Assessing the use of telemedicine among people with diabetes: A Danish translation and cross-cultural adaptation of the Telehealth Usability Questionnaire

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Abstract
The aim was to translate and cross-culturally adapt the original Telehealth Usability Questionnaire (TUQ) into Danish and pre-test the translation on a sample of Danish patients with diabetes who received telemedicine. Participants with diabetes (n = 34) completed the Danish TUQ and participated in semi-structured interviews. The overall internal consistency was 0.857. The internal consistency for the five sub-groups ranged from 0.241 (sub-group four) to 0.857 (sub-group five). The study demonstrates an overall accepted statistical internal consistency compared with the original TUQ, which makes it a reliable tool to assess patients' perceptions after using a telemedicine service.

Keywords
Telemedicine, questionnaire, adaption, forward-backwards translation, reliability

1 INTRODUCTION

Telemedicine solutions may use many different types of communication technology to support patients remotely. Various types of telemedicine solutions have been proposed for a wide range of patients [1–5], including patients with diabetes, pulmonary diseases, heart disease, cancer, and so on [6–10]. Moreover, a meta-review from 2017 focusing on telehealth interventions to support self-management of long-term conditions of diabetes, heart failure, chronic obstructive pulmonary disease, and cancer suggested that telemedicine is a safe way to deliver self-management support and showed that users have a high degree of acceptance of telemedicine. However, telemedicine solutions were not consistently superior to usual care [6]. This lack of consistent effect may be explained by the shortcomings of telemedicine studies, as their quality has been questioned [11]. One of the shortcomings of telemedicine studies is that they fail to explore patients' experiences with the telemedicine solution provided [11]. However, it is important to increase knowledge about telemedicine solutions and their usability to understand which solution is appropriate for which patient [12]. Considering the COVID-19 pandemic, this challenge has become even more relevant as the use of telemedicine has increased [13–17]. This highlights the need for tools to evaluate patients' perceptions of the quality of the telemedicine solutions provided.

Surveys have been commonly used to assess perceptions and outcomes in telemedicine studies among both patients and healthcare professionals [16,18].

The quality (i.e., consistency and transferability) of telemedicine studies has been questioned, and improved quality and reporting of telemedicine survey studies have been called for [12]. Moreover, to the best of our knowledge, the availability of surveys in the Scandinavian languages, including Danish, are very limited, underlining the need for a Danish validated and cross-culturally adapted survey that evaluates patients' perceptions of usefulness and satisfaction with a provided telemedicine solution.

Several of the existing telemedicine-specific questionnaires are lacking in their ability to evaluate more than one telehealth system. Furthermore, most of the questionnaires are only intended for either clinicians or patients and not both at the same time [1,18]. The Telehealth Usability Questionnaire (TUQ), however, has several advantages since it is intended for use with various types of telehealth systems and can be used both for clinicians and patients. The final TUQ consists of 21 items assessing computer usability, telemedicine solutions, and their quality. This assessment focuses on usefulness, ease of use, effectiveness, reliability, and satisfaction [19]. The original development of TUQ was based on four phases: 1) literature review, 2) construct development, 3) item development, and 4) examination of reliability.

To test the reliability of the content of the originally developed TUQ, 53 participants (21 males and 32 females) were included in a three-month study, where participants who regularly used telehealth technologies were asked to complete the TUQ based on their recent interaction with a selected system. At the same time, participants who had never used or did not regularly use telehealth technologies

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were asked to take part in a simulated telehealth session and afterwards complete the TUQ based on their interaction [19]. After the three months were over, statistical analysis was conducted and showed a solid, robust, and versatile TUQ instrument [19]. Since the results from the study by Parmanto et al. showed that TUQ is a relevant questionnaire to evaluate telehealth systems, a Danish translation and cross-cultural adaptation of it is highly needed due to the increased use of telemedicine solutions in the Danish healthcare sector.

Thus, the aim of the present study was to translate the TUQ into Danish, pre-test it, and thereby cross-culturally adapt the translation using a sample of Danish patients with diabetes who had recently received a telemedicine service in the form of a video consultation.

2 METHODS AND MATERIALS

2.1 Procedures

The English version of the TUQ was translated and adapted for the Danish culture in accordance with the guidelines for the process of cross-cultural adaptation of self-report measures provided by Beaton et al. [20]. The term cross-cultural adaptation refers to "a process that looks at both language (translation) and cultural adaption issues in the process of preparing a questionnaire for use in other set-tings" [20]. The English version of the TUQ includes 21 items with the possibility to respond using a seven-point Likert scale, where one represents total disagree and seven represents fully agree or N/A. Besides the 21 items, a space for more elaborate comments about the telemedicine system is provided in the TUQ.

The cross-cultural adaptation of the TUQ was performed in line with the process given by Beaton et al. [20] by using forward-backwards translation. Table 1 gives an overview of the steps in the process, which is described in detail below the table. The letters in the brackets say which authors did which of the tasks in the validation process.

Stage	Action
I	Forward translation by two translators
II	Synthesis of the two translators into one (T-12)
III	Backwards translation by two translators
IV	Expert committee review
V	Pre-testing and completing

Table 1 an overview of Beaton et al.'s five-stage cross cultural adaption process [20].

Stage I: Forward translation

Two forward translators translated the English version of the TUQ into Danish and produced two individual versions (T1 and T2) of the Danish TUQ. Both translators were bilingual, with Danish as their mother tongue. One translator had a clinical background and was familiar with the terms: telemedicine and usability. The other translator did not have a clinical background and was not familiar with the concepts of the TUQ. Both forward translators were selected based on the criteria given by Beaton et al. [20].

Time estimation: The number of working hours that each of the forward translators spent varied be-tween two and three hours. Their time was spent on literal translation work and on how to include cultural differences in the translation of the original TUQ (i.e., how the TUQ could be implemented in a Danish context).

Stage II: Synthesis of the initial translations (T-12)

Working from the original TUQ and the two independent initial Danish translations (T1 and T2), the two forward translators reached a consensus on a new version of the Danish TUQ (T-12). The out-come (i.e., the issues addressed by T1 and T2 in this synthesis step and how the issues were resolved) was described in a written report.

Time estimation: The number of working hours for the second stage was approximately one working day (eight hours) per translator.

Stage III: Backwards translation

To ensure the validity of the first two steps in the translation process, a third step, back-wards translation, was performed. Two independent backwards translators with English as their mother tongue translated the T-12 version of TUQ back into English and thus produced two different back translations (BT1 and BT2). Both backwards translators were familiar with the concepts of the TUQ, but neither of them had a medical background. The backwards translators were selected based on the criteria given by Beaton et al. [20].

Time estimation: Each backwards translator spent approximately half to one working day (four to eight hours) on the translation.

Stage IV: Expert committee review

The expert committee was composed of the two forward translators, the two backwards translators, two health professionals, a methodologist, and a language professional. During their meeting, the expert committee reviewed all the produced material from the previous stages (stages I, II, and III, i.e., the English TUQ and each translation [T1, T2, T-12, BT1, and BT2]) together with the corresponding written report. The expert committee discussed the translations and developed a pre-final version of the Danish TUQ. Due to the COVID-19 pandemic, the expert committee meeting was held digitally using Microsoft Teams.

Time estimation: the expert committee used approximately half a working day (three hours). The working hours did not include the preparation time that each of the committee members spent prior to the expert committee meeting.

Stage V: Pre-testing and completing

Participants with diabetes (n = 34) completed the Danish TUQ. Subsequently, they participated in semi-structured interviews concerning their basic demographics, their responses to the TUQ, and the relevance of each item within the Danish TUQ. This step was conducted to ensure the reliability and consistency of the Danish TUQ.

After the last stage, the authors had a series of meetings and went through the comments given by the interviewed subjects. Again, a consensus was reached, and the authors agreed on a final version of the Danish translation of the TUQ.

Time estimation: The researchers spent approximately 30 minutes per interview (plus additional preparation time before each interview and post-processing of the data). The

duration of the physical meeting between the authors lasted approximately two hours.

2.2 Participants in the Pre-test

All included participants (n = 34) were diagnosed with diabetes and had received a telemedicine service in the form of a video consultation within the last two months. The included participants were recruited from the four Steno Diabetes Centres located in Denmark (Steno Diabetes Centre North Denmark, Steno Diabetes Centre Aarhus, Steno Diabetes Centre Zealand, and Steno Diabetes Centre Odense). The aim of the Steno Diabetes Centres is to improve and prolong the lives of people with diabetes in Denmark [21].

The participants were selected using consecutive sampling, which refers to the inclusion of all accessible participants at multiple data collection sites - in this study, the four Steno Diabetes Centres. From each of the four sites, a manager provided a list with the names of potential participants. The potential participants had each received a short description of the aim of the study by healthcare professionals from one of the Steno Diabetes Centres. The participants had given written informed consent, so researchers (two assistant professors with experience within telemedicine and questionnaire translation) from Aalborg University were permitted to contact them by telephone (due to the COVID-19 pandemic, the interviews were performed by telephone). Each participant received a phone call during which they received a detailed description of the aim of the study and the study procedure. If the potential participants agreed to participate in the study, a time and date for a new phone call was planned. After the call ended, each subject received an email including the Danish TUQ, written information about the study, and their rights as a participant in the study. Moreover, the participants were encouraged to fill out the Danish TUQ based on their recent experience with teleconsultation.

Approximately one week after receiving the email, each participant received a phone call from the researchers. First, the participants were asked to provide basic demographics (sex, age, civil status, level of employment, level of education, comorbidities, and diagnosis/reason they had used the tele-medicine service). Second, each participant was asked to provide their response for each questionnaire item and their understanding of the meaning and relevance of each of the items. In closing, after going through all 21 items, the researchers asked if there was anything the participants wanted to add further to the interview. During and after all 34 semi-structured interviews, the researchers took notes.

The following criteria were outlined for the inclusion of participants in the pre-test of the Danish TUQ:

Inclusion criteria: diagnosed with diabetes (either type 1 or type 2 diabetes), have received a telemedicine service related to their diabetes, > 18 years old (both men and women were included), and able to read and understand Danish.

Exclusion criteria: blindness, too ill to participate, dementia, or other cognitive impairment (judged by the healthcare professionals at the Steno Diabetes Centres), unable to read or understand Danish and thereby fill out the Danish TUQ.

2.3 Statistical Analysis

Descriptive statistics were presented with mean and standard deviation (± SD) or percentage of the participants. The overall internal consistency of the Danish TUQ was measured using Cronbach's alpha, based on the data collected from the semi-structured interviews [22]. For each of the five sub-groups within the TUQ, the internal consistency was also calculated. The sub-groups were designed by Parmanto et al. based on covering all usability factors (i.e., usefulness, ease of use, effectiveness, reliability, and satisfaction) [19]. These sub-groups were sub-group one (items 1–3), sub-group two (items 4–6), sub-group three (items 7–14), sub-group four (items 15–17), and sub-group five (items 18–21).

The descriptive and reliability analyses were conducted in IBM SPSS Statistics, version 27 [23]. The significance level was set at 0.05.

2.4 Ethical Approval

The study was conducted in accordance with the Helsinki Declaration [24] and Danish legislation; questionnaires and qualitative studies do not require ethical approval since they are based on written consent [25]. Likewise, it was not required to have an approval from a data protection officer. Each participant received time for deliberation before giving informed written consent to participate in the study. The data analysis was executed anonymously. The AGREE checklist was followed.

3 RESULTS

Basic information on the participants		
Number of participants	34	
Male (sex)	18	53%
Age (y)	50.4 (± 13.5)	
Living situation		
In the city (defined as > 20,000 inhabitants)	21	62%
In rural area	13	38%
Civil status		
Married or living with a partner	28	82%
Living alone	6	18%
Level of employment		
Full-time employment	15	44%
Less than 37 hours per week	5	15%
No job (including those who have retired)	14	41%
Level of education		
9th or 10th grade or less (some only completed 7th grade)	2	6%
High school	5	15%
Higher education	12	35%
Skilled worker (trade, industry, office, etc.)	15	44%
Comorbidities		
Comorbidities (yes)	14	41%

Comorbidities (no)	11	32%
Comorbidities (not answered)	9	26%

Table 2: Basic demographics of the 34 participants in the study.

From table 2 an overview of the demographic information of the participants included in the study is given. The average age of the participants was 50.4 (SD: 13.5), and most of the participants (62%) lived in the city (defined as > 20,000 inhabitants).

Diagnose/reason why the participant received the telemedicine service		
Type 1 diabetes	17	50%
Type 2 diabetes	4	11.8%
Type 1.5 diabetes	2	5.9%
Screening for diabetes	2	5.9%
Follow up on a knee operation	1	2.9%
Dercum's disease	1	2.9%
Follow up after a Gastric bypass operation	3	8.8%
Struma diffusa	1	2.9%
Physical outpatient clinic visit changed to a telemedicine consultation	3	8.8%

Table 3: Overview of the different reasons or diagnosis of why the participants received the telemedicine service.

Table 3 generates an overview of the diagnoses or reasons why the participants received a telemedicine service. Half of the participants (50%) received the telemedicine service in relation to their type 1 diabetes, while 11.8% received the telemedicine service due to type 2 diabetes. The rest of the reasons why the participants received the telemedicine service were either related to comorbidities or related to organizational changes implemented to meet the COVID-19 restrictions.

3.1 The Distribution of Answers

Overall, the Danish TUQ consisted of 21 items, as did the original TUQ [19]. Table 4 gives an overview of the accumulated distribution of answers related to each item (Item 1 to Item 21) given by the 34 participants included in the study. Response category 7 was most used (48.2%), followed by response category 6 (18.8%). Response category 2 was the least used (1.6%), followed by response category 3 (2.0%). Regarding item 20, 30 out of 34 participants answered using response category 7. Item nos. 16 and 17 were considered not relevant by 29 of the 34 participants.

No.	Response category							
	1	2	3	4	5	6	7	N/A
1	2	0	1	4	8	11	7	1
2	1	0	0	0	2	5	26	0
3	3	2	2	7	9	2	9	0
4	1	0	1	2	1	6	22	1
5	1	0	0	4	1	8	20	0
6	0	1	0	2	1	11	15	4
7	1	1	0	0	3	7	22	0
8	1	1	0	4	7	7	14	0
9	2	0	0	1	1	10	19	1
10	2	0	3	3	4	6	15	1
11	2	0	1	1	0	7	22	1
12	0	0	1	1	4	4	21	2
13	2	0	0	1	3	7	20	0
14	3	2	2	0	9	5	11	2
15	4	1	3	4	8	6	6	2
16	0	1	0	0	1	1	2	29
17	1	2	0	0	0	1	1	29
18	1	0	0	0	6	4	22	1
19	1	0	0	3	2	12	16	0
20	1	0	0	1	0	2	30	0
21	1	0	0	1	0	11	21	0
Total	30	11	14	39	68	133	341	72

Table 4: The accumulated distribution of responses related to each item, including the response categories: 1,2,3,4,5,6,7 or not relevant (N/A) given by the 34 participants. The number of times a response category was used is visualized by colour ranging from green to red. Green indicates the lowest number of times a value was given, while red indicates the highest number of times a value was given.

3.2 Internal Consistency

The overall internal consistency of the Danish TUQ was measured as a Cronbach's alpha of 0.857. Table 5 gives an overview of the internal consistency for each of the five sub-groups that the original TUQ was divided into [19]. The *Reliability* group (items 15–17) showed the lowest Cronbach's alpha value (0.241), while the *Satisfaction and future use* group (items 18–21) showed the highest Cronbach's alpha value (0.857).

No.	Name	Items	Cronbach's alpha value
1	Usefulness	1–3	0.579
2	Ease of use & learnability	4–9	0.759
3	Effectiveness	10–14	0.795
4	Reliability	15–17	0.241
5	Satisfaction and future use	18–21	0.857

Table 5: Overview of the internal consistency for the five subgroups within the Danish TUQ.

4 DISCUSSION

The aim of this study was to translate the original Telehealth Usability Questionnaire by Parmanto et al. [19] into Danish and cross-culturally validate the translation by pre-testing it and using a sample of Danish patients with diabetes who had received a telemedicine service within the last two months. The Danish TUQ was pretested on 34 participants with diabetes to ensure reliability, which is in accordance with Beaton et al. [20]. The overall internal

consistency of the Danish TUQ was found to be satisfactory (Cronbach's alpha: 0.857) [26].

The present study mirrors similar translation studies. A very similar study to this is a translational validation study by Vidal-Alaball et al., which included 33 participants. That translation showed a similar Cronbach's alpha of 0.84 in a Catalan version of the Health Optimum Telemedicine Acceptance Questionnaire [1]. In addition, Micoulaud-Franchi et al. aimed to translate and validate a French version of a six-item self-reported questionnaire that evaluates the extent to which patients find e-health systems acceptable [27]. According to the authors, their validation process revealed a satisfactory level of acceptance (i.e., a Cronbach's alpha of 0.7) [27]. When Parmanto et al. developed and tested the TUQ, they found that the Cronbach's alpha value was 0.8 [19], which is in line with the findings of the present study. Finally, in a systematic review by Weaver et al., a list of available telehealth survey instruments was examined with appertaining calculated Cronbach's alphas [16]. From their systematic assessment, Weaver et al. identified twelve telehealth communication assessment instruments and their corresponding Cronbach's alpha values, which ranged from 0.7 to 0.93. This systematic review, including the studies by Vidal-Alaball et al. and Micoulaud-Franchi et al., confirms the trend that a Cronbach's alpha value between 0.7 to 0.9 is generally considered acceptable [22]. Thus, the measured Cronbach's alpha in this study is in line with the trend.

4.1 The internal consistency

When comparing the Cronbach's alpha for each of the five sub-groups within the Danish TUQ with the same five sub-groups within the original TUQ, the values are closely related, with only a few deviations. Three out of the five sub-groups were almost identical (e.g., sub-group two: original = 0.92, Danish = 0.759; sub-group three: original = 0.86, Danish = 0.795; and sub-group five: original = 0.91, Danish = 0.857). The remaining two sub-groups deviated much from each other (sub-group one: original = 0.83, Danish = 0.579; sub-group four: original = 0.79, Danish = 0.241). There could be several explanations for the deviations seen within the two sub-groups. However, the most reasonable explanation is probably that the number of participants included in the studies has an important influence on Cronbach's alpha. In the study by Parmanto et al., 53 participants were included [19], whereas only 34 participants were included in the present study. The low Cronbach's alpha in sub-group four could be explained by the fact that 29 of the participants responded Not relevant to two of three items in this specific sub-group. These items concern potential issues regarding the specific telehealth system, and the responses indicate that the participants did not experience any issues when using the telehealth system.

4.2 Reduction in the number of questions

When looking at the accumulated distribution of answers related to each item (Table 4), the participants used response category 7 most often. This might indicate that the participants were very satisfied with the telemedicine service they received and/or that they understood the item without problems. When it comes to items 16 and 17, the participants used the response category Not relevant the most. This may indicate that there were no problems with the system; however, it may also indicate that the translation was insufficient. When going through each of the items and the appertaining given response categories with the participants during the interviews, it appears that the participants clearly understood these items. Thus, there might be an indication of a need for a reduction in the number of questions.

To our knowledge, this study is the first initiative conducted where the original TUQ has been translated into Danish or any other Scandinavian language. A limitation of the study is that only 34 participants were included. Even though Beaton et al. argue that 30 to 40 participants is an ideal number to test on, it may have had an impact on the calculated Cronbach's alpha in this study compared to the original study where 53 participants were included [19] or other studies with several participants included [28]. Thus, it could be relevant to test the Danish TUQ on a larger scale. Moreover, telemedicine includes various technologies, users, and organizational setups [6–10]. A highly relevant next step would be to validate the Danish TUQ on different telemedicine solutions with other types of users to ensure the applicability of the Danish TUQ to all available telemedicine solutions.

4.3 Developing in a Danish context

Another limitation of the study is related to the cross-cultural differences in the healthcare sector (i.e., the context where the original TUQ was developed differed from the context where the Danish TUQ was implemented). However, this study followed the cross-cultural adaptation process prescribed by Beaton et al. [20], and these concerns should, therefore, be minimal. Finally, the study was limited by the fact that the included participants were not a representative sample of people with diabetes compared to the future users of the Danish TUQ. However, when observing the basic demographics in Table 2 and Table 3, it is evident that they represent the typical patient with diabetes in accordance with the characteristics given by the World Health Organization and several other studies describing the typical characteristics of people with diabetes [29–33].

4.4 Conclusion

A translation and cross-cultural adaptation of the original TUQ was performed into Danish. The study demonstrates an overall accepted statistical internal consistency compared with the original TUQ, which makes it a reliable tool to assess patients' perceptions after using a telemedicine service. Future work could include testing the TUQ on other groups of patients since the Danish TUQ was only pre-tested on patients with diabetes. Furthermore, it has become evident that telemedicine services will be a more integrated part of receiving healthcare services in the aftermath of the COVID-19 pandemic.

5 SUMMARY

The original TUQ was translated and cross-culturally adapted into Danish. The study demonstrates an overall accepted statistical internal consistency compared with the original TUQ, which makes it a reliable tool to assess patients' perception of telemedicine after receiving a telemedicine service.

6 REFERENCES

[1] Vidal-Alaball J, Mateo GF, Domingo JLG, Gomez XM, Valmaña GS, Ruiz-Comellas A, et al. Validation of a short questionnaire to assess healthcare professionals' perceptions of asynchronous telemedicine services: The Catalan version of the health optimum telemedicine acceptance questionnaire. Int J Environ Res Public Health 2020;17:2–11. https://doi.org/10.3390/ijerph17072202

[2] Beard M, Orlando JF, Kumar S. Overcoming the tyranny of distance: An audit of process and outcomes from a pilot telehealth spinal assessment clinic. J Telemed Telecare 2017;23:733–9. https://doi.org/10.1177/1357633X16664851

[3] Westra I, Niessen FB. Implementing real-time video consultation in plastic surgery. Aesthetic Plast Surg 2015;39:783–90. https://doi.org/10.1007/s00266-015-0526-4

[4] Nakagawa K, Umazume T, Mayama M, Chiba K, Saito Y, Kawaguchi S, et al. Feasibility and safety of urgently initiated maternal telemedicine in response to the spread of COVID-19: A 1-month report. J Obstet Gynaecol Res 2020;46:1967–71. https://doi.org/10.1111/jog.14378

[5] Morland LA, Poizner JM, Williams KE, Masino TT, Thorp SR. Home-based clinical video teleconferencing care: Clinical considerations and future directions. Int Rev Psychiatry 2015;27:504–12. https://doi.org/10.3109/09540261.2015.1082986

[6] Hanlon P, Daines L, Campbell C, Mckinstry B, Weller D, Pinnock H. Telehealth interventions to support self-management of long-term conditions: A systematic metareview of diabetes, heart failure, asthma, chronic obstructive pulmonary disease, and cancer. J Med Internet Res 2017;19. https://doi.org/10.2196/jmir.6688

[7] Wootton R. Twenty years of telemedicine in chronic disease management - an evidence synthesis. J Telemed Telecare 2012;18:211–20. https://doi.org/10.1258/jtt.2012.120219

[8] Faruque LI, Wiebe N, Ehteshami-Afshar A, Liu Y, Dianati-Maleki N, Hemmelgarn BR, et al. Effect of telemedicine on glycated hemoglobin in diabetes: A systematic review and meta-analysis of randomized trials. Cmaj 2017;189:E341–64. https://doi.org/10.1503/cmaj.150885

[9] Mclean S, Nurmatov U, Jly L, Pagliari C, Car J, Sheikh A, et al. Telehealthcare for chronic obstructive pulmonary disease: Cochrane review and meta-analysis. Br J Gen Pract 2012;62:e739–49. https://doi.org/10.3399/bjgp12X658269

[10] Sirintrapun SJ, Lopez AM. Telemedicine in cancer care. Am Soc Clin Oncol Educ B 2018:540–5. https://doi.org/10.1200/edbk_200141

[11] Ekeland AG, Bowes A, Flottorp S. Methodologies for assessing telemedicine: A systematic review of reviews. Int J Med Inform 2012;81:1–11. https://doi.org/10.1016/j.ijmedinf.2011.10.009

[12] Langbecker D, Caffery LJ, Gillespie N, Smith AC. Using survey methods in telehealth research: A practical guide. J Telemed Telecare 2017;23:770–9. https://doi.org/10.1177/1357633X17721814

[13] Mann DM, Chen J, Chunara R, Testa PA, Nov O. COVID-19 transforms health care through telemedicine: Evidence from the field. J Am Med Inform Assoc 2020;27:1132–5. https://doi.org/10.1093/jamia/ocaa072

[14. Valentino LA, Skinner MW, Pipe SW. The role of telemedicine in the delivery of health care in the COVID-19 pandemic. Haemophilia 2020;26:e230–1. https://doi.org/10.1111/hae.14044

[15] Layfield E, Triantafillou V, Prasad A, Deng J, Shanti RM, Newman JG, et al. Telemedicine for head and neck ambulatory visits during COVID-19: Evaluating usability and patient satisfaction. Head Neck 2020;42:1681–9. https://doi.org/10.1002/hed.26285

[16] Weaver MS, Lukowski J, Wichman B, Navaneethan H, Fisher AL, Neumann ML. Human connection and technology connectivity: A systematic review of available telehealth survey instruments. J Pain Symptom Manage 2020. https://doi.org/10.1016/j.jpainsymman.2020.10.010

[17] Ohannessian R, Duong TA, Odone A. Global telemedicine implementation and integration within health systems to fight the COVID-19 pandemic: A call to action. JMIR Public Heal Surveill 2020;6. https://doi.org/10.2196/18810

[18] Gohari SH, Bahaadinbeigy K. The most used questionnaires for evaluating telemedicine services 2021:1–11

[19] Parmanto B, Lewis, Jr. AN, Graham KM, Bertolet MH. Development of the Telehealth Usability Questionnaire (TUQ). Int J Telerehabilitation 2016;8:3–10. https://doi.org/10.5195/ijt.2016.6196

[20] Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine (Phila Pa 1976) 2000;25:3186–91. https://doi.org/10.1097/00007632-200012150-00014

[21] Mogensen CE, Standl E. Prevention and Treatment of Diabetes Late Complications. De Gruyter, Inc.; 2010

[22] de Vet HCW, Terwee CB, Mokkink LB, Knol DL. Measurement in Medicine. Cambridge University Press; 2011. https://doi.org/10.1017/CBO9780511996214

[23] IBM. IBM Corp. Released 2020. IBM Statistics for Windows, version 27.0. Armonk 2020

[24] Medical Association W. WMA DECLARATION OF HELSINKI – ETHICAL PRINCIPLES FOR MEDICAL RESEARCH INVOLVING HUMAN SUBJECTS 2020. https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/

[25] Ministry of Health SÆ. Bekendtgørelse af lov om videnskabsetisk behandling af sundhedsvidenskabelige forskningsprojekter 2017. https://www.retsinformation.dk/eli/lta/2017/1083

[26] Bland JM, Altman DG, Bland JM. Statistics Notes : The Odds Ratio linked references are available on JSTOR for this article : Statistics Notes The odds ratio. Br Med J 1997;314:572

[27] Micoulaud-Franchi JA, Sauteraud A, Olive J, Sagaspe P, Bioulac S, Philip P. Validation of the French version of the Acceptability E-scale (AES) for mental E-health systems. Psychiatry Res 2016;237:196–200. https://doi.org/10.1016/j.psychres.2016.01.043

[28] Argimon-Palls JM, Flores-Mateo G, Jiménez-Villa J, Pujol-Ribera E. Psychometric properties of a test in evidence based practice: The Spanish version of the Fresno test. BMC Med Educ 2010;10. https://doi.org/10.1186/1472-6920-10-45

[29] Okwechime IO, Roberson S, Odoi A. Prevalence and predictors of pre-diabetes and diabetes among adults 18 years or older in Florida: A multinomial logistic modeling approach. PLoS One 2015;10:1–17. https://doi.org/10.1371/journal.pone.0145781

[30] Gucciardi E, Wang SCT, DeMelo M, Amaral L, Stewart DE. Characteristics of men and women with diabetes: Observations during patients' initial visit to a diabetes education centre. Can Fam Physician 2008;54:219–27

[31] Turi KN, Buchner DM, Grigsby-Toussaint DS. Predicting risk of type 2 diabetes by using data on easy-to-measure risk factors. Prev Chronic Dis 2017;14:E23–E23. https://doi.org/10.5888/pcd14.160244

[32] World Health Organization T. Diabetes 2020. https://www.who.int/health-topics/diabetes#tab=tab_1

[33] Khunkaew S, Fernandez R, Sim J. Demographic and clinical predictors of health-related quality of life among people with type 2 diabetes mellitus living in northern Thailand: A cross-sectional study. Health Qual Life Outcomes 2019;17:1–9. https://doi.org/10.1186/s12955-019-1246-2

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