BMC Medicine

RESEARCH ARTICLE

Open Access

Patient-reported outcome measures for medication treatment satisfaction: a systematic review of measure development and measurement properties

Mengting Yang[1,2,3,4,5], Puwen Zhang[1,2,3,4,5], Jillian Halladay[6,7], Kun Zou[1,2,3,4], Imti Choonara[8], Xiaorui Ji[9], Shuya Zhang[9], Weiyi Yan[9], Liang Huang[1,2,3,4], Xiaoxi Lu[4,10], Huiqing Wang[11], Yuxin Jiang[12], Xinyu Liu[12], Linan Zeng[1,2,3,4*], Lingli Zhang[1,2,3,4,13*] and Gordon H. Guyatt[14,15]

Abstract

Background Medication Treatment Satisfaction (M-TS) from the patients' perspective is important for comprehensively evaluating the effect of medicines. The extent to which current patient-reported outcome measures (PROMs) for M-TS are valid, reliable, responsive, and interpretable remains unclear. To assess the measurement properties of existing PROMs for M-TS and to highlight research gaps.

Methods Using PubMed, Embase (Ovid), Cochrane library (Ovid), IPA (Ovid), PsycINFO, Patient-Reported Outcome and Quality of Life Questionnaires biomedical databases, and four Chinese databases, we performed a systematic search for studies addressing the development and validation of PROMs for M-TS. Based on the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) guideline, pairs of reviewers independently assessed the measurement properties of the PROMs and rated the quality of evidence on the measurement properties of each PROM. (The Open Science Framework registration: https://doi.org/10.17605/OSF.IO/8S5ZM).

Results This review identified 69 PROMs for M-TS in 114 studies (four generic, 32 disease-specific, and 33 drug-specific) of which 60 were intended for adults. All provided limited or no information regarding interpretability. Most demonstrated appropriate construct validity including convergent validity (39/69) and discriminative or known-groups validity (40/69) (high to moderate quality of evidence). Only a few provided evidence of sufficient content validity (8/69), structural validity (13/69), and internal consistency (11/69). Of 38 PROMs reporting test–retest reliability, results in 24 provided evidence of satisfactory test–retest reliability (18 with high to moderate, 6 with low to very low quality of evidence). Few PROMs reported responsiveness (16/69). Two generic PROMs (Treatment Satisfaction Questionnaire for Medication initial Version 1.4, TSQM-1.4; Treatment Satisfaction with Medicines Questionnaire, SATMED-Q) and one drug-specific PROM (Insulin Treatment Satisfaction Questionnaire, ITSQ) demonstrated both satisfactory validity and reliability.

*Correspondence:
Linan Zeng
LinanZeng@scu.edu.cn
Lingli Zhang
zhanglingli@scu.edu.cn
Full list of author information is available at the end of the article

Conclusions Most existing PROMs for M-TS require further exploration of measurement properties. Reporting guidelines are needed to enhance the reporting quality of the development and validation of PROMs for M-TS.

Keywords Patient-reported outcome measures, Systematic review, Medication treatment satisfaction, COSMIN, Measurement properties

Background

Medication Treatment Satisfaction (M-TS) is a subjective patient-reported outcome (PRO) that evaluates patients' perception of medication-taking process and its associated outcomes [1]. Both the US Food and Drug Administration (FDA) [2] and the European Medicines Agency (EMA) [3] encourage involving patient-reported satisfaction with treatment in drug development and evaluation, with an emphasis placed upon patients' judgment.

M-TS, if captured in a scientifically rigorous way [3, 4], can predict adherence (e.g., by identifying areas where patients are dissatisfied with their medication) [5], inform clinical decision-making (e.g., by allowing health care professionals to select therapies based on patient feedback) [3, 6–8], and influence health care policy (e.g., by guiding reimbursement decision and quality improvement initiatives based on patient-centered outcomes) [3, 6–8]. Patient-reported outcome measures (PROMs) with poor validity, reliability, or responsiveness in the target population may inadequately capture the changes in M-TS [9, 10] resulting in inaccurate estimates of the effect of drugs and misguided clinical decisions [9–11]. With the growing breadth of available PROMs for M-TS [12–15], heterogeneity in outcome reporting has stifled efforts to synthesize findings across trials [16, 17].

Identifying valid, reliable, responsive, and interpretable PROMs for M-TS therefore is crucial for clinical trials and clinical practice [7, 8, 10]. To date, no study has systematically reviewed existing PROMs for M-TS and assessed their measurement properties. Our systematic review aims to identify currently available PROMs for M-TS, to evaluate the measurement properties of these PROMs, to provide evidence for choosing PROM for M-TS, and if any to highlight the research gap regarding the development and validation of PROMs for M-TS.

Methods

We registered this systematic review on the Open Science Framework (https://doi.org/10.17605/OSF.IO/8S5ZM) and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guideline [18] and the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) guideline for systematic reviews of patient-reported outcome measures [19–21]. The COSMIN guideline provides a standardized data abstraction form for characteristics and measurement properties of the included PROMs, and criteria for assessing the measurement properties of PROMs. The reviewers used the COSMIN Risk of Bias checklist to assess the risk of bias of individual studies, and the modified Grading of Recommendations Assessment, Development, and Evaluation (GRADE) to grade the quality of evidence.

The research team formation

We established a multidisciplinary research team, comprising two PROM methodologists, one epidemiology methodologist, three clinicians, three pharmacists, and two pharmacy students, to ensure comprehensive analysis and diverse perspectives in this review.

Literature search and selection

Using PubMed, Embase (Ovid), Cochrane library (Ovid), International Pharmaceutical Abstracts (IPA, Ovid), PsycINFO, Patient-Reported Outcome and Quality of Life Questionnaires biomedical databases (PROQOLID), China National Knowledge Infrastructure (CNKI), Wanfang, Chinese Scientific Journal Database (VIP database), and Chinese Biomedicine Literature Database (CBM) (from inception through 5 December, 2022) and ePROVIDE (https://eprovide.mapi-trust.org/), the reviewers performed a systematic search for literature published in English and Chinese reporting the development (i.e., development study including cognitive interview or other pilot study) and validation (i.e., validation study) of PROMs for M-TS in adults and children with any medical condition (Additional file 1: table S1).

After removing duplicate records, pairs of reviewers (M.Y., X.J., W.Y., and S.Z.) independently screened the titles and subsequent full-text articles, with conflicts handled by a fifth reviewer (L.Z.). For including relevant literature, the reviewers reviewed the references of included articles.

Data extraction

Using a pilot tested data abstraction form, after a calibration exercise, pairs of reviewers (M.Y., X.J., W.Y. and S.Z.) independently extracted data including the characteristics of the individual studies (e.g., study design, country, sample size, study population), the characteristics of the PROMs (e.g., target population, domains, response

options, and copyright based on ePROVIDE), and the measurement properties of the PROMs (i.e., content validity, structural validity, construct validity, criterion validity, cross-cultural validity or measurement invariance, internal consistency, test–retest reliability, measurement error, and responsiveness) and information about interpretability of the PROMs [19, 22].

For the PROM development, we extracted the origin of the construct to be measured reported in the study (e.g., a theory, conceptual framework, or disease model used, or a clear rationale provided to define the construct). Then, after group discussion within our research team, we summarized the concepts, components, and influencing factors of treatment satisfaction into a table.

Assessment of measurement properties

Using the criteria for good measurement properties [19, 20], two reviewers (M.Y. and P.Z.) based on individual studies independently assessed the measurement properties of each PROM as sufficient (+), insufficient (−), or indeterminate (?) (Additional file 1: table S2 [19, 20, 22]). For example, we rated the test–retest reliability of a PROM as sufficient if the intraclass correlation coefficient (ICC) or weighted Kappa ≥ 0.70, as insufficient if < 0.70, or as indeterminate if ICC or weighted Kappa were not reported. Based on all studies relevant to a particular PROM, the reviewers assessed the overall measurement properties of that PROM as sufficient (+), insufficient (−), inconsistent (±), or indeterminate (?) [19, 20]. A third reviewer (L.Z.) resolved any disagreement.

Grading the quality of evidence

Using the COSMIN risk of bias checklist [19, 23], two reviewers (M.Y. and P.Z.) independently assessed the risk of bias (RoB) of individual development and validation study as very good, adequate, doubtful, inadequate quality. For example, we rated RoB of a PROM development study as very good if PROM design (including construct to be measured, origin of the construct, target population, context of use etc.) and cognitive interview study or another pilot test regarding the relevance, comprehensibility, and comprehensiveness of the PROM were clearly described; adequate if assumably appropriate but not clearly described; and doubtful or inadequate if not clearly described. A third reviewer (L.Z.) resolved any disagreement.

Using the modified GRADE approach in COSMIN guideline, the reviewers graded the overall quality of evidence on the measurement properties of a PROM as high, moderate, low, or very low (Additional file 1: table S3 [20–22, 24]) [19, 24]. When a specific measurement property was assessed as indeterminate (e.g., due to lack of reporting), the reviewers did not rate the quality of evidence on that particular measurement property [19, 20].

Results

Literature screening and characteristics of included studies

The search strategy yielded 2813 records, with 114 studies [25–138] included in this review (Fig. 1). Sixty-three studies (55%) pertained to the development and validation of PROMs for M-TS, while the remaining 51 studies (45%) focused on the validation of PROMs (Additional file 1: table S4 [25–138]). The United States accounted for the majority of studies conducted (46, 40%), followed by Spain (16, 14%) and the UK (15, 13%). The median sample sizes of studies that developed and validated the PROMs is 205 (with a range from 13 to 1336) and that of studies that validated the PROMs is 197 (with a range from 10 to 2511).

Characteristics of PROMs for M-TS

The 114 studies [25–138] reported 69 PROMs for M-TS. Sixty PROMs (87%) were intended for adults (Table 1). Most of the PROMs are disease-specific (32, 46%) or drug-specific (33, 48%), while four are generic (6%). The disease-specific PROMs cover 12 categories of diseases under the International Classification of Diseases 11th (ICD-11) [139] with 29 specific diseases (mostly often diabetes, asthma, and migraine). The drug-specific PROMs targeted 12 categories of medicines under the Anatomical Therapeutic Chemical Classification System (ATC) [140] (mostly often anticoagulants, insulin, and iron chelation).

The majority of M-TS PROMs (61, 88%) were self-reported, four (6%) were either self-reported or proxy-reported (e.g., by parents or clinicians), and the remaining four (6%) were health practitioner administered (e.g., through interviews). Data collection modes for self-reported PROMs include questionnaires (in paper and pen or electronic versions), interviews (face-to-face or via phone script), and mobile applications. All included 69 M-TS PROMs have questionnaire data mode; only the TSQM-1.4, TSQM-II, and TSQM-9 (3, 4%) have further developed phone scripts and mobile applications [141]. In practical applications, patients can independently complete self-reported M-TS PROMs on paper or electronic devices, or with the assistance of researchers, who will read the questions aloud and record the patient's answers (e.g., in-person or telephone interviews). Thirty-eight PROMs (55%) reported copyright information, of which 28 belong to the pharmaceutical industry. Sixty-four PROMs (93%) provided free access to full questionnaires. Ten PROMs (14%) proved easy to be administrated and completed in the context of clinical trials.

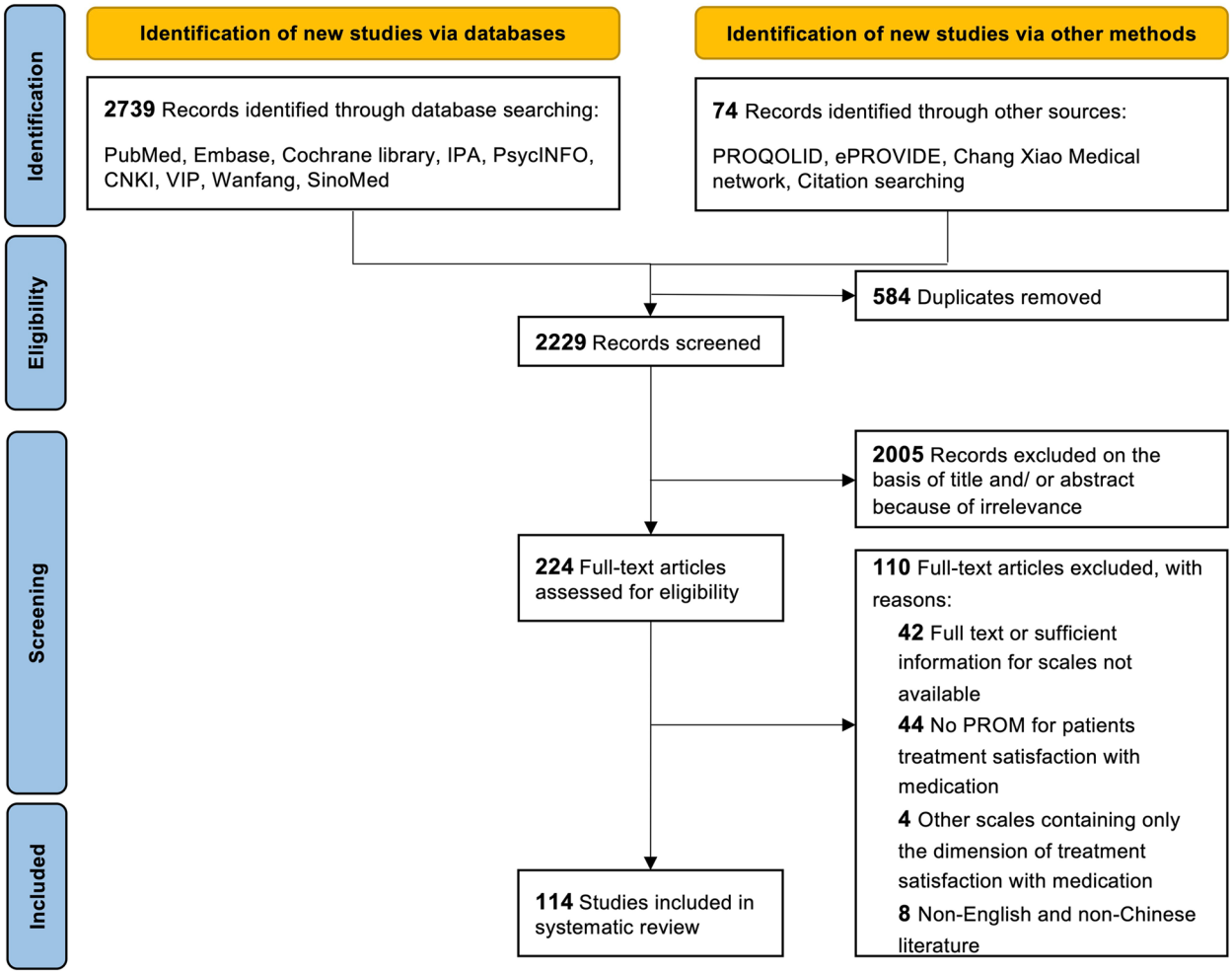

Fig. 1 Preferred Reporting Items for Systematic Reviews and Meta-Analysis Diagram of Study Selection

The most commonly measured domains were convenience (40, 58%), side effects (39, 57%), and perceived effectiveness of medication (29, 42%) (Table 1). The most commonly used response option was a 5-point Likert scale (32, 46%). Less than half of the PROMs (32, 46%) clarified the timing for measuring M-TS. Among those clarified, the most common recall period for measuring M-TS was 2 to 4 weeks after the initiation of medication.

Measurement properties of PROMs for M-TS with quality of evidence

Among sixty-four PROMs reported the development process (Table 2). All of these 64 PROMs described the construct measured and the target population. Ten reported the conceptual framework or theory for defining the construct being measured that supported their generation of measurement items (Additional file 1: table S5 [1, 30, 44, 66, 82, 95, 100, 117, 125, 126, 129, 142]). No common framework or theory was used. Figure 2 summarizes the concepts, components, and influence factors of treatment satisfaction from the ten frameworks [30, 44, 66, 82, 95, 100, 117, 125, 126, 129] and two theories [1, 142].

Eight PROMs (12%) had sufficient overall content validity (i.e., relevance: items were relevant for the construct of interest, the target population, and the context of use; comprehensiveness: all key concepts were included; comprehensibility: the PROM was understood by the target population) (5/8, moderate; 3/8, low quality of evidence) (Table 2). The other PROMs failed to simultaneously meet the criteria of relevance, comprehensiveness, or comprehensibility or did not report the content validity. Among 54 PROMs that reported structural validity (all of which applied classical test theory), 13 had sufficient structural validity (i.e., comparative fit index (CFI) or Tucker–Lewis index (TLI) or comparable measure > 0.95, or Root Mean Square Error of Approximation (RMSEA) < 0.06 or standardized root mean residuals (SRMR) < 0.08) (high to moderate quality of evidence).

Table 1 Characteristics of PROMs for medication treatment satisfaction

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
Generic PROMs for M-TS										
1	TSQM-1.4 [25–29] (English, Arabic, Kurdish, and Spanish version)	2004, USA	Adults	Generic	Self-report	Past 2–3 weeks or since last used the medicine	1. Effectiveness; 2. Side effects; 3. Convenience; 4. Global Satisfaction	14	7-point or 5-point Likert scale	© 2023 IQVIA. All rights reserved. Any use, distribution, or reproduction, in whole or in part, is expressly prohibited without the prior express written permission of IQVIA
2	TSQM-II [30–35] (English, French, Chinese, Japanese, and Persian version)	2005, USA	Adults	Generic	Self-report	Past 2–3 weeks or since last used the medicine	1. Effectiveness; 2. Side effects; 3. Convenience; 4. Global Satisfaction	11	7-point or 5-point Likert scale	© 2023 IQVIA. All rights reserved. Any use, distribution, or reproduction, in whole or in part, is expressly prohibited without the prior express written permission of IQVIA
3	TSQM-9 [36] (English version)	2009, USA	Adults	Generic	Self-report	Past 2–3 weeks or since last used the medicine	1. Effectiveness; 2. Convenience; 3. Global Satisfaction	9	7-point or 5-point Likert scale	© 2023 IQVIA. All rights reserved. Any use, distribution, or reproduction, in whole or in part, is expressly prohibited without the prior express written permission of IQVIA
4	SATMED-Q [31, 37–40] (English, French, and Polish version)	2008, Spain	Adults	Generic	Self-report	Not specified	1. Treatment effectiveness; 2. Convenience of use; 3. Impact on daily living/activity; 4. Medical care/ medical follow-up; 5. Undesirable side effects; 6.Global satisfaction	17	4-point Likert scale	© Miguel A. Ruiz, 2008. All Rights Reserved
Disease-specific PROMs for M-TS [a]										
Endocrine, nutritional, or metabolic diseases										
5	DTSQ-IP [51] (English version)	2009, UK	Teens and adults	Insulin-treated diabetes	Self-report	Past 2 weeks	NR	19	6-point Likert scale	No information

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
6	DIDS [55] (English version)	2020, USA	Adults	Type 1 diabetes	Self-report and parent/proxy report	Not specified	1. Device satisfaction; 2. Diabetes impact	12	10-point Likert scale	No information
7	ThyTSQ [56, 57] (English version)	2004, UK	Adults	Hypothyroidism	Self-report	Past few weeks	1. Present satisfaction; 2. How well working; 3. Convenient; 4. Understanding of condition; 5. Encourage; 6. Controlling symptoms; 7. Continue	7	6-point Likert scale	No information
8	MS-TSQ [58] (English version)	2007, USA	Adults	Hot flashes, menopause	Self-report	Past 4 weeks	1. Satisfaction with the treatment's ability to control specific symptoms associated with menopause; 2. Side effects or treatment tolerability; 3. Global treatment satisfaction	8	5-point Likert scale	No information
9	Acro-TSQ [59, 60] (English version)	2019, USA	Adults	Acromegaly	Self-report	Past 4 weeks	1. Treatment effectiveness; 2. Symptom burden; 3. Treatment side-effects; 4. Convenience of treatment; 5. Overall satisfaction	26	NR	No information
Diseases of the respiratory system										
10	SATQ [75–77] (English, Spanish, and Polish version)	2003, UK	Adults	Asthma	Self-report	Not specified	1. Effectiveness of treatment; 2. Ease of use; 3. Medication burden; 4.Side-effects and worries	26	7-point Likert scale	No information

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
11	PASAPQ [78] (English version)	2005, USA	NR	Asthma, asthma-chronic obstructive pulmonary disease overlap syndrome	Self-report	Not specified	1. Performance; 2. Convenience; 3. Overall satisfaction	14	7-point Likert scale	© Boehringer Ingelheim hold the copyright
Diseases of the nervous system										
12	PPMQ [79] (English version)	2002, Canada, Finland, The Netherlands, New Zealand, Spain	Adults	Migraine	Self-report	Past 4 h	NR	15	7-point or 5-point Likert scale	©2008 GlaxoSmithKline. All rights reserved
13	PPMQ-R [80, 81] (English version)	2006, USA	Adults	Migraine	Self-report	Past 24 h	1. Efficacy; 2. Function; 3. Ease of use; 4. Cost; 5. Side effects; 6. Global items	32	7-point or 5-point Likert scale	©2008 GlaxoSmithKline. All rights reserved
14	MTSM [82, 83] (English version)	2003, USA, UK	Adults	Migraine	Self-report	Not specified	1. Expectations of treatment outcomes; 2. Importance of attributes; 3. Rating of treatment outcome; 4.Satisfaction with treatment	NR	NR	No information
15	PTSS [85, 86] (English and Traditional Chinese Cantonese version)	2004, USA, Italy, France	Adults	Acute pain, chronic pain	Self-report	Not specified	1. Information; 2. Medical care; 3. Impact of current pain medication; 4. Satisfaction with pain medication which included the two subscales medication characteristics; 5. Side effects	39	5-point Likert scale	The PTSS is copyrighted by Pfizer
16	MSTCQ [87] (English version)	2006, USA	Adults	Multiple sclerosis	Self-report	Not specified	1. Satisfaction with the injection system; 2. Side effects	30	NR	The instrument is copyrighted by Joyce A. Cramer

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
Neoplasms										
17	CTSQ [90–94] (English, Korean, Dutch, and Malay version)	2005, USA, UK, France	Adults	Generic for Neoplasms	Self-report	Past 4 weeks	1. Expectations of cancer therapy; 2. Feelings about side effects; 3. Oral cancer therapy adherence; 4. Convenience; 5. Satisfaction with cancer therapy; 6.Stopping cancer therapy; 7. Reasons for nonadherence	21	5-point Likert scale	© 2007, Cronos Clinical Consulting Services, an IQVIA business
Diseases of the digestive system										
18	TSQ-G [96] (English version)	2003, USA	Adults	Gastroesophageal reflux disease	Self-report	Past 2 weeks	1. Symptoms; 2. Satisfaction; 3. Expectations; 4. Provider relationships; 5. Cost; 6. Bother; 7. Flexibility with dosing	28	NR	© Astrazeneca. All rights reserved
19	GTSQ [97] (English version)	2005, USA	Adults	Gastroesophageal reflux disease	Self-report	Past 2 weeks	1. Specific symptom relief; 2. Nighttime relief; 3. Daytime relief; 4. Quick and long-lasting relief; 5. Ease and convenience; 6. Health-related quality of life (HRQL); 7. Overall satisfaction	25	5-point Likert scale	No information
20	TSQ-C [98] (English version)	2005, USA	NR	Crohn's disease	Self-report	Not specified	1. Symptoms; 2. Satisfaction; 3. Expectations; 4. Physician Relationships; 5. Bother; 6. Cost	32	6-point Likert scale	No information

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
21	SPACE-Q [99, 100] (English and French version)	2011, France	Adults	Crohn's disease	Self-report	Not specified	1. Disease control; 2. Symptoms transition scale; 3. Anal symptoms transition scale; 4. Quality of life transition scale; 5. Tolerability; 6. Convenience; 7. Expectation confirmation toward efficacy; 8. Expectation confirmation toward side effects; 9. Expectation confirmation toward convenience; 10. Satisfaction with treatment; 11. Motivation	58	4-point or 5-point Likert scale, dichotomous (Yes/No)	© Abbott France, 2011. All rights reserved
Certain infectious or parasitic diseases										
22	HIVTSQs [108] (English version)	2001, USA, Canada	Adults	Human immunodeficiency virus infection	Self-report	Past 4 weeks	1. Current treatment; 2. Control; 3. Side effects; 4. Demands; 5. Convenience; 6. Flexibility; 7. Understanding; 8. Lifestyle; 9. Recommend to others; 10. Continue	10	NR	© Professor C Bradley
23	HIVTSQc [109] (English version)	2006, UK	Adults	Human immunodeficiency virus infection	Self-report	Past 4 weeks	1. Current treatment; 2. Control; 3. Side effects; 4. Demands; 5. Convenience; 6. Flexibility; 7. Understanding; 8. Lifestyle; 9. Recommend to others; 10. Continue	10	NR	© Professor C Bradley

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
24	ESTAR [110] (Spanish version)	2007, Spain	Adults	Human immunodeficiency virus infection	Self-report	Past 4 weeks	1. Clinical satisfaction; 2. Satisfaction with lifestyle	10	6-point Likert scale	No information
25	GHerpTSQ [111] (English version)	2006, Canada	Adults	Genital herpes	Self-report	Not specified	1. Satisfied; 2. Controlled; 3. Side effects; 4. Convenience; 5. Flexibility; 6. Understanding; 7. Demanding; 8. Lifestyle; 9. Recommend to others; 10. Continue; 11. Effectiveness; 12. Effects on quality of life	12	NR	© Professor Clare Bradley
26	HCVTSat [112] (English version)	2013, USA	Adults	Chronic hepatitis C virus infection	Self-report	Not specified	1. Treatment experience; 2. Side effects; 3. Social aspects	12	NR	No information
Diseases of the visual system										
27	TSS-IOP [113] (English version)	2003, USA	Adults	Primary open-angle glaucoma or ocular hypertension	Self-report	Not specified	1. Eye irritation; 2. Convenience of use; 3. Ease of use; 4. Hyperemia; 5. Medication effectiveness	15	NR	© 2003, Cronos Clinical Consulting Services, an IQVIA business
28	RetTSQs [114–116] (English, German, and Serbian version)	2004, UK, Germany	Adults	Diabetic retinopathy	Self-report	Not specified	1. Household tasks; 2. Personal affairs; 3. Shopping; 4. Feelings future; 5. Feelings past; 6. Working life; 7. Close personal relationship; 8. Family life; 9. Social life; 10. Do things for others; 11. Get out and about; 12. Journeys; 13. Holidays; 14. Finances; 15. People react; 16. Physical appearance; 17. Physically do; 18. Leisure; 19. Hobbies/interests; 20. Self-confidence; 21. Motivation; 22. Dependence; 23. Mishaps/losses; 24. Time; 25. Care of diabetes; 26. Enjoy nature	26	7-point Likert scale	© Professor C Bradley

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
29	Patient satisfaction with glaucoma treatment [119] (Spanish version)	2010, Spain	Adults	Glaucoma	Self-report	Not specified	1. Expectations and beliefs about treatment; 2. Ease of use; 3. Efficacy; 4. Undesired effects; 5. Impact on health-related quality of life; 6. Medical care; 7. General satisfaction with treatment	22	5-point Likert scale	No information
30	MacTSQ [120, 121] (English and Greek version)	2018, UK	Adults	Macular degeneration	Self-report	Not specified	NR	14	5-point Likert scale	© Professor C Bradley
Diseases of the ear or mastoid process										
31	Patient satisfaction with treatment of otitis externa [122] (English version)	1999, USA	NR	Otitis externa	Self-report	Not specified	1. Information; 2. Ease of administration; 3. Side effects; 4. Relief of symptoms; 5. Medical care in general; 6. Cost; 7. Functioning; 8. Overall satisfaction	22	7-point Likert scale	No information
Diseases of the skin										
32	DermaSat [123] (Spanish version)	2010, Spain	Adults	Eczema (dermatitis) affecting the hands	Self-report	Not specified	1. Effectiveness; 2. Convenience; 3. Impact on health-related quality of life; 4. Medical follow-up; 5. Side effects; 6. General opinion	17	5-point Likert scale	No information
Diseases of the musculoskeletal system or connective tissue										
33	OPSAT-Q [124] (English version)	2006, USA	Adults	Osteoporosis with bisphosphonate treatments	Self-report	Not specified	1. Convenience; 2. Confidence with daily activities; 3. Side effects; 4. Overall satisfaction	16	4-point Likert scale	© 2005 Roche Laboratories, Inc. All Rights Reserved

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
Diseases of the genitourinary system										
34	OAB-S [125] (English version)	2008, USA	Adults	Prostatic hyperplasia, overactive urinary bladder	Self-report	Past 1 week	1. Overactive bladder (OAB) control expectations; 2. Impact on daily living with OAB; 3. OAB control; 4. OAB medication tolerability; 5. Satisfaction with OAB control; 6. Fulfillment of OAB medication expectations; 7. Interruption of day-to-day life due to OAB; 8. Overall satisfaction with OAB medication; 9. Willingness to continue OAB medication; 10. Improved life with OAB medication	41	4- to 6-point Likert scale	© 2005, Cronos Clinical Consulting Services, an IQVIA business
Conditions related to sexual health										
35	EDITS [128] (English version)	1999, USA	Adults	Erectile dysfunction	Self-report	Past 4 weeks	NR	11	5-point Likert scale	© 1999, Cronos Clinical Consulting Services, an IQVIA business
36	TSS [129, 130] (English, French, and German version)	2004, Germany	Adults	Erectile dysfunction	Self-report	Past 4 weeks	1. Satisfaction with medication; 2. Ease with erection; 3. Satisfaction with erectile function; 4. Pleasure from sexual activity; 5. Satisfaction with orgasm; 6. Sexual confidence (for patients) or Confidence in completion (for partners)	NR	5-point Likert scale	© Bayer Schering Pharma AG

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
Drug-specific PROMs for M-TS [b]										
A10 drugs used in diabetes										
37	PSIT [41] (English version)	2000, USA	Adults	Insulin for diabetes mellitus	Self-report	Past 12 weeks	1. Convenience and ease of use; 2. Social comfort	15	5-point Likert scale	© 1996 Pfizer Inc. All rights reserved
38	ITSQ [42, 43] (English version)	2004, USA	Adults	Insulin for diabetes mellitus	Self-report	Past 4 weeks	1. Inconvenience of regimen; 2. Lifestyle flexibility; 3. Glycemic control; 4. Hypoglycemic control; 5. Insulin delivery device satisfaction	22	7-point Likert scale	© Novo Nordisk, 2004, All rights reserved
39	DiabMedSat [44] (English version)	2006, USA	Adults	Diabetes medication	Self-report	Past 2 weeks	1. Burden; 2. Efficacy; 3. Symptoms	23	5- to 7-point Likert scale	© Novo Nordisk June 2004
40	DTTQ [45] (English version)	2007, UK	Adults	Diabetes tablet	Self-report	Past 2 weeks	1. Tablet-taking as recommended; 2. Tablet difficulty; 3. Tablet side effects; 4. Perceived hyperglycemia; 5. Perceived hypoglycemia; 6. Tablet continue	7	6-point Likert scale	No information
41	SOADAS [46, 47] (English and Chinese version)	2008, USA	Adults	Oral anti-diabetic agents	Self-report	Past 4 weeks	NR	6	5-point Likert scale	© 2006 GlaxoSmithKline. All rights reserved
42	DM-SAT [48] (English version)	2009, USA	Adults	Diabetes medication	Self-report	Past 4 weeks	1. Life style; 2. Convenience; 3. Glucose control; 4. Well-being	16	10-point Likert scale	© 2022 Merck & Co., Inc., Rahway, NJ, USA and its affiliates. All rights reserved

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
43	PAM-D [49] (English version)	2009, USA	Adults	Diabetes medication	Self-report	Past month	1. Scheduling flexibility; 2. Portability convenience; 3. Regimen inconvenience; 4. Medication effectiveness (perceived effectiveness); 5. Difficulty remembering medications; 6. Gastrointestinal side effects; 7. Hypoglycemia-related side effects; 8. Weight/edema side effects; 9. Emotional side effects	37	NR	No information
44	PRAM-TSQ [50] (English version)	2009, USA	Adults	Type 1 or type 2 diabetes using pramlintide as adjunctive therapy with insulin	Self-report	Past 2 weeks	1. Specific benefits; 2. Absence of side effects; 3. Global benefits; 4. Treatment preference	14	6-point Likert scale	No information
45	OHA-Q [52] (Japanese version)	2012, Japan	Adults	Oral hypoglycemic agent for type 2 diabetes	Self-report	Not specified	1. Treatment convenience; 2. Somatic symptom; 3. Satisfaction	20	NR	© Dr. Hitoshi Ishii. All rights reserved
46	DMSRQ [53] (English version)	2012, USA	Adults	Diabetes medication	Self-report	Not specified	1. Convenience; 2. Negative events; 3. Interference; 4. Self-monitoring of blood glucose burden; 5. Efficacy; 6. Social burden; 7. Psychological well-being; 8. Treatment satisfaction; 9. Treatment preference	54	NR	© Mark Peyrot and Richard R. Rubin

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
47	DMSRQ-SF [54] (English version)	2014, USA	Adults	Diabetes medication	Self-report	Not specified	1. Convenience satisfaction; 2. Negative events; 3. Interference; 4. Self-monitoring of blood glucose burden; 5. Efficacy; 6. Social burden; 7. Psychological well-being; 8. Treatment satisfaction; 9. Treatment preference if the respondent previously used another diabetes medication regimen	19	NR	No information
B01 antithrombotic agents										
48	DASS [61–65] (English, Brazilian–Portuguese, Maltese, Arabic, and Chinese version)	2004, USA	Adults	Anticoagulation drugs	Self-report	Not specified	1. Limitations on physical exercise; 2. Diet restrictions; 3. Hassles and burdens; 4. Positive impacts	25	5-point Likert scale	No information
49	PACT-Q [63, 66] (English and Maltese version)	2009, USA, France, Netherlands	Adults	Anticoagulation drugs	Self-report	Not specified	1. Convenience; 2. Burden of disease and treatment; 3. Anticoagulant treatment satisfaction	20	5-point Likert scale	© 2007 Sanofi-Aventis, France. All rights reserved
50	ACTS [34, 68–73] (English, Spanish, Danish, Japanese, Arabic, and Chinese version)	2012, UK	Adults	Anticlot treatment	Self-report	Past 4 weeks	1. Burdens; 2. Benefits; 3. Global satisfaction	17	4-point Likert scale	© Bayer AG, 2006. All Rights Reserved
B02 antihemorrhagics										
51	SQ-ISHI [136] (English version)	2021, USA	Children, teens and adults	Emicizumab for hemophilia A	Self-report	Not specified	1. Treatment's ease of administration; 2. Convenience; 3. Influence on daily life; 4. Participant's confidence and satisfaction	15	11-point Likert scale	© 2016, Roche Products Limited. All Rights Reserved

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
B03 antianemic preparations										
52	SICT [134] (English version)	2009, USA, UK	Children, teens and adults	Iron chelation therapy	Self-report and parent/proxy report	Not specified	1. Effectiveness; 2. Safety/side effects; 3. Convenience; 4. Costs; 5. Overall satisfaction; 6. Impact on daily life; 7. Patient adherence; 8. Preferences	28	5-point Likert scale	No information
53	ICT-sat [135] (English version)	2012, Egypt	Children, teens and adults	Iron chelation therapy for patients with β-thalassemia major	Self-report and parent/proxy report	Past 4 weeks	1. Perceived effectiveness; 2. Fear and worries; 3. Burden; 4. Side effects	15	5-point Likert scale	No information
H02 corticosteroids for systemic use										
54	SSQ [133] (English version)	2017, USA	Adults	Steroid for systemic lupus erythematosus	Self-report	Past 7 days	1. Steroid dose/duration; 2. General impact of steroids; 3. Benefits of steroids; 4. Work/productivity; 5. Side effects; 6. Emotions; 7. Overall satisfaction	44	11-point Likert scale	© 2017 GlaxoSmithKline. All rights reserved
L01 antineoplastic agents										
55	RASQ [95] (English version)	2016, USA	Adults	Rituximab for non-Hodgkin lymphoma	Interview-based	Most recent injection	1. Treatment satisfaction; 2. Convenience; 3. Physical impact; 4. Psychological impact; 5. Impact on activities of daily living	15	3-point or 5-point Likert scale	© 2013, Roche Products Limited. All Rights Reserved
L04 immunosuppressants										
56	PESaM [126, 127] (English and Dutch version)	2017, Netherlands	Adults	Pirfenidone (for idiopathic pulmonary fibrosis) and eculizumab (for atypical hemolytic uremic syndrome)	Interview-based	Past 4 weeks	1. Effectiveness; 2. Side effects; 3. Ease of use; 4. Overall satisfaction	16	5-point Likert scale	Instrument copyrighted by the MUMC (Maastricht University Medical Centre)

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
57	TASQ [137] (English version)	2021, UK	Adults	Eculizumab for rare paroxysmal nocturnal hemoglobinuria	Interview-based	Not specified	1. Treatment satisfaction; 2. Convenience; 3. Physical impact; 4. Psychological impact; 5. Impact on activities of daily living	12	5-point Likert scale	No information
N02 analgesics										
58	SPM [84] (Spanish version)	2004, Spain	Adults	Pain medication	Self-report	Not specified	1. Speed/duration of effect; 2. Adverse events; 3. Functional benefit; 4. Overall satisfaction	10	5-point Likert scale	No information
N03 antiepileptics										
59	Patient satisfaction with antiepileptic drugs/epilepsy treatment [89] (French version)	2015, France	Adults	Antiepileptic drugs	Self-report	Not specified	NR	4	4-point Likert scale, 10-cmr VAS	No information
N05 psycholeptics										
60	SWAM Scale® [101] (English version)	2005, UK	Teens and adults	Antipsychotic medication	Self-report	Not specified	1. Treatment acceptability; 2. Medication insight	23	5-point Likert scale	© 2001—2007, Diana Rofail. All Rights Reserved
61	PASAP [103] (French version)	2005, France	Adults	Psychotropics	Self-report	Not specified	1. Efficacy; 2. Tolerability; 3. Convenience; 4. Therapeutic relationship; 5. Global satisfaction	9	5-point Likert scale	© Boehringer Ingelheim hold the copyright
62	MSQ [104, 105] (English version)	2014, USA	Adults	Atypical antipsychotics	Self-report	Not specified	NR	10	6-point Likert scale	© Instrument copyrighted by the International Society for CNS Drug Development (ISCDD)

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
N06 psychoanaleptics										
63	SAMS [102] (German version)	2011, Germany	Children and teens	Medication for attention deficit hyperactivity disorder	Self-report and parent/proxy report	Not specified	NR	13	6-point Likert scale	No information
N07 other nervous system drugs										
64	SASMAT-METHER [106] (Spanish version)	1999, Spain	Adults	Methadone treatment for heroin-dependence	Self-report	Not specified	1. Overall satisfaction; 2. Pharmacotherapy; 3. Initiation; 4. Anti-addictive effect on main substance; 5. Mental state; 6. Physical state; 7. Personal functioning; 8. Acceptability; 9. Anti-addictive effect on secondary substances	44	5-point Likert scale	No information
65	SASMAT-BUNHER [107] (Spanish version)	2014, Spain	Adults	Buprenorphine-naloxone sublingual tablets treatment for heroin addiction	Self-report	Not specified	1. Overall satisfaction; 2. Pharmacotherapy; 3. Initiation; 4. Anti-addictive effect on main substance; 5. Mental state; 6. Physical state; 7. Personal functioning; 8. Acceptability; 9. Anti-addictive effect on secondary substances	44	5-point Likert scale	No information
R03 drugs for obstructive airway diseases										
66	PSAM [74] (English version)	2000, Canada	Adults	Asthma medication	Self-report	Past 2 weeks	NR	77	NR	No information

Table 1 (continued)

	PROM (language version)	Year and country of development	Target population	Target disease/drug	Administration	Recall period	Domains	Number of items	Response options	Copyright
S01 ophthalmologicals										
67	EDSQ [117, 118] (English and French version)	2007, France	Adults	Eye-drop for glaucoma	Interview-based	Not specified	1. Patient characteristics; 2. Treatment characteristics; 3. Patient-clinician relationship; 4. Patient experience with the disease and the treatment; 5. Interaction between the patient and the treatment; 6. Patient knowledge of the disease and the treatment	56	Likert scale	© Alcon Research, 2006. All rights reserved
V01 allergens										
68	ESPIA [131, 132] (English and Spanish version)	2011, Spain	Adults	Allergen immunotherapy	Self-report	Not specified	1. Perceived efficacy; 2. Daily life activities/activities and environment; 3. Cost–benefit balance; 4. General satisfaction	16	5-point Likert scale	No information
Not applicable to ATC classification										
69	TSTMQ [138] (Persian version)	2022, Iran	Adults	Traditional medicines treatment	Self-report	Not specified	1. Satisfaction with efficacy; 2. Satisfaction with convenience; 3. Overall satisfaction	14	5-point Likert scale	No information

[a] The classification of PROMs is based on the International Classification of Diseases 11th (ICD-11) Revision (https://icd.who.int/en)

[b] The classification of PROMs is based on the Anatomical Therapeutic Chemical Classification System (ATC) 2nd level—pharmacological or therapeutic subgroup (https://www.who.int/tools/atc-ddd-toolkit/atc-classification)

Table 2 Development and content validity of PROMs for medication treatment satisfaction

PROM	PROM development			Content validity							
	Design	Pilot study	Overall	Relevance		Comprehensiveness		Comprehensibility		Overall	
				Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE
Generic PROMs for M-TS											
TSQM-1.4	Doubtful	Doubtful	Doubtful	Sufficient	Low	Sufficient	Low	Sufficient	Low	Sufficient	Low
TSQM-II	Doubtful	Doubtful	Doubtful	Sufficient	High	Inconsistent	Low	Sufficient	Low	Inconsistent	Moderate
TSQM-9	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
SATMED-Q	Doubtful	Doubtful	Doubtful	Sufficient	Moderate	Sufficient	Low	Sufficient	Low	Sufficient	Moderate
Disease-specific PROMs for M-TS [a]											
Endocrine, nutritional, or metabolic diseases											
DTSQ-IP	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Inconsistent	Low	Inconsistent	Low
DIDS	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
ThyTSQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
MS-TSQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Sufficient	Low	Inconsistent	Low
Acro-TSQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
Diseases of the respiratory system											
SATQ	Doubtful	Inadequate	Inadequate	Inconsistent	Low	Sufficient	Low	Insufficient	Very low	Inconsistent	Very low
PASAPQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Sufficient	Low	Inconsistent	Low
Diseases of the nervous system											
PPMQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Inconsistent	Low	Inconsistent	Low
PPMQ-R	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
MTSM	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Sufficient	Low	Inconsistent	Low
PTSS	Doubtful	Doubtful	Doubtful	Sufficient	Low	Insufficient	Low	Sufficient	Low	Inconsistent	Low
MSTCQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Inconsistent	Low	Inconsistent	Low
Neoplasms											
CTSQ	Doubtful	Inadequate	Inadequate	Inconsistent	Moderate	Sufficient	Moderate	Sufficient	Moderate	Inconsistent	Moderate
Diseases of the digestive system											
TSQ-G	Doubtful	Inadequate	Inadequate	Inconsistent	Low	Insufficient	Low	Inconsistent	Low	Inconsistent	Low
GTSQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Sufficient	Low	Inconsistent	Low
TSQ-C	Doubtful	Inadequate	Inadequate	Inconsistent	Moderate	Sufficient	Low	Inconsistent	Very low	Inconsistent	Moderate
SPACE-Q	Doubtful	Doubtful	Doubtful	Sufficient	Low	Sufficient	Low	Sufficient	Moderate	Sufficient	Moderate
Certain infectious or parasitic diseases											
HIVTSQs	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
HIVTSQc	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Inconsistent	Very low	Inconsistent	Very low	Inconsistent	Very low
ESTAR	Doubtful	Inadequate	Inadequate	Inconsistent	Low	Inconsistent	Very low	Inconsistent	Very low	Inconsistent	Very low
GHerpTSQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low

Table 2 (continued)

PROM	PROM development			Content validity							
	Design	Pilot study	Overall	Relevance		Comprehensiveness		Comprehensibility		Overall	
				Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE
HCVTSat	Doubtful	Doubtful	Doubtful	Inconsistent	High	Sufficient	Low	Sufficient	Moderate	Inconsistent	Low
Diseases of the visual system											
TSS-IOP	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Insufficient	Low	Inconsistent	Low
RetTSQs	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Moderate	Inconsistent	Low
Patient satisfaction with glaucoma treatment	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
MacTSQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
Diseases of the ear or mastoid process											
Patient satisfaction with treatment of otitis externa	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
Diseases of the skin											
DermaSat	Adequate	Doubtful	Doubtful	Sufficient	Moderate	Sufficient	Moderate	Sufficient	Low	Sufficient	Moderate
Diseases of the musculoskeletal system or connective tissue											
OPSAT-Q	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
Diseases of the genitourinary system											
OAB-S	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
Conditions related to sexual health											
EDITS	Doubtful	Inadequate	Inadequate	Inconsistent	High	Inconsistent	Low	Inconsistent	Low	Inconsistent	Low
TSS	Doubtful	Doubtful	Doubtful	Inconsistent	Moderate	Sufficient	Low	Sufficient	Moderate	Inconsistent	Moderate
Drug-specific PROMs for M-TS [b]											
A10 drugs used in diabetes											
PSIT	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Inconsistent	Low	Inconsistent	Low
ITSQ	Adequate	Doubtful	Doubtful	Sufficient	Low	Sufficient	Very low	Sufficient	Low	Sufficient	Low
DiabMedSat	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Very low	Inconsistent	Low	Inconsistent	Low
DTTQ	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
SOADAS	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Sufficient	Low	Inconsistent	Low
DM-SAT	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Moderate	Inconsistent	Moderate	Inconsistent	Low
PAM-D	Doubtful	Doubtful	Doubtful	Sufficient	Low	Sufficient	Low	Inconsistent	Low	Inconsistent	Low
PRAM-TSQ	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
OHA-Q	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
DMSRQ	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
DMSRQ-SF	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low

Table 2 (continued)

PROM	PROM development			Content validity							
	Design	Pilot study	Overall	Relevance		Comprehensiveness		Comprehensibility		Overall	
				Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE
B01 antithrombotic agents											
DASS	Doubtful	Doubtful	Doubtful	Sufficient	Low	Sufficient	Low	Sufficient	Low	Sufficient	Low
PACT-Q	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Moderate	Inconsistent	Moderate
ACTS	Doubtful	Doubtful	Doubtful	Inconsistent	Moderate	Sufficient	Low	Sufficient	Low	Inconsistent	Moderate
B02 antihemorrhagics											
SQ-ISHI	Doubtful	Doubtful	Doubtful	Inconsistent	High	Sufficient	Low	Sufficient	Moderate	Inconsistent	Moderate
B03 antianemic preparations											
SICT	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Inconsistent	Low	Inconsistent	Low
ICT-sat	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
H02 corticosteroids for systemic use											
SSQ	Doubtful	Adequate	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Moderate	Inconsistent	Low
L01 antineoplastic agents											
RASQ	doubtful	doubtful	doubtful	sufficient	low	sufficient	moderate	sufficient	moderate	sufficient	moderate
L04 immunosuppressants											
PESaM	Doubtful	Doubtful	Doubtful	Inconsistent	Moderate	Sufficient	Low	Sufficient	Moderate	Inconsistent	Moderate
TASQ	Not assessed	Not assessed	Not assessed	Inconsistent	Moderate	Insufficient	Very low	Sufficient	Moderate	Inconsistent	Moderate
N02 analgesics											
SPM	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Insufficient	Low	Inconsistent	Low
N03 antiepileptics											
Patient satisfaction with antiepileptic Drugs/epilepsy treatment	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Insufficient	Low	Inconsistent	Low	Inconsistent	Low
N05 psycholeptics											
SWAM Scale®	Doubtful	Doubtful	Doubtful	Inconsistent	Moderate	Sufficient	Low	Sufficient	Low	Inconsistent	Moderate
PASAP	Doubtful	Doubtful	Doubtful	Sufficient	Moderate	Sufficient	Low	Sufficient	Moderate	Sufficient	Moderate
MSQ	Doubtful	Inadequate	Inadequate	Inconsistent	Low	Insufficient	Very low	Inconsistent	Very low	Inconsistent	Very low
N06 psychoanaleptics											
SAMS	Doubtful	Inadequate	Inadequate	Inconsistent	Low	Insufficient	Very low	Inconsistent	Very low	Inconsistent	Very low
N07 other nervous system drugs											
SASMAT-METHER	Doubtful	Inadequate	Inadequate	Inconsistent	Low	Sufficient	Very low	Inconsistent	Very low	Inconsistent	Very low
SASMAT-BUNHER	Doubtful	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
R03 drugs for obstructive airway diseases											
PSAM	Doubtful	Doubtful	Doubtful	Inconsistent	Moderate	Sufficient	Low	Sufficient	Moderate	Inconsistent	Moderate

Table 2 (continued)

PROM	PROM development			Content validity							
	Design	Pilot study	Overall	Relevance		Comprehensiveness		Comprehensibility		Overall	
				Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE
S01 ophthalmologicals											
EDSQ	Adequate	Doubtful	Doubtful	Inconsistent	Low	Sufficient	Low	Sufficient	Low	Inconsistent	Low
V01 allergens											
ESPIA	Doubtful	Doubtful	Doubtful	Inconsistent	Moderate	Insufficient	Low	Inconsistent	Low	Inconsistent	Moderate
Not applicable to ATC classification											
TSTMQ [138]	Doubtful	Doubtful	Doubtful	Inconsistent	Moderate	Insufficient	Low	Sufficient	Low	Inconsistent	Low

[a] The classification of PROMs is based on the International Classification of Diseases 11th (ICD-11) Revision (https://icd.who.int/en)

[b] The classification of PROMs is based on the Anatomical Therapeutic Chemical Classification System (ATC) 2nd level – pharmacological or therapeutic subgroup (https://www.who.int/tools/atc-ddd-toolkit/atc-classification)

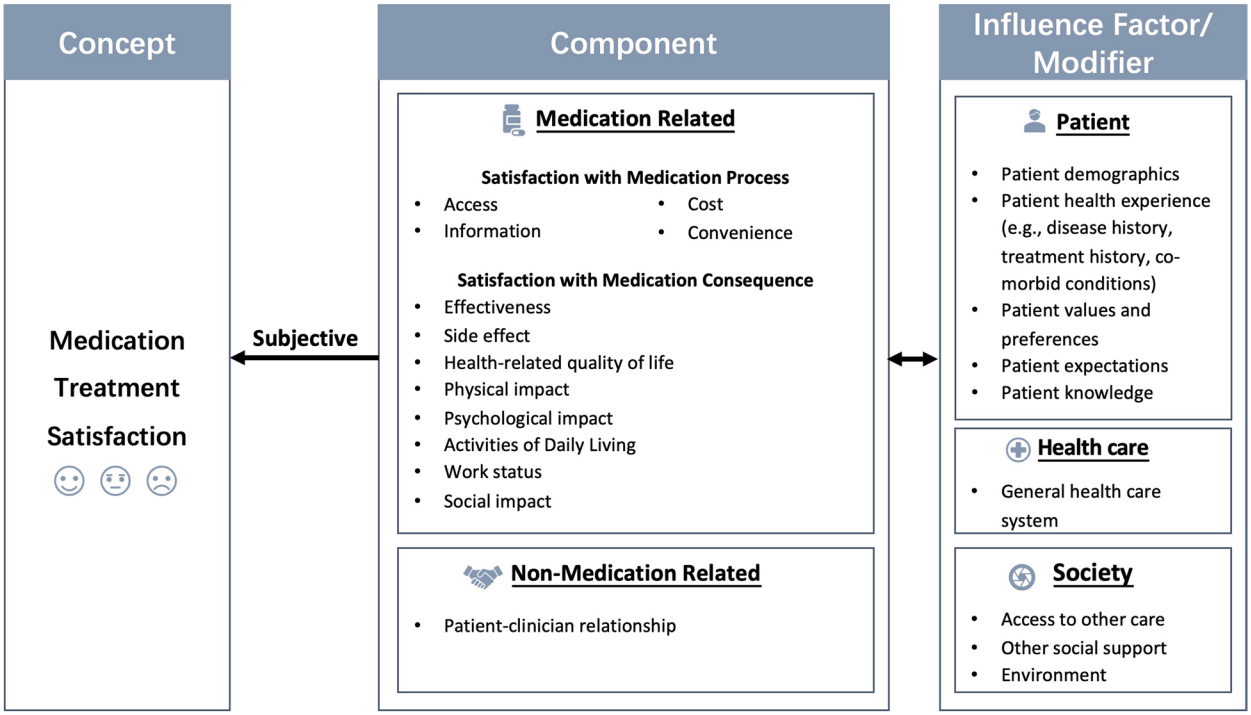

Fig. 2 The concept, component and influence factors of medication treatment satisfaction from current conceptual frameworks

The others did not report or meet the criteria for structural validity (Table 3 and Additional file 1: table S6 [25–138]) [19, 20]. Among 56 PROMs that reported construct validity, 39 had sufficient convergent validity (e.g., correlations with instruments measuring similar constructs ≥ 0.50) (39/44, 89%; 38/39, high to moderate; 1/39, low quality of evidence) and 43 had sufficient discriminative or known-groups validity (e.g., correlations with instruments measuring unrelated construct < 0.30) (42/45, 93%; 41/43, high to moderate; 2/42, low quality of evidence).

Among 63 PROMs that reported internal consistency, 11 PROMs demonstrated sufficient (i.e., Cronbach's alpha(s) ≥ 0.70 and at least low evidence for sufficient structural validity) (11/63, 17%, high quality of evidence). Thirty-eight PROMs reported test–retest reliability, of which 24 had sufficient test–retest reliability (i.e., ICC and weighted Kappa ≥ 0.70) (24/38, 63%; 18/24, high to moderate; 6/24, low to very low quality of evidence). The others did not report or meet the criteria for test–retest reliability.

Sixteen PROMs reported responsiveness, of which six drug or disease-specific PROMs demonstrated sufficient (e.g., area under the ROC Curve (AUC) ≥ 0.7). No generic PROMs had sufficient responsiveness.

Four PROMs for M-TS [60, 78, 80, 87] proposed the minimal important difference (MID) (Additional file 1: table S7 [25–138]). Four PROMs demonstrated normally distributed scores in the study population while 11 PROMs showed negatively or positively skewed scores. Thirty-two PROMs for M-TS reported floor or ceiling effects.

PROMs for M-TS with sufficient validity and reliability

One drug-specific PROM (Insulin Treatment Satisfaction Questionnaire, ITSQ) [42, 43] demonstrated sufficient construct validity, internal consistency, test–retest reliability and responsiveness (high to moderate quality of evidence), and content validity (low quality evidence). Two generic PROMs (TSQM-1.4 [25–29] and SATMED-Q) [31, 37–40] demonstrated sufficient construct validity, structural validity, and internal consistency (high quality of evidence) and content validity (moderate to low quality of evidence), but lack of evidence on test–retest reliability or responsiveness.

Discussion

Summary of findings

This review systematically searched and evaluated current PROMs for M-TS. Over 85% of the PROMs targeted adult patients. Most PROMs demonstrated sufficient construct validity including convergent validity (39/69, 57%) and discriminative or known-groups validity (40/69, 58%) (high to moderate quality of evidence) but failed

Table 3 Measurement properties[a] of PROMs for medication treatment satisfaction

PROM	Structural validity		Construct validity[b]				Internal consistency		Test–retest reliability		Responsiveness [b]	
			Convergent validity		Discriminative or known-groups validity							
	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE
Generic PROMs for M-TS												
TSQM-1.4	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	High	Not assessed		Not assessed	
TSQM-II	Sufficient	High	Sufficient	Moderate	Insufficient	Low	Sufficient	High	Sufficient	High	Not assessed	
TSQM-9	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	Moderate	Not assessed	
SATMED-Q	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	High	Indeterminate	NA
Disease-specific PROMs for M-TS [d]												
Endocrine, nutritional, or metabolic diseases												
DTSQ-IP	Indeterminate	NA	Not assessed		Not assessed		Indeterminate	NA	Not assessed		Not assessed	
DIDS	Indeterminate	NA	Not assessed		Sufficient	High	Indeterminate	NA	Insufficient	High	Not assessed	
ThyTSQ	Indeterminate	NA	Not assessed		Not assessed		Indeterminate	NA	Not assessed		Not assessed	
MS-TSQ	Sufficient	High	Not assessed		Sufficient	High	Sufficient	High	Not assessed		Not assessed	
Acro-TSQ	Indeterminate	NA	Sufficient	Moderate	Sufficient	Moderate	Not assessed		Sufficient	Very low	Indeterminate	NA
Diseases of the respiratory system												
SATQ	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	High	Not assessed	
PASAPQ	Indeterminate	NA	Not assessed		Sufficient	High	Indeterminate	NA	Not assessed		Indeterminate	NA
Diseases of the nervous system												
PPMQ	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Not assessed		Indeterminate	NA
PPMQ-R	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	Low	Indeterminate	NA
MTSM	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Not assessed		Sufficient	High
PTSS	Indeterminate	NA	Indeterminate	NA	Sufficient	High	Indeterminate	NA	Indeterminate	NA	Indeterminate	NA
MSTCQ	Indeterminate	NA	Sufficient	High	Not assessed		Indeterminate	NA	Insufficient	Low	Not assessed	
Neoplasms												
CTSQ	Sufficient	Moderate	Sufficient	High	Sufficient	High	Sufficient	High	Indeterminate	NA	Not assessed	
Diseases of the digestive system												
TSQ-G	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Indeterminate	NA	Not assessed	
GTSQ	Not assessed		Sufficient	High	Sufficient	High	Indeterminate	NA	Not assessed		Not assessed	
TSQ-C	Indeterminate	NA	Indeterminate		Sufficient	High	Indeterminate	NA	Not assessed		Not assessed	
SPACE-Q	Not assessed		Sufficient	High	Sufficient	High	Indeterminate	NA	Indeterminate	NA	Indeterminate	NA
Certain infectious or parasitic diseases												
HIVTSQs	Indeterminate	NA	Not assessed		Sufficient	High	Indeterminate	NA	Not assessed		Not assessed	
HIVTSQc	Insufficient	Moderate	Not assessed		Sufficient	Moderate	Indeterminate	NA	Not assessed		Not assessed	
ESTAR	Indeterminate	NA	Sufficient	High	Not assessed		Indeterminate	NA	Sufficient	Very low	Not assessed	

Table 3 (continued)

PROM	Structural validity		Construct validity[b]				Internal consistency		Test–retest reliability		Responsiveness [b]	
			Convergent validity		Discriminative or known-groups validity							
	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE
GHerpTSQ	Indeterminate	NA	Not assessed		Not assessed		Indeterminate	NA	Not assessed		Not assessed	
HCVTSat	Sufficient	High	Not assessed		Not assessed		Sufficient	High	Not assessed		Sufficient	High
Diseases of the visual system												
TSS-IOP	Indeterminate	NA	Sufficient	Moderate	Sufficient	High	Indeterminate	NA	Indeterminate	NA	Not assessed	
RetTSQs	Indeterminate	NA	Sufficient	High	Not assessed		Indeterminate	NA	Sufficient	High	Not assessed	
Patient Satisfaction with Glaucoma Treatment	Sufficient	high	Insufficient	High	Not assessed		Insufficient	High	Not assessed		Not assessed	
MacTSQ	Indeterminate	NA	Sufficient	High	Not assessed		Indeterminate	NA	Sufficient	Moderate	Not assessed	
Diseases of the ear or mastoid process												
Patient satisfaction with treatment of otitis externa	Not assessed		Sufficient	High	Not assessed		Indeterminate	NA	Not assessed		Not assessed	
Diseases of the skin												
DermaSat	Sufficient	Moderate	Insufficient	High	Sufficient	Low	Indeterminate	NA	Not assessed		Not assessed	
Diseases of the musculoskeletal system or connective tissue												
OPSAT-Q	Not assessed		Sufficient	High	Sufficient	Moderate	Indeterminate	NA	Indeterminate	NA	Not assessed	
Diseases of the genitourinary system												
OAB-S	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	Moderate	Indeterminate	NA
Conditions related to sexual health												
EDITS	Not assessed		Not assessed		Not assessed		Indeterminate	NA	Sufficient	Low	Not assessed	
TSS	Not assessed		Sufficient	High	Not assessed		Indeterminate	NA	Not assessed		Sufficient	High
Drug-specific PROMs for M-TS [e]												
A10 drugs used in diabetes												
PSIT	Indeterminate	NA	Not assessed		Sufficient	Moderate	Indeterminate	NA	Insufficient	Low	Not assessed	
ITSQ	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	Moderate	Sufficient	Moderate
DiabMedSat	Indeterminate	NA	Not assessed		Sufficient	High	Indeterminate	NA	Not assessed		Not assessed	
DTTQ	Not assessed		Not assessed		Sufficient	High	Indeterminate	NA	Not assessed		Not assessed	
SOADAS	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	High	Not assessed	
DM-SAT	Indeterminate	NA	Sufficient	Moderate	Sufficient	Moderate	Indeterminate	NA	Not assessed		Not assessed	
PAM-D	Indeterminate	NA	Not assessed		Sufficient	High	Indeterminate	NA	Sufficient	Low	Not assessed	
PRAM-TSQ	Indeterminate	NA	Not assessed		Insufficient	High	Indeterminate	NA	Not assessed		Not assessed	
OHA-Q	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	Moderate	Not assessed	

Table 3 (continued)

PROM	Structural validity		Construct validity[b]				Internal consistency		Test–retest reliability		Responsiveness [b]	
			Convergent validity		Discriminative or known-groups validity							
	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE
DMSRQ	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	High	Not assessed	
DMSRQ-SF	Not assessed		Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	High	Not assessed	
B01 antithrombotic agents												
DASS	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	Moderate	Not assessed	
PACT-Q	Insufficient	High	Not assessed		Sufficient	High	Indeterminate	NA	Indeterminate	NA	Not assessed	
ACTS	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	High	Sufficient	High
B02 antihemorrhagics												
SQ-ISHI	Not assessed		Not assessed		Not assessed		Not assessed		Not assessed		Not assessed	
B03 antianemic preparations												
SICT	Indeterminate	NA	Sufficient	High	Sufficient	High	Sufficient	High	Not assessed		Not assessed	
ICT-sat	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	High	Indeterminate	NA	Not assessed	
H02 corticosteroids for systemic use												
SSQ	Not assessed		Not assessed		Not assessed		Not assessed		Not assessed		Not assessed	
L01 antineoplastic agents												
RASQ	Not assessed		Sufficient	High	Not assessed		Indeterminate	NA	Not assessed		Not assessed	
L04 immunosuppressants												
PESaM	Sufficient	High	Sufficient	High	Sufficient	High	Sufficient	High	Indeterminate	NA	Not assessed	
TASQ	Not assessed		Not assessed		Not assessed		Not assessed		Not assessed		Not assessed	
N02 analgesics												
SPM	Indeterminate	NA	Not assessed		Not assessed		Indeterminate	NA	Sufficient	Moderate	Sufficient	High
N03 antiepileptics												
Patient satisfaction with antiepileptic drugs/epilepsy treatment	Not assessed		Not assessed		Not assessed		Not assessed		Not assessed		Not assessed	
N05 psycholeptics												
SWAM Scale®	Indeterminate	NA	Not assessed		Not assessed		Indeterminate	NA	Not assessed		Not assessed	
PASAP	Indeterminate	NA	Indeterminate	NA	Not assessed		Indeterminate	NA	Not assessed		Indeterminate	NA
MSQ	Not assessed		Sufficient	High	Sufficient	High	Not assessed		Sufficient	Moderate	Not assessed	
N06 psychoanaleptics												
SAMS	Indeterminate	NA	Not assessed		Not assessed		Indeterminate	NA	Not assessed		Not assessed	
N07 other nervous system drugs												
SASMAT-METHER	Indeterminate	NA	Sufficient	Low	Not assessed		Indeterminate	NA	Indeterminate	NA	Not assessed	

Table 3 (continued)

PROM	Structural validity		Construct validity[b]				Internal consistency		Test–retest reliability		Responsiveness [b]	
			Convergent validity		Discriminative or known-groups validity							
	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE	Rating	GRADE
SASMAT-BUNHER	Indeterminate	NA	Sufficient	High	Not assessed		Indeterminate	NA	Sufficient	Very low	Not assessed	
R03 drugs for obstructive airway diseases												
PSAM	Not assessed		Sufficient	Moderate	Sufficient	Moderate	Indeterminate	NA	Indeterminate	NA	Not assessed	
S01 ophthalmologicals												
EDSQ	Indeterminate	NA	Not assessed		Sufficient	Low	Indeterminate	NA	Not assessed		Not assessed	
V01 allergens												
ESPIA	Indeterminate	NA	Sufficient	High	Sufficient	High	Indeterminate	NA	Sufficient	Moderate	Indeterminate	NA
Not applicable to ATC classification												
TSTMQ [138]	Insufficient	high	Not assessed		Not assessed		Indeterminate	NA	Sufficient	Moderate	Not assessed	

Score: Quality of measurement properties of PROMs: sufficient; insufficient; indeterminate; inconsistent. Quality of the evidence (GRADE): high; moderate; low; very low. Level of recommendations for the use of PROMs: A; B; C

[a] The results of all available studies on a measurement property are quantitatively pooled or qualitatively summarized and compared against the criteria for good measurement properties. The overall ratings of each measurement property will be accompanied by a grading for the quality of the evidence using the GRADE approach [17]

[b] If no hypothesis was set in the original study, the review team defined generic hypotheses as follows: (1) correlations with (changes in) instruments measuring similar constructs should be ≥ 0.50; (2) correlations with (changes in) instruments measuring related, but dissimilar constructs should be lower, i.e., 0.30–0.50; 3); (3) correlations with (changes in) instruments measuring unrelated constructs should be < 0.30; (4) correlations with (changes in) instruments measuring similar constructs should differ by a minimum of 0.10 from correlations with (changes in) instruments measuring related but dissimilar constructs; (5) correlations with (changes in) instruments measuring related but dissimilar constructs should differ by a minimum of 0.10 from correlations with (changes in) instruments measuring unrelated constructs; and (6) meaningful changes between relevant (sub)groups (e.g., patients with expected high versus low levels of the construct of interest) [17]

[c] The classification of PROMs is based on the International Classification of Diseases 11th (ICD-11) Revision (https://icd.who.int/en)

[d] The classification of PROMs is based on the Anatomical Therapeutic Chemical Classification System (ATC) 2nd level—pharmacological or therapeutic subgroup (https://www.who.int/tools/atc-ddd-toolkit/atc-classification)

to demonstrate sufficient content validity (61/69, 88%), structural validity (56/69, 81%), internal consistency (58/69, 84%), or test–retest reliability (45/69, 65%). Few PROMs reported responsiveness (16/69, 23%). Only four PROMs provided an approach for interpreting the results of the PROMs (i.e., the MIDs).

Introduction of the three PROMs for M-TS with sufficient validity and reliability

The ITSQ [42, 43] is a drug-specific PROMs for insulin treatment satisfaction including domains of inconvenience of regimen (5 items), lifestyle flexibility (3 items), glycemic control (3 items), hypoglycemic control (5 items), and insulin delivery device satisfaction (6 items). According to the Allie database (i.e., a database for searching studies in PubMed and MEDLINE that involve a particular abbreviation and long form) [143], 12 trials in adults have applied the ISTQ. Due to unclear recall period and lack of evaluation on content validity, the quality of evidence on the content validity of ITSQ was still low.

Both TSQM-1.4 [25–29] (with 14 items) and SATMED-Q [31, 37–40] (with 17 items) are generic PROMs for adults with chronic diseases. The two PROMs shared four common domains including perceived effectiveness, side effects, convenience, and global satisfaction. The SATMED-Q had two additional domains (i.e., impact on daily living or activity, process of medical care or medical follow-up). The TSQM-1.4 was the most widely used PROMs for M-TS (106 trials applied, 4 of which were in children and adolescents) while SATMED-Q was rarely used in trials (ten trials in adults applied during the last 15 years) [143]. Both PROMs still lack high quality of evidence on content validity and responsiveness.

Limitations of current PROMs for M-TS

Although conceptual framework is not mandatory for developing measures, providing a theoretical foundation facilitates defining key components and their relationships within the construct [6, 7]. Our study revealed that over 70% PROMs did not define a conceptual framework for treatment satisfaction. The existing frameworks draw heavily from Shikiar's pyramid theory [1] and Weaver's concept of treatment satisfaction [142]. These frameworks, however, have limitations on considering the difference between patients with chronic disease and those with acute disease toward treatment satisfaction (e.g., chronic disease patients tend to emphasize long-term outcomes and quality of life, while acute disease patients prioritize immediate relief and symptom management) [144] and the difference between adults and children (e.g., children might prioritize medication side effects and ease of administration, whereas adults focus more on the effectiveness) [145]. These differing priorities highlight the need for PROMs that are tailored to specific disease contexts to accurately capture patient satisfaction. More than half of the PROMs (41/69, 59%) did not clearly report the process of cognitive interviews or other pilot tests of the PROMs damaging the transparency and rigor of the development process [146–148].

Regarding content validity, because the context of use was vague, we rated the relevance of most of the PROMs as indeterminate (e.g., whether the PROMs is for clinical trial or clinical practice, for discriminative, evaluative, or predictive purpose was unclear); due to paucity of justification on the appropriateness of response option and recall period, we rated the comprehensiveness as insufficient; due to lack of justification on the understandability of the PROMs in target population, we rated the comprehensibility as insufficient (Additional file 1: table S6 [25–138]).

Our systematic search found six PROMs for M-TS were developed specifically for children and adolescents. These PROMs, however, lacked of evidence on sufficient validity, reliability, or responsiveness [51, 101, 102, 134–136]. Compared with adults children and adolescents have limited vocabulary, comprehension, and self-awareness, which probably influence their ability to respond accurately to adult-oriented measures [149]. The validity, reliability, responsiveness, and feasibility of the PROMs developed for adults should be evaluated before they are applied in children and adolescents.

According to Allie [143], we found most PROMs were infrequently used with 38% never applied by any trial and 42% applied by less than 5 trials. Patient and Partner Treatment Satisfaction Scale in Erectile Dysfunction (TSS), the second most often used PROM (the first was TSQM), had inconsistent content validity (moderate quality of evidence) (Table 2). The infrequent application of the PROMs for M-TS and wide use of PROMs with poor measurement properties indicates that potential stakeholders (e.g., clinicians or researchers) probably lack awareness and access to validated PROMs for M-TS.

The practical application of self-reporting in M-TS PROMs faces several challenges, particularly for specific populations. Individuals with mental health issues may struggle to report treatment satisfaction accurately due to cognitive impairments or emotional distress [150]. Those with limited digital skills may find electronic PROMs difficult, resulting in incomplete or biased data [151]. Similarly, individuals with reading difficulties or low literacy may misinterpret questions, compromising response reliability [152]. These challenges underscore the need for inclusive PROM design, ensuring accessibility and comprehension for diverse patients. Alternative data collection methods, such as interviews or caregiver reports,

should be considered for those unable to self-report reliably.

Strengths and limitations of this systematic review

We conducted a comprehensive search for current PROMs for M-TS. This review included four Chinese databases, which expanded the scope beyond English-language publications to provide a more comprehensive understanding of M-TS across different cultural contexts and enhance the diversity, comprehensiveness, robustness, and applicability of our systematic review [153]. Following the COSMIN guideline [19, 20] we assessed the measurement properties of the PROMs, risk of bias of individual studies, and rated the quality of body of evidence on the development and validation of the PROMs.

This review has some limitations. First, we only included studies published in English and Chinese and might have missed PROMs for M-TS reported in other languages. Second, poor reporting of individual studies impeded our ability to assess the measurement properties and to rate the quality of evidence. To minimize the impact of ambiguous reporting, we searched for and abstracted data from all available literature for each included PROM. Third, some evaluation criteria for measurement properties were subjective (e.g., for the criteria for content validity: "are all key concepts included?"). We attempted to reduce the difference between reviewers by conducting calibration exercises, duplicated assessments and group discussions when discrepancy occurred. Fourth, we did not recommend PROMs based on the COSMIN guideline criteria (i.e., PROMs that have potential to be recommended as the most suitable PROM for those with evidence for sufficient content validity (any level) and sufficient internal consistency (at least low level) [19, 20]) because we think the evaluation of content validity was subjective. We, however, based on the evaluation of measurement properties, highlighted three PROMs with sufficient validity (particularly construct validity) and reliability (particularly internal consistency).

Recommendations for future research and clinical practice

Confident use of current available PROMs for M-TS will require validation study to assess their measurement properties (especially content validity, test–retest reliability, and responsiveness), interpretability, and feasibility in different context and population. Further studies can pay more attention to assess the measurement properties of current PROMs in children and adolescents or to develop PROMs targeted at this population. Although COSMIN provided a reporting guideline for validation study [154], our review found that the guideline was not widely used. A uniformed standard for reporting the development and validation of PROMs is needed to improve the reporting quality of studies on the development and validation of PROMs for M-TS. Additionally, collaborative efforts among researchers, clinicians, and policymakers are essential to develop and implement robust M-TS PROMs applicable to diverse patient groups. This will bridge the gap between current PROMs and patient needs, enhancing patient care and treatment outcomes.

The implementation of validated and reliable M-TS PROMs in clinical practice can significantly enhance patient care by providing healthcare providers with better tools to assess and address patient satisfaction and treatment outcomes. By accurately capturing patient experiences and preferences, PROMs can help tailor treatments to individual needs, leading to improved adherence and better health outcomes. Moreover, the use of PROMs can facilitate shared decision-making, empowering patients to be active participants in their own care. This patient-centered approach not only improves satisfaction but also contributes to more effective and efficient healthcare delivery. Ensuring that PROMs are culturally sensitive and accessible to all patient groups, including those with mental health issues, limited digital skills, and reading difficulties, is crucial for their widespread adoption and utility in diverse clinical settings.

Conclusions

Most current PROMs for M-TS demonstrated sufficient construct validity while only a few had sufficient content validity, structural validity, internal consistency, and test–retest reliability. Few PROMs reported responsiveness. Confident use of current PROMs requires further evaluation on the validity, reliability, responsiveness, and interpretability of current PROMs. Reporting guidelines are needed to enhance the reporting quality of the development and validation of PROMs for M-TS.

Abbreviations

M-TS	Medication Treatment Satisfaction
PROMs	Patient-reported outcome measures
COSMIN	Consensus-based Standards for the selection of health Measurement Instruments
TSQM	Treatment Satisfaction Questionnaire for Medication
TSQM-1.4	Treatment Satisfaction Questionnaire for Medication initial Version
TSQM-II	Treatment Satisfaction Questionnaire for Medication Version II
TSQM-9	Treatment Satisfaction Questionnaire for Medication—9 items (an abbreviated 9-item TSQM)
SATMED-Q	Treatment Satisfaction with Medicines Questionnaire
ITSQ	Insulin Treatment Satisfaction Questionnaire
PRO	Patient-reported outcome
FDA	US Food and Drug Administration
EMA	European Medicines Agency
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
GRADE	Grading of Recommendations Assessment, Development, and Evaluation
ICC	Intraclass correlation coefficient

RoB	Risk of bias
ICD-11	International Classification of Diseases 11th
ATC	Anatomical Therapeutic Chemical Classification System
CFI	Comparative fit index
TLI	Tucker–Lewis index
RMSEA	Root mean square error of approximation
SRMR	Standardized root mean residuals
AUC	Area under the ROC curve
MID	Minimal important difference
TSS	Patient and Partner Treatment Satisfaction Scale in Erectile Dysfunction
VAS	Visual analogue scale
NR	Information was not reported
PSIT	Patient Satisfaction with Insulin Therapy questionnaire
DiabMedSat	Diabetes Medication Satisfaction Questionnaire
DTTQ	Diabetes Tablet Treatment Questionnaire
SOADAS	Satisfaction with Oral Anti-Diabetic Agents Scale
DM-SAT	Diabetes Medication Satisfaction Questionnaire
PAM-D	Perceptions About Medications for Diabetes questionnaire
PRAM-TSQ	Treatment Satisfaction Associated With Pramlintide Use Questionnaire
DTSQ-IP	Diabetes Treatment Satisfaction Questionnaire for in-patients
OHA-Q	Oral Hypoglycemic Agent Questionnaire
DMSRQ	Diabetes Medication System Rating Questionnaire
DMSRQ-SF	Diabetes Medication System Rating Questionnaire-Short Form
DIDS	Diabetes Impact and Device Satisfaction Questionnaire
ThyTSQ	Underactive Thyroid Treatment Satisfaction Questionnaire
MS-TSQ	Menopause Symptoms Treatment Satisfaction Questionnaire
Acro-TSQ	Acromegaly Treatment Satisfaction Questionnaire
DASS	Duke Anticoagulation Satisfaction Scale
PACT-Q2	Perception of Anticoagulant Treatment Questionnaire 2
ACTS	Anticlot Treatment Scale
PSAM	Patient Satisfaction with Asthma Medication questionnaire
SATQ	Satisfaction with Asthma Treatment Questionnaire
PASAPQ	Patient Satisfaction and Preference Questionnaire
PPMQ	Patient Perception of Migraine Questionnaire
PPMQ-R	Patient Perception of Migraine Questionnaire-Revised
MTSM	Migraine Treatment Satisfaction Measure
SPM	Patient Satisfaction with Pain Medication Questionnaire
PTSS	Pain Treatment Satisfaction Scale
MSTCQ	Multiple Sclerosis Treatment Concerns Questionnaire
CTSQ	Cancer Therapy Satisfaction Questionnaire
RASQ	Rituximab Administration Satisfaction Questionnaire
TSQ-G	Treatment Satisfaction Questionnaire for Gastro-esophageal reflux disease
GTSQ	Gastroesophageal Reflux Disease Treatment Satisfaction Questionnaire
TSQ-C	Treatment Satisfaction Questionnaire for Crohn's Disease
SPACE-Q	Satisfaction of PAtients with Crohn's disease Questionnaire
SWAM Scale ®	Satisfaction With Antipsychotic Medication scale ®
SAMS	Satisfaction with Medication Scale
PASAP	PAtient SAtisfaction with Psychotropics questionnaire
MSQ	Medication Satisfaction Questionnaire
SASMAT-METHER	Satisfaction with Medications for Addiction Treatment-methadone for Heroin Addiction questionnaire
SASMAT-BUNHER	Satisfaction with Medications for Addiction Treatment-Buprenorphine-Naloxone for Heroin addiction questionnaire
HIVTSQs	Human Immunodeficiency Virus (HIV) Treatment Satisfaction Questionnaire—Status version
HIVTSQc	HIV Treatment Satisfaction Questionnaire—Change version
ESTAR	Escala de Satisfacción con el Tratamiento Antirretroviral, Antiretroviral Treatment Satisfaction scale
GHerpTSQ	Genital Herpes Treatment Satisfaction Questionnaire
HCVTSat	Chronic Hepatitis C Virus Treatment Satisfaction questionnaire
TSS-IOP	Treatment Satisfaction Survey for Intraocular Pressure
RetTSQs	Retinopathy Treatment Satisfaction Questionnaire (status)
EDSQ	Eye-Drop Satisfaction Questionnaire
MacTSQ	Macular Disease Treatment Satisfaction Questionnaire
DermaSat	Satisfaction with dermatological treatment of hand eczema questionnaire
OPSAT-Q	Osteoporosis Patient Satisfaction Questionnaire
OAB-S	Overactive Bladder Satisfaction Questionnaire
PESaM	Patient Experiences and Satisfaction with Medications Questionnaire
EDITS	Erectile Dysfunction Inventory of Treatment Satisfaction Questionnaire
ESPIA	Satisfaction Scale for Patients Receiving Allergen Immunotherapy Questionnaire
SSQ	Systemic Lupus Erythematosus Steroid Questionnaire
SICT	Satisfaction with Iron Chelation Therapy Questionnaire
ICT-Sat	Satisfaction with Iron Chelation Therapy for patients questionnaire
SQ-ISHI	Satisfaction Questionnaire with Intravenous or Subcutaneous Hemophilia Injection
TASQ	Therapy Administration Satisfaction Questionnaire
TASQ-SC	Therapy Administration Satisfaction Questionnaire—subcutaneous
TASQ-IV	Therapy Administration Satisfaction Questionnaire—intravenous
TSTMQ	Treatment Satisfaction with Traditional Medicines Questionnaire

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12916-024-03560-3.

Additional file 1: Tables S1-S7. Table S1 - Search Resources and Search Strategies. Table S2 - Definitions of Measurement Properties and Criteria for Assessing Measurement Properties. Table S3 - Grading of Quality of Evidence. Table S4 - Characteristics of Individual Studies. Table S5 - Summary of the Current Theories and Conceptual Frameworks for Medication Treatment Satisfaction. Table S6 - Measurement Properties Reported by Individual Studies and Risk of Bias of Individual Studies. Table S7 - Interpretability evidence of the PROMs.

Additional file 2. The PRISMA 2020 checklist.

Acknowledgements
None.

Authors' contributions
All authors read and approved the final manuscript. MTY: Concept and design, acquisition, analysis, or interpretation of data, drafting of the manuscript, and statistical analysis. LNZ: Concept and design, acquisition, analysis, or interpretation of data, administrative, technical, or material support, critical revision of the manuscript for important intellectual content, and supervision. ZLL: Obtained funding, administrative, technical, or material support, and supervision. PWZ: Acquisition, analysis, or interpretation of data, critical revision of the manuscript for important intellectual content, and statistical analysis. JH: Concept and design, critical revision of the manuscript for important intellectual content, and administrative, technical, or material support. XRJ, SYZ, WYY, XYJ, YXL: Acquisition, analysis, or interpretation of data. GG, IC, LH, KZ, XXL, HQW: Critical revision of the manuscript for important intellectual content. All authors had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Funding
A grant from the medical cross key project of Sichuan University, China (to Lingli Zhang) supported this work.

Availability of data and materials
All data in this systematic review are publicly available. All extracted data are available in the online supplementary files.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
[1]Department of Pharmacy/Evidence-Based Pharmacy Center, West China Second University Hospital, Sichuan University, Chengdu, China. [2]Children's Medicine Key Laboratory of Sichuan Province, Chengdu, China. [3]NMPA Key Laboratory for Technical Research On Drug Products In Vitro and In Vivo Correlation, Chengdu, China. [4]Key Laboratory of Birth Defects and Related Diseases of Women and Children, Sichuan University, Ministry of Education, Chengdu, China. [5]West China School of Medicine, Sichuan University, Chengdu, China. [6]The Matilda Centre for Research in Mental Health and Substance Use, University of Sydney, Camperdown, NSW, Australia. [7]Joseph's Healthcare Hamilton (SJHH), Research Institute of St. Joe's Hamilton Mental Health and Addictions Research Program, McMaster University, Hamilton, ON, Canada. [8]School of Medicine, University of Nottingham, Nottingham, UK. [9]West China School of Pharmacy, Sichuan University, Chengdu, China. [10]Department of Paediatric Haematology and Oncology, West China Second Hospital, Sichuan University, Chengdu, China. [11]Medical Simulation Centre, West China Second University Hospital, Sichuan University, Chengdu, Sichuan, China. [12]School of Mathematics, Sichuan University, Chengdu, China. [13]Chinese Evidence-Based Medicine Center, West China Hospital, Sichuan University, Chengdu, China. [14]Department of Health Research Methods, Evidence, and Impact, McMaster University, Hamilton, ON, Canada. [15]Department of Medicine, McMaster University, Hamilton, ON, Canada.

Received: 13 January 2024 Accepted: 13 August 2024
Published online: 02 September 2024

References

1. Shikiar R, Rentz AM. Satisfaction with medication: an overview of conceptual, methodologic, and regulatory issues. Value Health. 2004;7(2):204–15. https://doi.org/10.1111/j.1524-4733.2004.72252.x.
2. U.S. Food and Drug Administration (FDA). FDA patient-focused drug development guidance series for enhancing the incorporation of the patient's voice in medical product development and regulatory decision making. 2018–2023. [Online]. Available at: https://www.fda.gov/drugs/development-approval-process-drugs/fda-patient-focused-drug-development-guidance-series-enhancing-incorporation-patients-voice-medical. Accessed 18 Aug 2023.
3. European Medicines Agency Committee for Medicinal Products for Human Use. 2 to the Guideline on the Evaluation of Anticancer Medicinal Products in Man: The Use of Patient-Reported Outcome (PRO) Measures in Oncology Studies EMA/CHMP/292464/2014. London, England: European Medicines Agency; 2016.
4. Tunis SR, Stryer DB, Clancy CM. Practical clinical trials increasing the value of clinical research for decision making in clinical and health policy. JAMA. 2003;290(12):1624–32. https://doi.org/10.1001/jama.290.12.1624.
5. Barbosa CD, Balp MM, Kulich K, Germain N, Rofail D. A literature review to explore the link between treatment satisfaction and adherence, compliance, and persistence. Patient Prefer Adherence. 2012;6:39–48. https://doi.org/10.2147/ppa.S24752.
6. DeVellis RF, Thorpe CT. Scale Development: Theory and Applications. 5th ed. Thousand Oaks, CA: SAGE Publications; 2021.
7. U.S. Food and Drug Administration (FDA). Guidance for industry: patient-reported outcome measures: use in medical product development to support labeling claims. Silver Spring, MD: US Food and Drug Administration; 2009.
8. Black N. Patient reported outcome measures could help transform healthcare. BMJ. 2013;346:f167. https://doi.org/10.1136/bmj.f167.
9. Krogsgaard MR, Brodersen J, Jensen J, Hansen CF, Comins JD. Potential problems in the use of patient reported outcome measures (PROMs) and reporting of PROMs data in sports science. Scand J Med Sci Sports. 2021;31(6):1249–58. https://doi.org/10.1111/sms.13888.
10. Mokkink LB, Prinsen CA, Bouter LM, Vet HC, Terwee CB. The COnsensus-based Standards for the selection of health Measurement INstruments (COSMIN) and how to select an outcome measurement instrument. Braz J Phys Ther. 2016;20(2):105–13. https://doi.org/10.1590/bjpt-rbf.2014.0143.
11. Ioannidis JPA, Greenland S, Hlatky MA, et al. Increasing value and reducing waste in research design, conduct, and analysis. Lancet. 2014;383(9912):166–75. https://doi.org/10.1016/S0140-6736(13)62227-8.
12. Rofail D, Taylor F, Regnault A, Filonenko A. Treatment satisfaction instruments for different purposes during a product's lifecycle: keeping the end in mind. Patient. 2011;4(4):227–40. https://doi.org/10.2165/11595280-000000000-00000.
13. Bharmal M, Viswanathan S. Treatment satisfaction with medication: a review of conceptual frameworks and applications. Value Health. 2010;13(7):A338. https://doi.org/10.1016/S1098-3015(11)72335-X.
14. Guglieri M, Bushby K, McDermott MP, et al. Effect of different corticosteroid dosing regimens on clinical outcomes in boys with Duchenne muscular dystrophy: a randomized clinical trial. JAMA. 2022;327(15):1456–68. https://doi.org/10.1001/jama.2022.4315.
15. Buse JB, Nauck M, Forst T, et al. Exenatide once weekly versus liraglutide once daily in patients with type 2 diabetes (duration-6): a randomised, open-label study. Lancet. 2013;381(9861):117–24. https://doi.org/10.1016/S0140-6736(12)61267-7.
16. Basch E, Reeve BB, Mitchell SA, et al. Development of the national cancer institute's patient-reported outcomes version of the common terminology criteria for adverse events (PRO-CTCAE). *JNCI: Journal of the National Cancer Institute.* 2014;106(9). https://doi.org/10.1093/jnci/dju244.
17. Sælen MG, Hjelle LV, Aarsæther E, et al. Patient-reported outcomes after curative treatment for prostate cancer with prostatectomy, primary radiotherapy or salvage radiotherapy. Acta Oncologica. 2023;62(6):657–65. https://doi.org/10.1080/0284186X.2023.2224051.
18. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. https://doi.org/10.1136/bmj.n71.
19. Prinsen CAC, Mokkink LB, Bouter LM, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. Qual Life Res. 2018;27(5):1147–57. https://doi.org/10.1007/s11136-018-1798-3.
20. Mokkink LB, Prinsen CA, Patrick DL, Alonso J, Bouter LM, De Vet HC, et al. COSMIN methodology for systematic reviews of Patient-Reported Outcome Measures (PROMs) - user manual version 1.0 February. 2018. Available at: https://cosmin.nl/wp-content/uploads/COSMIN-syst-review-for-PROMs-manual_version-1_feb-2018.pdf. Accessed 23 May 2023.
21. Terwee CB, Prinsen CA, Chiarotto A, et al. COSMIN methodology for assessing the content validity of PROMs - user manual version 1.0 February. 2018. Available at: https://cosmin.nl/wp-content/uploads/COSMIN-methodology-for-content-validity-user-manual-v1.pdf. Accessed 23 May 2023.
22. Terwee CB, Bot SDM, de Boer MR, et al. Quality criteria were proposed for measurement properties of health status questionnaires. J Clin Epidemiol. 2007;60(1):34–42. https://doi.org/10.1016/j.jclinepi.2006.03.012.
23. Mokkink LB, de Vet HCW, Prinsen CAC, et al. COSMIN risk of bias checklist for systematic reviews of patient-reported outcome measures. Qual Life Res. 2018;27(5):1171–9. https://doi.org/10.1007/s11136-017-1765-4.
24 Guyatt G, Oxman AD, Akl EA, et al. GRADE guidelines: 1. Introduction—GRADE evidence profiles and summary of findings tables. J Clin Epidemiol. 2011;64(4):383–94. https://doi.org/10.1016/j.jclinepi.2010.04.026.
25. Atkinson MJ, Sinha A, Hass SL, et al. Validation of a general measure of treatment satisfaction, the treatment satisfaction questionnaire for medication (TSQM), using a national panel study of chronic disease. Health Qual Life Outcomes. 2004;2(1):12. https://doi.org/10.1186/1477-7525-2-12.
26. Regnault A, Balp MM, Kulich K, Viala-Danten M. Validation of the treatment satisfaction questionnaire for medication in patients with cystic fibrosis. J Cyst Fibros. 2012;11(6):494–501. https://doi.org/10.1016/j.jcf.2012.04.007.
27 Trujols J, Iraurgi I, Sinol N, Portella MJ, de los Cobos JP, et al. Satisfaction with methadone as a medication psychometric properties of the Spanish version of the treatment satisfaction questionnaire for medication.

J Clin Psychopharmacol. 2012;32(1):69–74. https://doi.org/10.1097/JCP.0b013e3182401e09.
28. Shilbayeh SAR, Alyahya SA, Alshammari NH, Almutairi WA, Shaheen E. Treatment satisfaction questionnaire for medication: validation of the translated Arabic version among patients undergoing warfarin therapy in Saudi Arabia. Value Health Reg Issues. 2018;16:14–21. https://doi.org/10.1016/j.vhri.2018.01.007.
29 AL-M LAI, Allela OQB, Salih HM, Ahmed IH. Medication satisfaction in diabetic patients: Kurdish version. J Public Health (Berl). 2020;30(4):879–84. https://doi.org/10.1007/s10389-020-01367-z.
30. Atkinson MJ, Kumar R, Cappelleri JC, Hass SL. Hierarchical construct validity of the treatment satisfaction questionnaire for medication (TSQM Version II) among outpatient pharmacy consumers. Value Health. 2005;8:S9–24. https://doi.org/10.1111/j.1524-4733.2005.00066.x.
31. Delestras S, Roustit M, Bedouch P, et al. Comparison between two generic questionnaires to assess satisfaction with medication in chronic diseases. PLoS ONE. 2013;8(2):e56247. https://doi.org/10.1371/journal.pone.0056247.
32. Shang YB, Liu HX, Yu LX, et al. Transcultural adaptation of the treatment satisfaction questionnaire for medication. *Chin Nurs Manag*. 2018;18(05):612-616. Available at: http://www.zghlgl.com/EN/https://doi.org/10.3969/j.issn.1672-1756.2018.05.008. 23 May 2023.
33. Shen ZY, Ding SQ, Zhong ZQ, Shi SJ, Li SG.Validity and reliability of the Chinese version of the treatment satisfaction questionnaire for medication-second edition in patients with hypertension. Chin Men. Health J. 2021;35(04):277-283. Available at: https://kns.cnki.net/kcms/detail/11.1873.R.20210309.1832.008.html. 23 May 2023.
34. Watanabe-Fujinuma E, Banderas BF, Koretsune Y, et al. Psychometric validation of anti-clot treatment scale and treatment satisfaction questionnaire for medication version II in Japanese patients with atrial fibrillation. J Med Econ. 2019;22(8):798–805. https://doi.org/10.1080/13696998.2019.1609003.
35. Abdshah A, Parsaeian M, Nasimi M, Ghiasi M. Validating the "treatment satisfaction questionnaire for medication" in Persian and evaluating treatment satisfaction among patients with psoriasis. Value Health Reg Issues. 2022;29:16–20. https://doi.org/10.1016/j.vhri.2021.06.008.
36. Bharmal M, Payne K, Atkinson MJ, Desrosiers MP, Morisky DE, Gemmen E. Validation of an abbreviated treatment satisfaction questionnaire for medication (TSQM-9) among patients on antihypertensive medications. Health Qual Life Outcomes. 2009;7:36. https://doi.org/10.1186/1477-7525-7-36.
37. Ruiz MA, Pardo A, Rejas J, Soto J, Villasante F, Aranguren JL. Development and validation of the "treatment satisfaction with medicines questionnaire" (SATMED-Q)©. Value Health. 2008;11(5):913–26. https://doi.org/10.1111/j.1524-4733.2008.00323.x.
38. Rejas J, Ruiz M, Pardo A, Soto J. Detecting changes in patient treatment satisfaction with medicines: the SATMED-Q. Value Health. 2013;16(1):88–96. https://doi.org/10.1016/j.jval.2012.08.2224.
39. López-Torres López J, Rabanales-Sotos J, López-Torres Hidalgo MR, MiliánGarcía RM, LópezMartínez C, Blázquez Abellán G. Reliability and validity of the treatment satisfaction with medicines questionnaire (SATMED-Q) in persons with arterial hypertension. Int J Environ Res Public Health. 2021;18(6):3212. https://doi.org/10.3390/ijerph18063212.
40. Świątoniowska-Lonc N, Kołtuniuk A, Jankowska-Polańska B. Psychometric properties of the treatment satisfaction with medicines questionnaire (SATMED-Q) in patients with diabetes, arterial hypertension and heart failure. Int J Environ Res Public Health. 2022;19(3):1088. https://doi.org/10.3390/ijerph19031088.
41. Cappelleri JC, Gerber RA, Kourides IA, Gelfand RA. Development and factor analysis of a questionnaire to measure patient satisfaction with injected and inhaled insulin for type 1 diabetes. Diabetes Care. 2000;23(12):1799–803. https://doi.org/10.2337/diacare.23.12.1799.
42. Anderson RT, Skovlund SE, Marrero D, et al. Development and validation of the insulin treatment satisfaction questionnaire. Clin Ther. 2004;26(4):565–78. https://doi.org/10.1016/S0149-2918(04)90059-8.
43. Brod M, Christensen T, Bushnell D. Maximizing the value of validation findings to better understand treatment satisfaction issues for diabetes. Qual Life Res. 2007;16(6):1053–63. https://doi.org/10.1007/s11136-007-9209-1.
44. Brod M, Skovlund SE, Wittrup-Jensen KU. Measuring the impact of diabetes through patient report of treatment satisfaction, productivity and symptom experience. Qual Life Res. 2006;15(3):481–91. https://doi.org/10.1007/s11136-005-1624-6.
45. Woodcock A, Bain S, Charlton M, Bradley C. Extent of satisfaction with tablets and food-timing in sulphonyl urea-treated diabetes. Diabetes Res Clin Pract. 2007;78(3):324–33. https://doi.org/10.1016/j.diabres.2005.07.013.
46. Donatti C, Wild D, Horblyuk R, et al. Psychometric evaluation of the satisfaction with oral anti-diabetic agent scale (SOADAS). Diabetes Res Clin Pract. 2008;80(1):108–13. https://doi.org/10.1016/j.diabres.2007.11.005.
47. Lin YJ, Wang CY, Chang EH, Cheng SW, Ko Y. Translation, revision, and validation of the Chinese version of the satisfaction with oral anti-diabetic agent scale (C-SOADAS) in patients with type 2 diabetes mellitus. Patient Prefer Adherence. 2018;12:667–72. https://doi.org/10.2147/ppa.S162268.
48. Anderson RT, Girman CJ, Pawaskar MD, et al. Diabetes medication satisfaction tool: a focus on treatment regimens. Diabetes Care. 2009;32(1):51–3. https://doi.org/10.2337/dc08-0856.
49. Monahan PO, Lane KA, Hayes RP, McHorney CA, Marrero DG. Reliability and validity of an instrument for assessing patients' perceptions about medications for diabetes: the PAM-D. Qual Life Res. 2009;18(7):941–52. https://doi.org/10.1007/s11136-009-9510-2.
50. Rubin RR, Peyrot M. Psychometric properties of an instrument for assessing treatment satisfaction associated with pramlintide use. Diabetes Educ. 2009;35(1):136–46. https://doi.org/10.1177/0145721708326989.
51. Sampson MJ, Singh H, Dhatariya KK, Jones C, Walden E, Bradley C. Psychometric validation and use of a novel diabetes in-patient treatment satisfaction questionnaire. Diabet Med. 2009;26(7):729–35. https://doi.org/10.1111/j.1464-5491.2009.02754.x.
52. Ishii H, Oda E. Reproducibility and validity of a satisfaction questionnaire on hypoglycemic agents: the oral hypoglycemic agent questionnaire (OHA-Q). Diabetol Int. 2012;3(3):152–63. https://doi.org/10.1007/s13340-012-0074-y.
53. Peyrot M, Harshaw Q, Shillington AC, Xu Y, Rubin RR. Validation of a tool to assess medication treatment satisfaction in patients with type 2 diabetes: the diabetes medication system rating questionnaire (DMSRQ). Diabet Med. 2012;29(8):1060–6. https://doi.org/10.1111/j.1464-5491.2011.03538.x.
54. Peyrot M, Xu Y, Rubin RR. Development and validation of the diabetes medication system rating questionnaire-short form. Diabet Med. 2014;31(10):1237–44. https://doi.org/10.1111/dme.12453.
55. Manning ML, Singh H, Stoner K, Habif S. The development and psychometric validation of the diabetes impact and device satisfaction scale for individuals with type 1 diabetes. J Diabetes Sci Technol. 2020;14(2):309–17. https://doi.org/10.1177/1932296819897976.
56 Mcmillan CV, Bradley C, Woodcock A, Razvi S, Weaver JU. Design of new questionnaires to measure quality of life and treatment satisfaction in hypothyroidism. Thyroid. 2004;14(11):916–25. https://doi.org/10.1089/thy.2004.14.916.
57. McMillan C, Bradley C, Razvi S, Weaver J. Psychometric evaluation of a new questionnaire measuring treatment satisfaction in hypothyroidism: the ThyTSQ. Value Health. 2006;9(2):132–9. https://doi.org/10.1111/j.1524-4733.2006.00091.x.
58. Hill CD, Fehnel SE, Bobula JD, Yu H, McLeod LD. Development and preliminary validation of the menopause symptoms treatment satisfaction questionnaire (MS-TSQ). Menopause. 2007;14(6):1047–55. https://doi.org/10.1097/gme.0b013e31803816b8.
59. Fleseriu M, Fogelfeld L, Gordon MB, et al. Development of a novel patient-reported measure for acromegaly: the Acro-TSQ. Pituitary. 2019;22(6):581–93. https://doi.org/10.1007/s11102-019-00986-4.
60. Fleseriu M, Fogelfeld L, Gordon MB, et al. An evaluation of the acromegaly treatment satisfaction questionnaire (Acro-TSQ) in adult patients with acromegaly, including correlations with other patient-reported outcome measures: data from two large multicenter international studies. Pituitary. 2020;23(4):347–58. https://doi.org/10.1007/s11102-020-01038-y.
61. Samsa G, Matchar DB, Dolor RJ, et al. A new instrument for measuring anticoagulation-related quality of life: development and preliminary validation. Health Qual Life Outcomes. 2004;2:22. https://doi.org/10.1186/1477-7525-2-22.

62. Pelegrino FM, Dantas RA, Corbi IS, da Silva Carvalho AR, Schmidt A, Pazin FA. Cross-cultural adaptation and psychometric properties of the Brazilian-Portuguese version of the duke anticoagulation satisfaction scale. J Clin Nurs. 2012;21(17–18):2509–17. https://doi.org/10.1111/j.1365-2702.2011.03869.x.
63. Riva N, Borg Xuereb C, Ageno W, Makris M, Gatt A. Validation and psychometric properties of the Maltese version of the duke anticoagulation satisfaction scale (DASS). Psychol Res Behav Manag. 2019;12:741–52. https://doi.org/10.2147/prbm.S216617.
64. AlAmmari M, Sultana K, AlHarbi SN, et al. Validation and psychometric properties of the Arabic version of the duke anticoagulation satisfaction scale (DASS). Original Research. *Front Pharmacol.* 2020;11. https://doi.org/10.3389/fphar.2020.587489.
65. Wu Y, Dong S, Li X, Xu H, Xie X. The transcultural adaptation and validation of the Chinese version of the duke anticoagulation satisfaction scale. Front Pharmacol. 2022;13:790293. https://doi.org/10.3389/fphar.2022.790293.
66. Prins MH, Guillemin I, Gilet H, et al. Scoring and psychometric validation of the perception of anticoagulant treatment questionnaire (PACT-Q). Health Qual Life Outcomes. 2009;7:30. https://doi.org/10.1186/1477-7525-7-30.
67. Riva N, Borg Xuereb C, Makris M, Ageno W, Gatt A. Reliability and validity of the Maltese version of the perception of anticoagulant treatment questionnaire (PACT-Q). Patient Prefer Adherence. 2019;13:969–79. https://doi.org/10.2147/ppa.S207498.
68. Cano SJ, Lamping DL, Bamber L, Smith S. The anti-clot treatment scale (ACTS) in clinical trials: cross-cultural validation in venous thromboembolism patients. Health Qual Life Outcomes. 2012;10:120. https://doi.org/10.1186/1477-7525-10-120.
69. Suárez C, Pose A, Montero-Pérez-Barquero M, et al. Validation of satisfaction questionnaire ACTS in outpatients with atrial fibrillation treated with oral anticoagulants in Spain. ALADIN study Med Clin (Barc). 2016;147(5):192–8. https://doi.org/10.1016/j.medcli.2016.05.024.
70 Comuth WJ, Lauridsen HH, Kristensen SD, Münster A-MB. Translation, cultural adaptation, and psychometric properties of the Danish version of the anti-clot treatment scale. TH Open. 2018;02(03):e280–90. https://doi.org/10.1055/s-0038-1670631.
71. Shilbayeh SAR, Ibrahim AA. The anti-clot treatment scale (ACTS): validation of the translated Arabic version among patients undergoing warfarin therapy in Saudi Arabia. Health Qual Life Outcomes. 2020;18(1):215. https://doi.org/10.1186/s12955-020-01471-4.
72. Shilbayeh SAR, Ismail S. Translation, pilot psychometric validation, and comparative performance of the Arabic version of the anti-clot treatment scale (ACTS). J Pharm Bioallied Sci. 2021;13(1):61–8. https://doi.org/10.4103/jpbs.JPBS_395_20.
73. Yi YL. Translation and preliminary application of the anti-clot treatment scale (ACTS). Nanhua University, China; 2021. https://doi.org/10.27234/d.cnki.gnhuu.2021.000959.
74. Mathias SD, Warren EH, Colwell HH, Sung JC. A new treatment satisfaction measure for asthmatics: a validation study. Qual Life Res. 2000;9(7):873–82. https://doi.org/10.1023/a:1008913209828.
75. Campbell JL, Kiebert GM, Partridge MR. Development of the satisfaction with inhaled asthma treatment questionnaire. Eur Respir J. 2003;22(1):127–34. https://doi.org/10.1183/09031936.03.00097503.
76 Martin Fernandez J, Barcina Sanchez C, Jimenez Barcia FJ, Marazuela Bermejo R. Validation study of the Spanish adaptation of the satisfaction with inhaled asthma treatment questionnaire. Arch Bronconeumol. 2006;42(11):575.
77. Dońka K, Czarnocki KJ, Emeryk A. Validation of the polish version of satisfaction with asthma treatment questionnaire (SATQ). Postepy Dermatol Alergol. 2017;34(1):77–81. https://doi.org/10.5114/ada.2017.65625.
78. Kozma CM, Slaton TL, Monz BU, Hodder R, Reese PR. Development and validation of a patient satisfaction and preference questionnaire for inhalation devices. Treat Respir Med. 2005;4(1):41–52. https://doi.org/10.2165/00151829-200504010-00005.
79. Davis KH, Black L, Sleath B. Validation of the patient perception of migraine questionnaire. Value Health. 2002;5(5):422–30. https://doi.org/10.1046/J.1524-4733.2002.55120.x.
80. Revicki DA, Kimel M, Beusterien K, et al. Validation of the revised patient perception of migraine questionnaire: measuring satisfaction with acute migraine treatment. Headache. 2006;46(2):240–52. https://doi.org/10.1111/j.1526-4610.2006.00289.x.
81. Kimel M, Hsieh R, McCormack J, Burch S, Revicki D. Validation of the revised patient perception of migraine questionnaire (PPMQ-R): measuring satisfaction with acute migraine treatment in clinical trials. Cephalalgia. 2008;28(5):510–23. https://doi.org/10.1111/j.1468-2982.2007.01524.x.
82. Patrick DL, Martin ML, Bushmell DM, Pesa J. Measuring satisfaction with migraine treatment: expectations, importance, outcomes, and global ratings. Clin Ther. 2003;25(11):2920–35. https://doi.org/10.1016/S0149-2918(03)80345-4.
83. Martin ML, Patrick DL, Bushnell DM, Gandra SR, Gilchrist K. Further validation of an individualized migraine treatment satisfaction measure. Value Health. 2008;11(5):904–12. https://doi.org/10.1111/j.1524-4733.2008.00320.x.
84. Baró E, Casado A, García-Cases C, Clerch L, Ribas S. Assessing satisfaction with pain medication in primary care patients: development and psychometric validation of a new measure. Clin Ther. 2004;26(7):1124–36. https://doi.org/10.1016/s0149-2918(04)90185-3.
85. Evans CJ, Trudeau E, Mertzanis P, et al. Development and validation of the pain treatment satisfaction scale (PTSS): a patient satisfaction questionnaire for use in patients with chronic or acute pain. Pain. 2004;112(3):254–66. https://doi.org/10.1016/j.pain.2004.09.005.
86. Wong WS, Chen PP, Chow YF, Wong S, Fielding R. The reliability and validity of the Cantonese version of the pain treatment satisfaction scale (ChPTSS) in a sample of Chinese patients with chronic pain. Pain Med. 2015;16(12):2316–23. https://doi.org/10.1111/pme.12790.
87. Cramer JA, Cuffel BJ, Divan V, Al-Sabbagh A, Glassman M. Patient satisfaction with an injection device for multiple sclerosis treatment. Acta Neurol Scand. 2006;113(3):156–62. https://doi.org/10.1111/j.1600-0404.2005.00568.x.
88. Muntéis Olivas E, Navarro Mascarell G, Meca Lallana J, et al. Cultural adaptation and validation of a peninsular Spanish version of the MSTCQ (©) (multiple sclerosis treatment concerns questionnaire). Neurologia. 2017;32(1):29–39. https://doi.org/10.1016/j.nrl.2014.12.011.
89. Biraben A, Allaf B. An instrument to assess patient satisfaction with epilepsy treatment. Epilepsy Behav. 2015;43:24–9. https://doi.org/10.1016/j.yebeh.2014.11.031.
90. Abetz L, Coombs JH, Keininger DL, et al. Development of the cancer therapy satisfaction questionnaire: item generation and content validity testing. Value Health. 2005;8:S41–53. https://doi.org/10.1111/j.1524-4733.2005.00073.x.
91. Trask PC, Tellefsen C, Espindle D, Getter C, Hsu M-A. Psychometric validation of the cancer therapy satisfaction questionnaire. Value Health. 2008;11(4):669–79. https://doi.org/10.1111/j.1524-4733.2007.00310.x.
92. Park SJ, An SM, Kim SH. Development of a Korean version of the cancer therapy satisfaction questionnaire (CTSQ): cross-cultural adaptation, reliability, and validity. Qual Life Res. 2013;22(2):431–6. https://doi.org/10.1007/s11136-012-0164-0.
93. Cheung K, de Mol M, Visser S, Den Oudsten BL, Stricker BH, Aerts JGJV. Reliability and validity of the cancer therapy satisfaction questionnaire in lung cancer. Qual Life Res. 2016;25(1):71–80. https://doi.org/10.1007/s11136-015-1062-z.
94. Norhaliza Abd H, Nur Amirah H, Nizuwan A, Mohammad Farris Iman Leong Bin A. Validation of the Malay version of the cancer therapy satisfaction questionnaire among Malaysian cancer patients. *Malaysian J Public Health Med.* 2021;21(1):274–285. https://doi.org/10.37268/mjphm/vol.21/no.1/art.845.
95. Theodore-Oklota C, Humphrey L, Wiesner C, Schnetzler G, Hudgens S, Campbell A. Validation of a treatment satisfaction questionnaire in non-Hodgkin lymphoma: assessing the change from intravenous to subcutaneous administration of rituximab. Patient Prefer Adherence. 2016;10:1767–76. https://doi.org/10.2147/ppa.S108489.
96. Coyne KS, Wiklund I, Schmier J, Halling K, Degl'Innocenti A, Revicki D. Development and validation of a disease-specific treatment satisfaction questionnaire for gastro-oesophageal reflux disease. Aliment Pharmacol Ther. 2003;18(9):907–15. https://doi.org/10.1046/j.1365-2036.2003.01674.x.
97. Shikiar R, Flood E, Siddique R, Howell J, Dodd SL. Development and validation of the gastroesophageal reflux disease treatment satisfaction

questionnaire. Dig Dis Sci. 2005;50(11):2025–33. https://doi.org/10.1007/s10620-005-3002-1.
98. Coyne K, Joshua-Gotlib S, Kimel M, Thompson C, Lewis A, Danilewitz M. Validation of the treatment satisfaction questionnaire for Crohn's disease (TSQ-C). Dig Dis Sci. 2005;50(2):252–8. https://doi.org/10.1007/s10620-005-1591-3.
99. Marant C, Arnould B, Marrel A, et al. Assessing patients' satisfaction with anti-TNFα treatment in Crohn's disease: qualitative steps of the development of a new questionnaire. Clin Exp Gastroenterol. 2011;4:173–80. https://doi.org/10.2147/CEG.S18585.
100. Gilet H, Arnould B, Fofana F, et al. Measuring patients' satisfaction with their anti-TNF treatment in severe Crohn's disease: scoring and psychometric validation of the satisfaction for patients in Crohn's disease questionnaire (SPACE-Q©). Patient Prefer Adherence. 2014;8:1671–81. https://doi.org/10.2147/PPA.S72004.
101. Rofail D, Gray R, Gournay K. The development and internal consistency of the satisfaction with antipsychotic medication scale. Psychol Med. 2005;35(7):1063–72. https://doi.org/10.1017/s0033291705004526.
102 Görtz-Dorten A, Breuer D, Hautmann C, Rothenberger A, Döpfner M. What contributes to patient and parent satisfaction with medication in the treatment of children with ADHD? A report on the development of a new rating scale. Eur Child Adolesc Psychiatry. 2011;20 Suppl2(Suppl 2):S297-307. https://doi.org/10.1007/s00787-011-0207-z.
103. Nordon C, Falissard B, Gerard S, et al. Patient satisfaction with psychotropic drugs: validation of the patient satisfaction with psychotropic (PASAP) scale in patients with bipolar disorder. Eur Psychiatry. 2014;29(3):183–90. https://doi.org/10.1016/j.eurpsy.2013.03.001.
104 Kalali A. Patient satisfaction with, and acceptability of, atypical antipsychotics. Curr Med Res Opin. 1999;15(2):135–7. https://doi.org/10.1185/03007999909113374.
105. Vernon MK, Revicki DA, Awad AG, et al. Psychometric evaluation of the medication satisfaction questionnaire (MSQ) to assess satisfaction with antipsychotic medication among schizophrenia patients. Schizophr Res. 2010;118(1):271–8. https://doi.org/10.1016/j.schres.2010.01.021.
106 de los Cobos JP, Trujols J, Siñol N, Batlle F. Development and validation of the scale to assess satisfaction with medications for addiction treatment-methadone for heroin addiction (SASMAT-METHER). Drug Alcohol Depend. 2014;142:79–85. https://doi.org/10.1016/j.drugalcdep.2014.05.024.
107 de los Pérez Cobos J, Trujols J, Alcaraz S, Siñol N, Lozano Ó, González-Saiz F. Development and validation of the scale to assess satisfaction with medications for addiction treatment - buprenorphine-naloxone for heroin addiction (SASMAT-BUNHER). Int J Drug Policy. 2018;58:126–34. https://doi.org/10.1016/j.drugpo.2018.06.007.
108. Woodcock A, Bradley C. Validation of the HIV treatment satisfaction questionnaire (HIVTSQ). Qual Life Res. 2001;10(6):517–31. https://doi.org/10.1023/a:1013050904635.
109. Woodcock A, Bradley C. Validation of the revised 10-item HIV treatment satisfaction questionnaire status version and new change version. Value Health. 2006;9(5):320–33. https://doi.org/10.1111/j.1524-4733.2006.00121.x.
110. Ventura Cerdá JM, Casado Gómez MA, Morales González JM, Ortega Valín L, Ibarra Barruéta O, Escobar RI. Psychometric characteristics of the antiretroviral treatment satisfaction scale (ESTAR): ARPAS study (I). Farm Hosp. 2007;31(6):331–9. https://doi.org/10.1016/s1130-6343(07)75405-3.
111. Taback NA, Bradley C. Validation of the genital herpes treatment satisfaction questionnaire (GHerpTSQ) in status and change versions. Qual Life Res. 2006;15(6):1043–52. https://doi.org/10.1007/s11136-006-0048-2.
112. Szeinbach SL, Baran RW, Dietz B, Gazzouola Rocca L, Littlefield D, Yawn BP. Development and validation of the chronic hepatitis C virus treatment satisfaction (HCVTSat) instrument. Aliment Pharmacol Ther. 2013;37(5):573–82. https://doi.org/10.1111/apt.12202.
113. Atkinson MJ, Stewart WC, Fain JM, et al. A new measure of patient satisfaction with ocular hypotensive medications: the treatment satisfaction survey for intraocular pressure (TSS-IOP). Health Qual Life Outcomes. 2003;1:67. https://doi.org/10.1186/1477-7525-1-67.
114 Woodcock A, Bradley C, Plowright R, Ffytche T, Kennedy-Martin T, Hirsch A. The influence of diabetic retinopathy on quality of life: interviews to guide the design of a condition-specific, individualised questionnaire: The RetDQoL. Patient Educ Couns. 2004;53(3):365–83. https://doi.org/10.1016/j.pec.2003.10.007.
115. Brose LS, Bradley C. Psychometric development of the retinopathy treatment satisfaction questionnaire (RetTSQ). Psychol Health Med. 2009;14(6):740–54. https://doi.org/10.1080/13548500903431485.
116. Karadzic J, Stojkovic M, Risimic D, et al. Cross-cultural validation of the retinopathy treatment satisfaction questionnaire status version (RetTSQs) in Serbian community: a cross-sectional study. BMJ Open. 2020;10(1):e031236. https://doi.org/10.1136/bmjopen-2019-031236.
117. Nordmann J-P, Denis P, Vigneux M, Trudeau E, Guillemin I, Berdeaux G. Development of the conceptual framework for the eye-drop satisfaction questionnaire (EDSQ©) in glaucoma using a qualitative study. BMC Health Serv Res. 2007;7(1):124. https://doi.org/10.1186/1472-6963-7-124.
118. Regnault A, Viala-Danten M, Gilet H, Berdeaux G. Scoring and psychometric properties of the eye-drop satisfaction questionnaire (EDSQ), an instrument to assess satisfaction and compliance with glaucoma treatment. BMC Ophthalmol. 2010;10:1. https://doi.org/10.1186/1471-2415-10-1.
119 Ruiz MA, Pardo A, de la Martinez Casa JM, Polo V, Esquiro J, Soto J. Development of a specific questionnaire measuring patient satisfaction with glaucoma treatment: Glausat. Ophthalmic Epidemiol. 2010;17(3):131–43. https://doi.org/10.3109/09286581003734852.
120. Mitchell J, Bradley C. Design and development of the MacTSQ measure of satisfaction with treatment for macular conditions used within the Ivan trial. J Patient Rep Outcomes. 2018;2(1):5. https://doi.org/10.1186/s41687-018-0031-z.
121. Marakis TP, Koutsandrea C, Chatzistefanou KI, Tountas Y. Treatment satisfaction of patients with neovascular age-related macular degeneration treated with anti-vascular endothelial growth factor agents. Int Ophthalmol. 2018;38(2):565–76. https://doi.org/10.1007/s10792-017-0492-8.
122. Shikiar R, Halpern MT, McGann M, Palmer CS, Seidlin M. The relation of patient satisfaction with treatment of otitis externa to clinical outcomes: development of an instrument. Clin Ther. 1999;21(6):1091–104. https://doi.org/10.1016/s0149-2918(99)80027-7.
123. Ruiz MA, Heras F, Alomar A, et al. Development and validation of a questionnaire on "satisfaction with dermatological treatment of hand eczema" (DermaSat). Health Qual Life Outcomes. 2010;8(1):127. https://doi.org/10.1186/1477-7525-8-127.
124. Flood EM, Beusterien KM, Green H, et al. Psychometric evaluation of the osteoporosis patient treatment satisfaction questionnaire (OPSAT-Q™), a novel measure to assess satisfaction with bisphosphonate treatment in postmenopausal women. Health Qual Life Outcomes. 2006;4(1):42. https://doi.org/10.1186/1477-7525-4-42.
125. Piault E, Evans CJ, Espindle D, Kopp Z, Brubaker L, Abrams P. Development and validation of the overactive bladder satisfaction (OAB-S) questionnaire. Neurourol Urodyn. 2008;27(3):179–90. https://doi.org/10.1002/nau.20455.
126. Kimman ML, Rotteveel AH, Wijsenbeek M, et al. Development and pretesting of a questionnaire to assess patient experiences and satisfaction with medications (PESaM Questionnaire). Patient. 2017;10(5):629–42. https://doi.org/10.1007/s40271-017-0234-z.
127. Kimman ML, Wijsenbeek MS, van Kuijk SMJ, et al. Validity of the patient experiences and satisfaction with medications (PESaM) questionnaire. Patient. 2019;12(1):149–62. https://doi.org/10.1007/s40271-018-0340-6.
128. Althof SE, Corty EW, Levine SB, et al. Edits: development of questionnaires for evaluating satisfaction with treatments for erectile dysfunction. Urology. 1999;53(4):793–9. https://doi.org/10.1016/s0090-4295(98)00582-2.
129 Kubin M, Trudeau E, Gondek K, Seignobos E, Fugl-Meyer AR. Early conceptual and linguistic development of a patient and partner treatment satisfaction scale (TSS) for erectile dysfunction. Eur Urol. 2004;46(6):768–74. https://doi.org/10.1016/j.eururo.2004.08.001. discussion 774-5.
130. DiBenedetti DB, Gondek K, Sagnier PP, et al. The treatment satisfaction scale: a multidimensional instrument for the assessment of treatment

satisfaction for erectile dysfunction patients and their partners. Eur Urol. 2005;48(3):503–11. https://doi.org/10.1016/j.eururo.2005.05.008.
131. Justícia JL, Baró E, Cardona V, et al. Development of a questionnaire to assess patient satisfaction with allergen-specific immunotherapy in adults: item generation, item reduction, and preliminary validation. Patient Prefer Adherence. 2011;5:239–50. https://doi.org/10.2147/PPA.S19219.
132. Justicia JL, Cardona V, Guardia P, et al. Validation of the first treatment-specific questionnaire for the assessment of patient satisfaction with allergen-specific immunotherapy in allergic patients: the ESPIA questionnaire. J Allergy Clin Immunol. 2013;131(6):1539-1546.e2. https://doi.org/10.1016/j.jaci.2012.11.049.
133 Mathias SD, Berry P, De Vries J, et al. Development of the systemic lupus erythematosus steroid questionnaire (SSQ): a novel patient-reported outcome tool to assess the impact of oral steroid treatment. Health Qual Life Outcomes. 2017;15(1):43. https://doi.org/10.1186/s12955-017-0609-9.
134. Rofail D, Abetz L, Viala M, Gait C, Baladi JF, Payne K. Satisfaction and adherence in patients with iron overload receiving iron chelation therapy as assessed by a newly developed patient instrument. Value Health. 2009;12(1):109–17. https://doi.org/10.1111/j.1524-4733.2008.00390.x.
135. Elalfy MS, Massoud W, Elsherif NH, et al. A new tool for the assessment of satisfaction with iron chelation therapy (ICT-SAT) for patients with β-thalassemia major. Pediatr Blood Cancer. 2012;58(6):910–5. https://doi.org/10.1002/pbc.23413.
136. Kempton C, Trask P, Parnes A, et al. Development and testing of the satisfaction questionnaire with intravenous or subcutaneous hemophilia injection and results from the phase 3 HAVEN 3 study of emicizumab prophylaxis in persons with hemophilia a without FVIII inhibitors. Haemophilia. 2021;27(2):221–8. https://doi.org/10.1111/hae.14222.
137. Doll H, Coşkun U, Hartford C, Tomazos I. Concept confirmation of the treatment administration satisfaction questionnaire (TASQ) in rare paroxysmal nocturnal hemoglobinuria. J Patient Rep Outcomes. 2021;5(1):45. https://doi.org/10.1186/s41687-021-00319-9.
138. Fataneh H-D, Fatemeh Sadat H-B, Fatemeh Y, Samira K. Development and validation of the "treatment satisfaction with traditional medicines" questionnaire (TSTMQ). Trad Integr Med. 2022;7(3):302–9. https://doi.org/10.18502/tim.v7i3.10772.
139. Geneva: World Health Organization. International Classification of Diseases Eleventh Revision (ICD-11). Geneva: World Health Organization. 2022. License: CC BY-ND 3.0 IGO. Available at: https://icd.who.int/en. Accessed 23 May 2023.
140. World Health Organization. Anatomical Therapeutic Chemical (ATC) Classification. Available at: https://www.who.int/tools/atc-ddd-toolkit/atc-classification. Accessed 21 Aug 2023.
141. IQVIA. Treatment Satisfaction Questionnaire for Medication (TSQM). Available from: https://www.iqvia.com/solutions/research-and-development/consulting/patient-centered-endpoints/clinical-outcome-assessments-coa/tsqm. Accessed 3 Jul 2024.
142. Weaver M, Patrick DL, Markson LE, Martin D, Frederic I, Berger M. Issues in the measurement of satisfaction with treatment. Am J Manag Care. 1997;3(4):579–94.
143. Yamamoto Y, Yamaguchi A, Bono H, Takagi T. Allie: A database and a search service of abbreviations and long forms. Database. 2011;2011:bar013. https://doi.org/10.1093/database/bar013 The Allie service is available at http://allie.dbcls.jp/. Accessed 20 Aug 2023.
144. Niño de Guzmán Quispe E, Martínez García L, Orrego Villagrán C, et al. The perspectives of patients with chronic diseases and their caregivers on self-management interventions: a scoping review of reviews. *Patient*. 2021;14(6):719–740. https://doi.org/10.1007/s40271-021-00514-2.
145. Ahmed R, Aslani P. Attention-deficit/hyperactivity disorder: an update on medication adherence and persistence in children, adolescents and adults. Expert Rev Pharmacoecon Outcomes Res. 2013;13(6):791–815. https://doi.org/10.1586/14737167.2013.841544.
146. Patrick DL, Burke LB, Gwaltney CJ, et al. Content validity–establishing and reporting the evidence in newly developed patient-reported outcomes (PRO) instruments for medical product evaluation: ISPOR PRO good research practices task force report: part 2–assessing respondent understanding. Value Health. 2011;14(8):978–88. https://doi.org/10.1016/j.jval.2011.06.013.
147. Lasch KE, Marquis P, Vigneux M, et al. PRO development: rigorous qualitative research as the crucial foundation. Qual Life Res. 2010;19(8):1087–96. https://doi.org/10.1007/s11136-010-9677-6.
148. Ioannidis JPA. How to make more published research true. PLoS Med. 2014;11(10):e1001747. https://doi.org/10.1371/journal.pmed.1001747.
149. Varni JW, Burwinkle TM, Lane MM. Health-related quality of life measurement in pediatric clinical practice: an appraisal and precept for future research and application. Health Qual Life Outcomes. 2005;3(1):34. https://doi.org/10.1186/1477-7525-3-34.
150. Thornicroft G, Brohan E, Rose D, Sartorius N, Leese M. Global pattern of experienced and anticipated discrimination against people with schizophrenia: a cross-sectional survey. Lancet. 2016;373(9661):408–15. https://doi.org/10.1016/S0140-6736(08)61817-6.
151. van Deursen AJAM, van Dijk JAGM. The digital divide shifts to differences in usage. New Media Soc. 2014;16(3):507–26. https://doi.org/10.1177/1461444813487959.
152. Parker RM, Ratzan SC, Lurie N. Health literacy: a policy challenge for advancing high-quality health care. Health Aff. 2003;22(4):147–53. https://doi.org/10.1377/hlthaff.22.4.147.
153. Neimann Rasmussen L, Montgomery P. The prevalence of and factors associated with inclusion of non-English language studies in Campbell systematic reviews: a survey and meta-epidemiological study. Syst Rev. 2018;7(1):129. https://doi.org/10.1186/s13643-018-0786-6.
154. Gagnier JJ, Lai J, Mokkink LB, Terwee CB. COSMIN reporting guideline for studies on measurement properties of patient-reported outcome measures. Qual Life Res. 2021;30(8):2197–218. https://doi.org/10.1007/s11136-021-02822-4.

Publisher's Note