An Internet Health Care Acceptability Assessment Tool for Adolescents with Chronic Disease: Translation and Validation Study

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Abstract

Background: Adolescents with chronic conditions encounter difficulties transitioning to adult health systems, particularly in terms of self-managing their symptoms and supporting physical and psychological development. Internet health care can provide disease-specific information, tools, and support, aiding adolescents during this transition. However, scales measuring technology acceptability among Chinese adolescents with chronic conditions remain scant.

Objective: To develop the Chinese version of Service User Technology Acceptability Questionnaire (C-SUTAQ) and evaluate its reliability and validity among adolescents with chronic conditions in China.

Methods: We first translated SUTAQ from English into Chinese and then evaluated its reliability and validity. Two translators independently used the Brislin model for translation and back translation. We then assessed the construct validity of C-SUTAQ through exploratory factor analysis and evaluated its reliability based on Cronbach ? and test-retest coefficients.

Results: In total, 277 adolescents with chronic conditions from 9 hospitals in China were recruited. Cronbach ? for the complete C-SUTAQ was 0.898, whereas that for its subscales ranged from 0.869 to 0.912. Moreover, its test-retest reliability coefficients ranged from 0.801 to 0.885. The factor loadings of the 22 items in all 6 subscales ranged from 0.734 to 0.845, and the cumulative variance contribution rate was 77.07%.

Conclusions: C-SUTAQ is reliable and valid, making it a decisive tool for assessing the acceptability of Internet health care for managing chronic conditions among Chinese adolescents.

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Abstract

Background: Adolescents with chronic conditions encounter difficulties transitioning to adult health systems, particularly in terms of self-managing their symptoms and supporting physical and psychological development. Internet health care can provide disease-specific information, tools, and support, aiding adolescents during this transition. However, scales measuring technology acceptability among Chinese adolescents with chronic conditions remain scant.
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Results: In total, 277 adolescents with chronic conditions from 9 hospitals in China were recruited. Cronbach *α* for the complete C-SUTAQ was 0.898, whereas that for its subscales ranged from 0.869 to 0.912. Moreover, its test-retest reliability coefficients ranged from 0.801 to 0.885. The factor loadings of the 22 items in all 6 subscales ranged from 0.734 to 0.845, and the cumulative variance contribution rate was 77.07%.
Conclusions: C-SUTAQ is reliable and valid, making it a decisive tool for assessing the acceptability of Internet health care for managing chronic conditions among Chinese adolescents.

Keywords: adolescents; chronic disease; e-health; acceptability; reliability and validation

Introduction

Adolescents with chronic conditions typically encounter difficulties related to the recurrent progression of their condition and the ongoing treatment. They must also balance major physical and psychological expectations (ie, puberty, schooling activities, and preparation for entering the workforce) [1]. The transition from adolescence to adulthood is a major step in adolescent development. In this stage, adolescents with chronic conditions transfer from parent-supervised pediatric health care to relatively independent, patient-centered adult health care [2]. An improper transition to adult health care services can lead these adolescents to not comply with required treatment, increasing unplanned emergency visits, financial burden, and loss of confidence in managing their condition [3-6]. Furthermore, in most cases, neither adolescents with special health care needs (eg, personalized academic counseling, disease self-management skills, psychological support, local resources, and economic assistance) nor their families receive the preparation and support needed to transition to adult care [7,8]. According to White et al [2], the 2016 National Survey of Children's Health revealed that 83% of youth with special health care needs do not meet the national health care transition performance measure. For instance, they lacked coverage for pediatric-onset conditions or mental health and supportive services. They also encountered difficulties related to the communication, coordination, and transfer of medical records between adult and pediatric clinicians or systems. The policies in both the Healthy China 2030 Planning Outline and China Children's Development Outline (2021-2030) emphasize the establishment of continuous, life-cycle health management and referral services for adolescents [9]. In general, conventional chronic disease management services may not fulfill the needs of adolescents and their families in the current era.

Studies on adolescents with various chronic conditions have reported that Internet health care may allow multilevel transition services to become further streamlined and easier to use [7,10,11]. Internet health care, a crucial self-management modality, provides information and enables interactions among youths with chronic conditions, caregivers, and health professionals [12]. Internet health care tools such as mobile applications (eg, WeChat), text message reminders, and social media provide condition-specific health information, tools, and peer support online to engage youths in managing their health [13-15]. Most current adolescents are considered part of the Internet generation, including individuals who grew up in the widespread Internet and social media usage era. In Pew Research Center's 2018 survey, 45% of adolescents reported that they were online on a near-constant basis, and 95% indicated that they had access to a smartphone [16]. Moreover, in the China Internet Network Information Center's 2023 survey, China had nearly 49 million adolescent netizens, accounting for 49% of all new Chinese netizens, indicating that most new Internet users are adolescents [17]. De Nardi et al reported that adolescents with a chronic condition used the Internet an average of 5 hours a day during healthy periods and that this time increased to 11 hours per day during flare-ups or hospitalizations related to their condition [18]. In another study, although 84% of adolescents used the Internet to access their health information, 25% reported they "get a lot" of health information online [19].

Patient perception is essential for evaluating the utility of Internet health care services. In particular, patient acceptability and satisfaction, indicators commonly used for measuring quality in health care, can indicate the potential success of an Internet health care service [21,22]. Patients may refuse to use Internet health care or fail to continue using relevant devices for various reasons, specifically their perception of the services. Nevertheless, among adolescents, the belief that Internet health care will be useful to them is the strongest predictor of teenagers' interest in using it in the future [20].

Therefore, increasing the willingness to accept Internet health care among adolescents with chronic conditions may allow for the complete streamlining of related services in China. However, although several studies have focused on Internet health care use among adolescents, few have evaluated the acceptability of Internet health care use in adolescents with chronic conditions during the transition from adolescence to adulthood [23,24].

In 2016, Hirani et al investigated technology acceptance based on psychometrics and developed the Service User Technology Acceptability Questionnaire (SUTAQ) to measure telehealth acceptability [25]. This questionnaire was validated in 478 British older individuals with a broad range of chronic conditions. SUTAQ is an instructive tool, which can predict individual differences in beliefs and behavior and allow for between-group discrimination to identify respondents more likely to reject Internet medical services. Thus far, this instrument has been translated and applied to adults with chronic conditions in various countries, including Italy and Norway, with satisfactory reliability and validity [22,26].

The first step in maximizing the benefits of Internet health care for adolescents with chronic conditions is developing an appropriate acceptability assessment tool to assess acceptance and beliefs or expectations affecting the adolescents' user experience. Therefore, in this study, we evaluated the reliability and validity of the Chinese version of SUTAQ (C-SUTAQ) in Chinese adolescents with chronic conditions.

Methods

Study Design

We used a cross-sectional research design to translate the English version of SUTAQ into C-SUTAQ and then tested its reliability and validity in adolescents with chronic disease.

Step 1: Translation and Pilot Testing

We used the Brislin model [27] for the translation process, including forward translation, back translation, cross-cultural adaptation, and pilot testing.

Forward Translation and Synthesis

After obtaining authorization from the original author of SUTAQ, 2 native Chinese translators with a master's degree in nursing independently translated SUTAQ into Chinese. The 2 translators and a medical expert who had studied in the United Kingdom for ≥1 year analyzed and compared the 2 translated versions with the original SUTAQ, discussed, and made modifications to obtain a final forward translation draft, named Version 1.

Back Translation

Next, 2 independent translators back-translated Version 1 into English to obtain Version 2. Both translators were nurses who had lived in the United States for >5 years but had no initial association with SUTAQ.

Expert Discussion and Cross-Cultural Adaptation

A prefinal version of C-SUTAQ was created by an expert committee comprising 3 professors, each specializing in linguistics, medicine, and nursing. Next, the 4 aforementioned translators were invited to discuss and analyze the 2 drafts (Versions 1 and 2) and compare them with the original version.

The cross-cultural comparability and conceptual equivalence between the prefinal version and SUTAQ were assessed to ensure semantic and conceptual consistency between both versions. After a draft of the prefinal version was obtained, the original authors were contacted, and further modifications were made based on their suggestions.

Pilot Testing

A sample of 30 adolescents with a chronic condition were invited to complete C-SUTAQ and provide feedback on the draft. After considering the feedback of the adolescents and researchers, we made modifications to obtain the final version of C-SUTAQ.

Step 2: Reliability and Validity Testing

Participants

To ensure that our study included a minimum number of participants based on the number of items in the instrument, we followed Nunnally's recommendation [28]: a minimum participant ratio of 10 participants per survey item. Because C-SUTAQ had 22, our ideal target sample size was ≥220. Next, we considered that 20% of responses would be invalid. As such, our final target sample size was 264.

As such, we recruited 277 adolescents with chronic disease from 9 tertiary hospitals in Chongqing (southwest China), Hebei (northeast China), Shandong (eastern China), Guangdong (south China), Beijing (northeast China), and Shanghai (southeast China) from the beginning of December 2023 until the end of May 2024. The inclusion criteria were being aged 10 to 19 years, having a diagnosis of at least one chronic disease (eg, chronic kidney disease, asthma, epilepsy, leukemia, immunodeficiency, and cancer), and being able to read and converse in Chinese. The exclusion criteria were having a cognitive impairment determined by a medical doctor, being critically ill, or not being able to read and converse in Chinese.

Questionnaire

Sample Characteristics

The included adolescents were asked to provide information regarding their sex, age, educational level, chronic condition diagnosis, time since diagnosis, illness duration, and Internet health care service use-related information.

C-SUTAQ

Our final version of C-SUTAQ contained 22 items assessing the Internet health care technical acceptance among patients with chronic conditions. The 22 items were distributed among 6 subscales: *enhanced care*, *increased accessibility*, *privacy and discomfort*, *care personnel concern*, *telecare as a substitution*, and *satisfaction*. Each item was rated on a 6-point Likert-type agreement scale, with 1 representing "strongly disagree" and 6 representing "strongly agree". For each subscale, the scores were calculated as the means of the scores for each item. The subscales *privacy and discomfort* and *care personnel concerns* were inverted, whereby a higher score indicated a more negative perception. In contrast, for the remaining 4 subscales, a higher score indicated a more positive perception.

System Usability Scale

We also applied the system usability scale (SUS), compiled by Jhon Brook et al in 1986 [29], as a convergent validity tool. The scale includes 2 dimensions and 10 items, rated on a 5-point Likert-type scoring system, with 1 representing "strongly disagree" and 5 representing "strongly agree."

The higher the scores, the better the usability of the application. The SUS, with a Cronbach α of 0.92, has been widely used in medical apps.

Ethics Considerations

This study was approved by the Human Ethics Committee of the Children's Hospital of China Chongqing Medical University (Ref No. 20231105). Our study was performed simultaneously in 9 hospitals. At each hospital, we explained the purpose and shared an electronic informed consent form and study flow with the heads of relevant departments before study initiation. Only patients and their families who agreed to participate by completing the electronic informed consent form were included in the study.

Data Collection

After obtaining informed consent from patients and their families, we performed the reliability and validation testing on C-SUTAQ by using a web-based WeChat form, the link for which was sent to each participant by trained research assistants. For the items that the participants did not understand, the assistants provided an explanation and assistance. All questionnaires were collected at admission. To assess the test-retest reliability, we readministered C-SUTAQ to 20 randomly selected participants after 14 days of the initial survey. All questionnaire data were stored under password protection. We cleaned all collected data to remove items with response times of <120 seconds, consistent choices, or obvious regularities. Of all 286 distributed questionnaires, 277 were returned, with an effective response rate of 96.85%.

Item Analysis and Reliability and Validity Testing

Next, we subjected C-SUTAQ to item analysis, validity testing, and reliability testing.
In particular, the critical ratio (CR) method and correlative coefficients were used for item analysis, content and construct validity analysis to test validity, and internal consistency and test-retest coefficients to determine reliability.

We first used the t-test to calculate the CR value of each item divided into 2 subgroups according to its scores from high to low (bounded by 27% and 73% quantiles). The CR was deemed satisfactory when $P < .05$ [30]. Next, we performed Pearson correlation analysis and considered an item with a correlation coefficient (r) with the entire questionnaire of ≥0.4 satisfactory [30].

To determine content validity, we evaluated the relevancy of the items in each domain and the clarity of the translated item. Three experts with more than 5 years of experience in nursing informatics, information engineering, or nursing management and holding titles of deputy or above were invited to score the entire questionnaire and each item for relevance, clarity, and cultural adaptability. The scoring was performed on a 4-point Likert scale, with 1 denoting "strongly disagree" and 4 denoting "strongly agree." One expert was located in. Three experts Content validity was established based on the item-level content validity index (I-CVI) and overall-scale content validity index (S-CVI). Next, the number of experts in agreement was divided by the total number of experts. I-CVI > 0.780 and S-CVI > 0.9 were considered to indicate an item was relevant to the domain, as well as clear and comprehensible to the target users [30].

To determine construct validity, we performed exploratory factor analysis (EFA) through principal component analysis with varimax rotation to obtain the factor structure. The Kaiser-Meyer-Olkin

(KMO) measure and Bartlett sphericity were calculated to assess the sampling adequacy before the EFA. Factors with KMO > 0.8 and significant Bartlett sphericity ($P < .05$) were considered qualified. The factor loadings of each item were >0.40, and the cumulative variance contribution rate was > 50%, indicating good structural validity [30].

Because an external gold standard scale for determining concurrent validity is unavailable, we compared the correlation between the mean C-SUTAQ scores and the SUS scale scores by using Pearson coefficient analysis. An r of 0.40 to 0.80 was considered to represent acceptability[30].

To assess reliability, we analyzed the internal consistency of the total and subscale scores of C-SUTAQ by using Cronbach α. Internal consistency was deemed acceptable when $\alpha \geq 0.80$. According to the American Association of Pediatric Nurses, adolescence can be divided into 3 stages: early (11-16 y), middle (16-18 y), and late (≥18 y) [31]. We analyzed the reliability of the questionnaire among individuals at different stages of adolescence and noted that the test-retest reliability was satisfactory with $r \geq 0.70$ [30].

Statistical Analysis

All statistical analyses were performed on SPSS (version 23.0; IBM, Armonk, NY, USA) and AMOS (version 25.0; IBM). Descriptive statistics was used to analyze the participants' demographic characteristics. Reliability and validity were analyzed using factors such as CR, Pearson r, EFA, Cronbach α, and test-retest coefficient. Two-sided $P < .05$ was considered to indicate statistical significance.

Results

Demographic Characteristics

In total, 277 patients completed C-SUTAQ. The participant age ranged from 11 to 19 years (mean = 15.71 y, standard deviation [SD] = 2.80 y); 48.7% (n = 135) of the participants were male, whereas 51.3% (n = 142) were female. Moreover, 52.3% (n = 145) and 47.7% (n = 132) of the participants were junior middle school and senior high school, respectively. The participants had one of the following primary diseases: leukemia (n = 30, 10.8%), epilepsy (n = 28, 10.1%), asthma (n = 25, 9.0%), diabetes (n = 40, 14.4%), heart disease (n = 28, 10.1%), obesity (n = 33, 11.9%), immunodeficiency (n = 35, 12.6%), cancer (n = 32, 11.6%), and other (n = 26, 9.4%). Most (55.9%) patients had comorbidities, and the mean illness duration was 2.52 years (SD = 1.13 y). Their families resided in urban (n = 132, 47.7%) and rural (n = 145, 52.3%) areas. Finally, most participants (69.3%) previously used Internet health care services, and the average frequency of using these services was 2.45 (SD = 1.14).

Cross-cultural Adaptation and Pilot Test Result

All items in the original SUTAQ were retained in C-SUTAQ, except *the kit* referring to *the Telehealth and/or TeleCare equipment*, which was replaced with *Internet health care*. The main modifications were as follows:

(1) Because China lacks social care similar to that in the UK health care system, the phrase "social care" was replaced with care."
(2) The phrase "visit my General Practitioner (GP) clinic or other health/social care professional as often" in item 1 was translated as "go to the hospital outpatient clinic to see my doctor or

go to other health facilities (eg, health centers, community, etc.)" to suit the Chinese health care environment.

(3) The phrase "my health" in item 11 was translated as "my health management" for clarity.

(4) The phrases "better monitor me and my condition" in item 13 and "my personal health/social care history" in item 21 were amended to "better monitor my condition" and "my personal health history" according to the Chinese native expression, respectively.

(5) The phrase "people looking after me" in items 13 and 18 was changed to "health care professionals" to be consistent with the health care situation.

Item Analysis

The total score of C-SUTAQ was 3.464 (SD = 0.734), and the subscale scores of *enhanced care*, *increased accessibility*, *privacy and discomfort*, *care personnel concern*, *telecare as a substitution*, and *satisfaction* were 3.353 (SD = 1.022), 3.456 (SD = 0.966), 3.425 (SD = 1.033), 3.448 (SD = 1.029), 3.595 (SD = 1.039), 3.587 (SD = 1.055), respectively. Table 1 presented the item analysis results; the CRs were acceptable, and the r values were satisfactory (range, 0.569-0.738). These results suggested that C-SUTAQ has good discriminatory ability and representativeness.

Table 1. Item analysis for the C-SUTAQ (n=277)

Items	Item scores Mean (SD)	CR value	*r* value
1.The Internet healthcare has saved me time, as I did not have to frequently visit the hospital outpatient clinic or other health facilities (eg. health centers, community health centers, etc.).	3.42(1.144)	44.871	0.634***
2.The Internet healthcare has interfered with my daily routine.	3.08(1.172)	28.413	0.643***
3.The Internet healthcare has increased my access to healthcare provided by healthcare professionals.	3.18(1.117)	30.175	0.638***
4.The Internet healthcare has helped me to improve my health.	3.67(1.132)	29.135	0.641***
5.The Internet healthcare has invaded my privacy.	3.25(1.185)	32.922	0.594***
6.The Internet healthcare is explained to me sufficiently.	3.72(1.122)	33.378	0.602***
7.The Internet healthcare can be trusted to work appropriately.	3.59(1.153)	29.324	0.575***
8.The Internet healthcare has made me feel uncomfortable, e.g., physically or emotionally.	3.76(1.155)	32.188	0.627***
9.I am concerned about the level of expertise of the those who monitor my status through the Internet healthcare.	3.32(1.145)	32.178	0.569***
10.The Internet healthcare has reduced my concerns about my healthcare.	3.19(1.174)	32.344	0.696***
11.The Internet healthcare has made me more actively involved in my health management.	3.07(1.217)	31.228	0.715***
12.The Internet healthcare makes me worry about my personal information being leaked.	3.48(1.128)	31.857	0.593***
13.The Internet healthcare allows the healthcare professionals to better monitor my condition.	3.58(1.157)	30.823	0.696***
14.I am satisfied with this Internet healthcare.	3.47(1.226)	29.462	0.610***
15.The Internet healthcare can be/should be recommended to people in a similar condition to mine.	3.32(1.165)	30.811	0.671***
16.The Internet healthcare can be a replacement for my regular healthcare.	3.67(1.220)	30.078	0.637***
17.The Internet healthcare is a good addition to my regular healthcare.	3.58(1.200)	32.386	0.738***
18.The Internet healthcare is not as suitable as regular face-to-face consultations with healthcare professionals.	3.53(1.190)	26.698	0.694***
19.The Internet healthcare makes it easier for me to get in	3.56(1.094)	31.453	0.607***

touch with healthcare professionals.			
20.The Internet healthcare interferes with the continuity of the care, e.g., I cannot contact the same healthcare providers each time.	3.56(1.149)	30.621	0.622***
21.I am concerned that the health care professionals who monitors my health do not know my personal health history.	3.47(1.169)	32.699	0.606***
22.The Internet healthcare has made me less concerned about my health status.	3.74(1.134)	27.398	0.644***

Note: ***P□0.001

Validity Results

Content and Concurrent Validity

After Delphi expert consultation, I-CVI ranged from 0.875 to 1.000, and the S-CVI was 0.938. Moreover, the total scores of C-SUTAQ and SUS were significantly correlated (r = 0.440), indicating the presence of concurrent validity.

Construct Validity

In the EFA of C-SUTAQ, KMO was 0.922, and Bartlett sphericity was significant (χ^2 = 3871.298 and $P < .001$), indicating data fitness. In the principal components analysis with varimax rotation, we extracted 6 common factors, which were the same as those in the original SUTAQ. All 22 items met the retention criteria, with factor loading coefficients ranging from 0.734 to 0.845. The details were show in Table 2.

Reliability Results

The Cronbach α was 0.898 for the total C-SUTAQ and ranged from 0.869 to 0.912 for the subscales, indicating good internal consistency. Moreover, the Cronbach α for C-SUTAQ was 0.934, 0.930, and 0.926 among early-, middle-, and late-stage adolescents, respectively—all confirming good internal consistency. In the test-retest reliability analysis, the r values for all subscales ranged from 0.801 to 0.885, indicating satisfactory reliability.

Table 2. Factor loadings of C-SUTAQ items (n=277)

Items	Enhanced care	Increased accessibility	Privacy and discomfort	Care personnel concern	Telecare as a substitution	Satisfaction
The Internet healthcare is a good addition to my regular health care.	**0.734**	0.258	0.196	0.138	0.184	0.168
The Internet healthcare can be/should be recommended to people in a similar condition to mine.	**0.805**	0.116	0.172	0.190	0.091	0.113
The Internet healthcare has reduced my concerns about my healthcare.	**0.768**	0.156	0.196	0.180	0.105	0.158
The Internet healthcare has made me more actively involved in my health management.	**0.811**	0.159	0.160	0.116	0.193	0.165
The Internet healthcare allows the healthcare professionals to better monitor my condition.	**0.788**	0.166	0.228	0.104	0.134	0.126
The Internet healthcare has saved me time, as I did not have to frequently visit the hospital outpatient clinic or other health facilities (eg. health centers, community health centers, etc.).	0.170	**0.783**	0.139	0.175	0.144	0.116
The Internet healthcare has increased my access to healthcare provided by healthcare professionals.	0.181	**0.820**	0.129	0.174	0.126	0.100
The Internet healthcare has helped me to improve my health.	0.187	**0.787**	0.080	0.180	0.138	0.180
The Internet healthcare makes it easier for me to contact healthcare professionals.	0.159	**0.803**	0.155	0.054	0.150	0.125
The Internet healthcare has made me feel uncomfortable, e.g., physically or emotionally.	0.231	0.135	**0.807**	0.056	0.092	0.158
The Internet healthcare has invaded my privacy.	0.156	0.102	**0.829**	0.087	0.085	0.159
The Internet healthcare has interfered my daily routine.	0.217	0.143	**0.824**	0.118	0.109	0.117
The Internet healthcare makes me worry about personal information leaks.	0.181	0.114	**0.791**	0.105	0.099	0.122
I am concerned that the health care professionals monitoring my health do not know my health history.	0.177	0.166	0.094	**0.826**	0.140	0.181
The Internet healthcare interferes with the continuity of the care, e.g., I cannot contact the same healthcare providers each time.	0.167	0.236	0.181	**0.816**	0.117	0.089
I am concerned about the expertise of those monitoring my status through	0.209	0.126	0.067	**0.837**	0.106	0.133

the Internet healthcare.						
The Internet healthcare can be explained to me sufficiently.	0.187	0.175	0.080	0.133	**0.807**	0.183
The Internet healthcare can be trusted to work appropriately.	0.150	0.144	0.148	0.098	**0.845**	0.112
I am satisfied with this Internet healthcare.	0.182	0.182	0.117	0.127	**0.832**	0.139
The Internet healthcare is not as suitable as regular face-to-face consultations with healthcare professionals.	0.203	0.184	0.247	0.178	0.161	**0.795**
The Internet healthcare can replace my regular healthcare.	0.232	0.173	0.154	0.075	0.148	**0.825**
The Internet healthcare has made me less concerned about my health status.	0.161	0.150	0.178	0.195	0.166	**0.814**

Note: Bold numbers indicate the factor loading 0.40. The standard for factor extraction regarding item loading on a factor was 0 .40.

C-SUTAQ Scores at Different Adolescence Stages

As presented in Table 3, the mean C-SUTAQ total and subscale scores differed significantly among different participant age groups ($P < .01$).

Table 3. The C-SUTAQ scores of different age group (n=277, Mean (SD))

Groups	N	Enhanced care	Increased accessibility	Privacy and discomfort	Care personnel concern	Telecare as a substitution	Satisfaction	Total scores
Early adolescents	106	3.001(0.955)	3.175(0.944)	3.238(0.977)	3.123(0.978)	3.421(0.963)	3.359(0.942)	3.199(0.644)
Later adolescents	80	3.398(1.016)	3.591(0.857)	3.448(0.990)	3.475(0.908)	3.564(1.045)	3.642(1.055)	3.530(0.717)
Early adult	91	3.719(0.976)	3.665(1.012)	3.621(1.105)	3.802(1.076)	3.780(1.138)	3.828(1.085)	3.714(0.779)
F		13.088	7.763	3.441	11.525	3.228	5.267	13.275
p		0.000	0.001	0.033	0.000	0.041	0.006	0.000

Note: Early adolescents: □16 years old; Later adolescents:16-□18 years old; Early adult: ≥18 years old.

Discussion

Patient attitude and perception are major factors driving effective implementation of any health care service [18]. To assess the acceptability of Internet health care in Chinese adolescents with chronic conditions during the adolescence-to-adulthood transition, we created C-SUTAQ and tested its validity according to the standard procedure after receiving approval from the developer of the original scale. Our findings indicated that C-SUTAQ was valid and reliable for evaluating the acceptability of Internet health care among Chinese adolescents with chronic conditions.

Practicality of C-SUTAQ

During our thorough cross-cultural translation process, the item required only a few revisions, mostly related to syntax, substituting words without exact meaning in Chinese, and adjusting for the health care environment in China. For instance, we replaced *the kit* referring to *Telehealth and/or TeleCare equipment* with *Internet health care*, and the phrase “my health” in item 11 was interpreted as “my health management” for improved clarity. After receiving positive feedback from cognitive interviews and final approval from the original developer of SUTAQ, we determined that C-SUTAQ was effectively adapted to the Chinese context and was conceptually equivalent to the original questionnaire.

Scientific Applicability of C-SUTAQ

In this study, content validity testing of C-SUTAQ revealed consistency between adolescents’ understanding of the items and the designer’s expectations related to inquiring about relevant content. The I-CVI and S-CVI values were higher than the standard values, indicating agreement among the experts and their satisfaction with this scale. EFA revealed that C-SUTAQ’s 6-factor structure (including *enhanced care*, *increased accessibility*, *privacy and discomfort*, *care personnel concern*, *telecare as a substitution*, and *satisfaction*), consistent with the original questionnaire [25], demonstrated adequate construct validity. To ensure that C-SUTAQ was acceptable, specific, and relevant to the target population, we made incremental changes to SUTAQ. The results of concurrent validity testing further demonstrated that C-SUTAQ scores were significantly and positively correlated with those on the well-validated SUS, indicating that the 2 scales partially measured similar constructs.

In reliability testing, C-SUTAQ demonstrated high Cronbach α, as well as high item and total correlation coefficients; therefore, C-SUTAQ has satisfactory internal consistency and item homogeneity, similar to those of the original version. The test-retest reliability testing of each subscale over 2 weeks revealed considerable acceptability, demonstrating that C-SUTAQ outcomes remained stable over time. In contrast, the Italian [22] and Norwegian [26] studies on SUTAQ did not include validation based on test-retest reliability analysis because their sample size was insufficient because of financial and logistic difficulties.

After suitable Sinicization, SUTAQ might apply to patients with chronic conditions in China. Cheng et al [32] were the first to apply SUTAQ in China; the authors tested its reliability and validity in 554 adults with malignancies and reported results similar to the current findings. Thus, the current study may be considered an expansion and continuation of that study.

We also noted that C-SUTAQ had good reliability among adolescents with chronic conditions from different age groups. The mean scores on each subscale, as well as the total scores, significantly increased with age. Therefore, C-SUTAQ can stably reflect the acceptance of Internet health care among adolescents among different age groups. Moreover, perception of the benefits of Internet health care and willingness to use it may be positively associated with their ages; these results corroborate those of Chisolm et.al [20]. Internet health care has several applications, including scheduling remote visits with treating physicians, remote diagnosis of many diseases according to the description of signs and symptoms, remote monitoring of patients with chronic conditions, remote review of laboratory and imaging findings, and teleconsultation [33]. During the transition from adolescence to adulthood, individuals undergo considerable physical and psychological changes; however, adolescents with chronic conditions also encounter difficulties related to comorbidities, prolonged medication, and uncertain onset of symptoms, which impede growth and cognitive development.

Early adolescence is a key stage during the aforementioned transition period. Understanding early adolescents' e-health literacy and medical needs, along with timely assessment of their attitudes toward Internet health care, can improve their beliefs and expectations regarding Internet medicine and further promote their disease self-management abilities.

Limitations

Our study has several limitations. First, although this was a multicenter study conducted at major pediatric hospitals around China, we used convenience sampling to recruit participants. As such, more rigorously designed studies with stratified sampling are warranted to verify our findings and improve the generalizability of C-SUTAQ. Second, we could not perform a criterion validity test because gold standard instruments or objective indicators for Internet health care acceptance in China are lacking. Third,

although we included participants aged 10 to 19 years, we did not include parent-reported responses in the validation of C-SUTAQ. As such, future studies should focus on determining the value of C-SUTAQ among the parents of adolescents with chronic conditions is warranted.

Conclusion

In this study, we developed C-SUTAQ and evaluated its reliability and validity in adolescents with chronic conditions. C-SUTAQ is a short, clinically meaningful, and psychometrically sound scale applicable to research. Clinically, this questionnaire may be used to evaluate the acceptability of Internet health care among adolescents diagnosed as having a chronic condition during the adolescence-to-adulthood transition period.

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Authors' Contributions

YZ, C-JW, and CC conceived and designed the study. YZ and CC analyzed and interpreted the data and wrote the original draft. All authors contributed to reviewing and editing the final manuscript. All authors have read and approved the final manuscript for submission. CC received research funding for the study.

Conflicts of Interest

The authors declare no conflicts of interest.

Multimedia Appendix 1

Original version of SUTAQ.

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Supplementary Files

Multimedia Appendixes

Original version of SUTAQ.
URL: http://asset.jmir.pub/assets/9244f4df7d9b91cc684ba6f268189031.xlsx