being. Accordingly, explanations were added to define each value (Table 3).

The categories of basic criteria were carefully assigned to reflect as accurately as possible their actual impact on health and self-care ability. An appropriate criteria arrangement, suitable domain values, and knowledge about their relationships and effects on the overall assessment of self-care were vital for determining the proposed model’s decision rules.

### 3.3 Decision rules

Utility functions were assigned to individual aggregated criteria. The estimated overall self-care ability is derived from assessing the impact of specific criteria on physical and psychosocial health. Figure 3 shows how the overall estimated risk varies depending on patients’ Physiological and Psychosocial health.

A 3D chart has three axes of which two correspond to two sub-criteria and the vertical axis represents the topmost criterion that delivers the final assessment of self-care. There are 20 points on the chart, each corresponding to a single if–then rule. Together, they form a utility function of the topmost criterion.

The DEXi software has an algorithm which combines rules with a similar result into aggregated rules. The aggregated rules corresponding to the utility function presented in Fig. 3 are presented in Fig. 4. The algorithm managed to represent all decision rules.
### Table 3 Domain values with descriptions for the overall assessment of a patient’s health and self-care ability

| Desirability | Domain value          | Description                                                                                                                                 |
|--------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Most         | Excellent self-care   | I feel healthy. I am completely independent in my self-care. I need to have my health checked every 6 months                                  |
|              | Sufficient self-care  | I have some health problems, but I can manage symptoms and signs well by myself. I follow the recommendations of healthcare providers. I need to check symptoms and signs monthly. I take some preventive measures |
|              | Insufficient self-care| I have some health problems that I cannot always manage. I need to check symptoms and signs daily. In the case of worsening, I seek professional help |
|              | Professional help      | My health is poor. I need professional help. I immediately make an appointment with my general practitioner or seek other professional help          |
| Least        | Urgent                | Due to my poor health condition, I need to seek medical help immediately: call the nearest emergency medical unit or an ambulance                |

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**Fig. 3** Graphical presentation of the utility function for the topmost criterion
three-level aggregated criteria are presented in the polar charts in Fig. 5. Values lying on the outer border in the charts are the most desirable, while values lying in the centre of the charts are the least desirable.

The self-care of patient 2 was assessed as Insufficient self-care, whereas the self-care level of patient 5 reaches Professional help (both values according to the definitions in Table 3). The self-care abilities of patient 2 are assessed as inadequate, although do not require professional help. They can be managed by the patient and/or his/her lay caregiver. This means they should be assessed every day to quickly detect any important health changes. Patient 5 is recommended to seek the support of healthcare professionals. Professional help is the second-least desired outcome of the model. If the patient’s health status were evaluated any worse, the decision model would rate the

| Rule | Physiological health | Psychosocial health | Self-care |
|------|----------------------|---------------------|-----------|
| 1    | Urgency              |                     | Urgent    |
| 2    | *                    | Urgency             |           |
| 3    | Not under control    | Not under control : Under control | Professional help |
| 4    | Not under control : Under control |                      |           |
| 5    | Not under control : Partly under control | No problems         |           |
| 6    | Partly under control | >= Under control    | Insufficient self-care |
| 7    | No problems          | Not under control   |           |
| 8    | Under control        | >= Under control    | Sufficient self-care |
| 9    | >= Under control     | Under control       |           |
| 10   | No problems          | No problems         | Excellent self-care |

Legend: * any value; a:b interval from value a to value b, values a and b are included; >=a more or equally desirable as value a

with nine aggregated rules that are useful for understanding the utility function. For example, the first decision rule reads: If Physiological health is assessed as Urgency, no matter the assessment of Psychosocial health, the overall Self-care assessment is Urgent.

The inclusion of decision rules which represent normative expertise in a consistently regulated form ensures the model’s transparency and comprehensibility. The rules were developed based on the team members’ expertise and the literature review conducted. They were reviewed by all experts in the team. The rules can easily be reviewed and modified if necessary.

3.4 Testing

The Single Item Literacy Screener (Morris et al. 2006) was used to assess possible patients to be included in testing of the model. Nine older adults with CNDs living at home and one lay caregiver were selected. This section presents the self-care assessment of two patients, who were purposely chosen as their assessment results clearly demonstrate the decision model’s advantages.

DEXi offers some visualisation tools for graphically representing the data. The mode’s usability is presented by an evaluation of two participating patients. Both patients have considerable health problems. The final assessment of their health status and self-care ability together with values of the third-level aggregated criteria are presented in the polar charts in Fig. 5. Values lying on the outer border in the charts are the most desirable, while values lying in the centre of the charts are the least desirable.

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patient’s health condition as Urgent, indicating the need to immediately seek medical attention.

Closer examination of the evaluated criteria reveals similarities in the assessments of patients 2 and 5. Both patients were assessed with the same grades for five out of six third-level aggregated criteria. The only difference is seen in the Cognitive ability criterion. When considering a triangular polar chart with the sub-criteria of the Cognitive ability criterion it becomes evident that the least desirable value was assessed for Memory (the domain value Often denotes the frequency of occurrence of memory problems), thereby influencing the poor assessments of aggregated criteria lying above. This is appropriate since mental-health-related problems importantly contribute to a person’s overall health and functionally. It is also one of the health problems most likely to be underestimated and overlooked by patients, who in turn often do not seek the professional attention they need.

This example reflects the model’s holistic evaluation of a patient’s health and its incorporation of the interconnectivity of different dimensions of health. The visualisation also demonstrates how transparency of the decision process can contribute to improved understanding of the decision results and help the decision-makers pinpoint the areas on where action is needed.

3.5 Sensitivity analysis

We have performed a sensitivity analysis to estimate the robustness of the model’s results given the input criteria. We have run what-if analysis tests to see how a change in a single criterion’s value (if it improves or worsens for one class) affects the overall assessment of self-care. To test all such cases for a given patient, software DEXi offers a plus-minus-1 analysis. Table 4 presents plus-minus-1 analysis results for patient 2. The overall self-care would improve only in one case: if Physical strain improves from Strenuous to No problems. This change would result in Sufficient self-care.

Five cases result in worsening the overall assessment. Four of them (Unmanageable Heavy breathing, Unmanageable Changes in skin & mucosa, Often Memory problems,
Table 4 Results of plus-minus-1 analysis for Patient 2

| Basic criterion                  | Change in value from to | Changes Insufficient self-care to |
|----------------------------------|-------------------------|-----------------------------------|
| Pain on the VAS scale            | Levels 4–6 → Levels above 6 | Urgent                            |
| Heavy breathing                  | Manageable → Unmanageable | Professional help                  |
| Changes in skin and mucosa       | Manageable → Unmanageable |                                    |
| Memory problems frequency        | Rarely → Often           |                                    |
| Attention problems frequency     | Rarely → Often           |                                    |
| Physical strain                  | Strenuous → No problems  | Sufficient self-care              |

and Often Attention problems) worsen the comprehensive evaluation for one class to Professional help. Changing Pain to unbearable (score seven or higher on the VAS scale, see Table 2), the overall assessment would change to Urgent.

Experts closely examined the results of plus-minus-1 analyses in observed patients to search for possible errors.

4 Discussion

Providing patients with digital decision support regarding self-care can have a positive impact on their independence in the home environment (World Health Organization 2021). Contemporary research recognises the importance of digital technology use in self-care and self-management support for patients with diverse health conditions (Adriaans et al. 2021; Neal et al. 2021; Riegel et al. 2021), which encourages the development of decision support systems like the model presented in this paper.

Decision-making is a fundamental part of processes in healthcare. Health-related decision problems are made especially complex by the large amount of commonly unstructured data (Mulligan et al. 2019). Patients require proper information regarding their health for them to make informed decisions and choose behaviours that support their health and well-being. Using a structured decision-making self-care model, we enable patients with CNDs to better monitor their own health and make more transparent and informed decisions about self-care. Patients are thereby enabled to respond to health-related changes in a timely and appropriate manner.

Management of CNDs requires the vigilant monitoring of symptoms and signs as well as intensive self-care (Jimison and Gordon 2016). As disease progresses, patients must often engage in self-care even more intensively. The proposed model offers a structured approach in self-care-related decision-making that can replace patients’ spontaneous and intuitive responses. Such decision support can reduce the likelihood of errors and lead to improved decision-making (Thompson et al. 2011).

Besides better decision-making, our model can also improve the usefulness and credibility of reported symptoms and signs when patients seek professional help. The severity and presence of symptoms and signs are important for establishing the appropriate treatment and nursing care plan. However, self-assessment is not always the best source of information (Poote et al. 2014) given that it is often incomplete.
and unstructured. It is in the interest of healthcare professionals to obtain a patient history summary that is as holistic and as structured as possible (Schäfer et al. 2020), a requirement which is supported by the model.

The self-assessment of health status and expressed disease symptoms and signs is a subjective general assessment of one’s health. It is based on a patient’s experience of their health. It relies mostly on nursing-specific data that enable easy translation into treatment planning and the creation of a nursing care plan. It ensures the holistic gathering of data. This approach is useful for healthcare professionals to better understand the causes of health-related problems, identify poor preventive measures and recognise risks that could lead to frequent emergency room or general practitioner visits that might be prevented. The model is based on the assumption that patients, as experts regarding their own health, can provide crucial health and well-being-related data.

Another important benefit of the model is patient empowerment. The model encourages patients to actively participate in their treatment regimen and disease management. Through decision-making, patients take responsibility for their health and well-being, in turn transforming their role in the healthcare system. Digital decision support is a viable strategy for promoting patients’ empowerment because patients with CNDs desire to use the available digital technologies to help them be independent in taking care of themselves, provide safety and security, enable them to socialise, and help them in daily activities (Vassli and Farshchian 2018). The model gives patients adequate decision support so that they can participate in the treatment of their health-related problems as autonomous partners together with healthcare professionals.

The model was tested on a small set of patients. Future work should focus on ensuring the model’s appropriate functionality according to patients’ needs. In addition, the model focuses exclusively on health assessment in the context of CNDs. Although the model could be modified to suit different purposes, future research should test the applicability of such an approach among diverse populations. Taking that into consideration, this strategy could potentially be widely utilised by healthcare professionals to detect risk factors and changes that indicate a deterioration of health and well-being. Such assessments also support a more personalised approach to patient treatment.

The importance of using decision support models in healthcare is even more evident in light of the COVID-19 pandemic, which has limited access to healthcare services. Digital support systems have already been used during the period of disruption to support the organisation of home healthcare during the COVID-19 pandemic (Rest and Hirsch 2022). Effective self-care can reduce the need for professional care while avoiding the unnecessary exposure of patients with CNDs to potential infection.

5 Conclusion

The presented multi-criteria decision model is a novel approach to supporting the self-care decisions of patients with CNDs. It encompasses physiological and psychosocial health-related data. The model offers simple data acquisition allowing for timely and transparent decisions by patients and/or their lay caregivers. In general, this may contribute to better healthcare services resulting in more desirable health outcomes and
hence improved quality of life. It focuses on prevention and encourages a personalised approach to patients. The model’s transparency allows for it to be easily modified for other populations and cultural settings providing a springboard for future innovations in using digital decision support tools for patient self-care.

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**Availability of data and material** Signed forms of informed consent are securely stored by the first author in a paper form. All signed forms will be destroyed within a year of publication. The evaluation model used in this study is saved in electronic form by all authors.

**Code availability** Used software DEXi 5.05 and DEXi HTML Evaluator are not customized and are freely available at [https://kt.ijs.si/MarkoBohanec/dexi.html](https://kt.ijs.si/MarkoBohanec/dexi.html) and at [https://kt.ijs.si/MarkoBohanec/dexihtml.html](https://kt.ijs.si/MarkoBohanec/dexihtml.html).

**Declarations**

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethics approval** Ethical approval for the conduction of this study was attained from the Ethical Committee for Research in Organizational Sciences of the University of Maribor, Faculty of Organizational Sciences, No. 514-2/2019/1/902-DJ.

**Human or animal participants** All the procedures performed in studies involving human participants were in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Consent to participate and consent for publication** Participants signed a uniform consent of participation and publication prior to the conduction of the study.

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