

## Systematic review: questionnaires for assessment of gastroesophageal reflux disease

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**SUMMARY.** Numerous questionnaires with a wide variety of characteristics have been developed for the assessment of gastroesophageal reflux disease (GERD). Four well-defined dimensions are noticeable in these GERD questionnaires, which are symptoms, response to treatment, diagnosis, and burden on the quality of life of GERD patients. The aim of this review is to develop a complete overview of all available questionnaires, categorized per dimension of the assessment of GERD. A systematic search of the literature up to January 2013 using the Pubmed database and the Embase database, and search of references and conference abstract books were conducted. A total number of 65 questionnaires were extracted and evaluated. Thirty-nine questionnaires were found applicable for the assessment of GERD symptoms, three of which are generic gastrointestinal questionnaires. For the assessment of response to treatment, 14 questionnaires were considered applicable. Seven questionnaires with diagnostic purposes were found. In the assessment of quality of life in GERD patients, 18 questionnaires were found and evaluated. Twenty questionnaires were found to be used for more than one assessment dimension, and eight questionnaires were found for GERD assessment in infants and/or children. A wide variety of GERD questionnaires is available, of which the majority is used for assessment of GERD symptoms. Questionnaires differ in aspects such as design, validation and translations. Also, numerous multidimensional questionnaires are available, of which the Reflux Disease Questionnaire is widely applicable. We provided an overview of GERD questionnaires to aid investigators and clinicians in their search for the most appropriate questionnaire for their specific purposes.

**KEY WORDS:** esophagus, GERD, questionnaire, review.

### INTRODUCTION

In western countries, 10–30% of the population experiences symptoms of gastroesophageal reflux disease (GERD).<sup>1</sup> Most common symptoms are heartburn and regurgitation.<sup>2</sup> Beside these typical esophageal symptoms, atypical extra-esophageal manifestations can be present. For example, chronic cough, asthma, laryngitis, and dental erosion are grouped among extra-esophageal syndromes by the Montreal Classification.<sup>3</sup>

A wide variety of questionnaires have been developed, validated, translated, evaluated, and compared for assessment of GERD.<sup>4</sup> There are multiple dimensions in the assessment of a specific disease with a

questionnaire. In GERD, one of the most important dimensions is symptoms, including typical and atypical symptoms of GERD. Another assessment dimension is the response to treatment, in which the change in severity and/or frequency of symptoms is measured. A third assessment dimension is diagnosis, a tool to discriminate patients with GERD from other diseases. Also, disease-specific quality of life, the burden of GERD on the quality of life of patients, is an assessment dimension of GERD. Beside these well-defined assessment dimensions, characteristics of questionnaires for the assessment of GERD may differ. Gastrointestinal-generic and disease-specific questionnaires exist for assessment of GERD.<sup>5</sup> Also, questionnaires used for the assessment of multiple dimensions have been developed.<sup>6</sup> Questionnaires can be available in a single language or multiple languages and can be validated for all or some of these languages.<sup>4</sup> Typical esophageal symptoms of GERD such as heartburn and regurgitation can be assessed.

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Also, atypical extra-esophageal symptoms of GERD such as chronic cough, asthma, laryngitis, and dental erosion can be assessed.<sup>7</sup> Although most questionnaires primarily assess esophageal symptoms of GERD, some questionnaires show a clear emphasis primarily on the assessment of extra-esophageal reflux symptoms.

This plethora of available questionnaires makes it difficult for physicians or investigators to select the most appropriate questionnaire for their specific purposes. Therefore, a complete overview of these questionnaires could be a great aid. Because such an overview is currently not available, the aim of this review is to develop a complete overview of available questionnaires per dimension of GERD assessment.

## METHODS

### Literature searches

Systematic searches were performed in PubMed and Embase. The search structure was based on the components 'questionnaires' and 'GERD'. Therefore, the following search string was used to perform the literature search in PubMed: ('Gastroesophageal Reflux'[Majr] OR GERD[tiab] OR Gastroesophageal Reflux[tiab] OR GORD[tiab] OR Gastro-Esophageal Reflux[tiab] OR 'Heartburn'[Mesh] OR pyrosis[tiab] OR heartburn[tiab]) AND ('Questionnaires'[Mesh] OR questionnaire\*[ti] OR scale\*[ti]). To perform the literature search in Embase, the following search string was used: (exp \*gastroesophageal reflux/ or heartburn/ or (gastroesophageal reflux or GERD or GORD or gastro-esophageal reflux or pyrosis or heartburn).ti,ab) and (exp questionnaire/ or (questionnaire\* or scale\*).ti), limited to Embase. A systematic search of all literature available up to January 2013 was performed. No questionnaires and languages were excluded. In addition, literature was retrieved manually, and a search of conference abstract books was conducted.

### Data collection

After the removal of duplicates, screening was performed by reading title and abstract. All records with one or more questionnaire-based assessment scale as a subject in its title or abstract were included, and full articles were read.

### Study selection

Articles providing substantial information on aspect criteria of a questionnaire (discussed below) were found eligible and were included. Review articles, commentaries, studies on questionnaires that did not assess symptoms of GERD or syndromes and diseases related to GERD (e.g. dyspepsia), and studies

not providing information on aspect criteria of a questionnaire were found not eligible and were excluded.

### Assessment dimensions

Questionnaires were assigned to one or more assessment dimensions (symptoms, response to treatment, diagnosis, and quality of life). A separate group was formed by questionnaires that assessed other aspects of GERD (e.g. treatment satisfaction and psychosocial effects). Also, all questionnaires applicable for the assessment of GERD in children and/or infants were grouped separately.

Questionnaires for the assessment of symptoms were assigned to one of the two subdivisions *gastrointestinal-generic assessment scales* and *disease-specific assessment scales*. In disease-specific assessment scales, questionnaires were considered *extra-esophageal* in case its primary purpose was assessment of extra-esophageal symptoms of GERD as stated in the Montreal Classification. Other questionnaires were considered *esophageal*.

### Eligibility criteria

All extracted questionnaires were evaluated on multiple criteria. Information on the questionnaires' construct aspects, such as number of items, scale type, and assessment of severity and/or frequency of symptoms, was attained. Other questionnaire aspects were the available languages, whether it was validated (and in what languages), its mode of administration, and questionnaires' particulars. It was noted whether translated versions of questionnaires were obtained through linguistic validation studies of the translated version or through back-translation methods.

## RESULTS

Three thousand ninety-five studies were identified. Duplicates were removed and after screening, 2444 studies not on questionnaires or on questionnaires that did not assess GERD or syndromes related to GERD were excluded. After duplicate removal and screening, 264 studies were assessed for eligibility. One hundred eighteen studies were found eligible, and five studies were manually attained by reading references in eligible studies. A flow diagram presenting study selection and reasons of exclusion is presented in Figure 1. A total number of 65 questionnaires were extracted.

### Symptoms

Thirty-nine of the extracted questionnaires were found applicable for assessment of GERD symptoms. Three of those were evaluated as generic gastrointestinal, all others as GERD specific. Of the

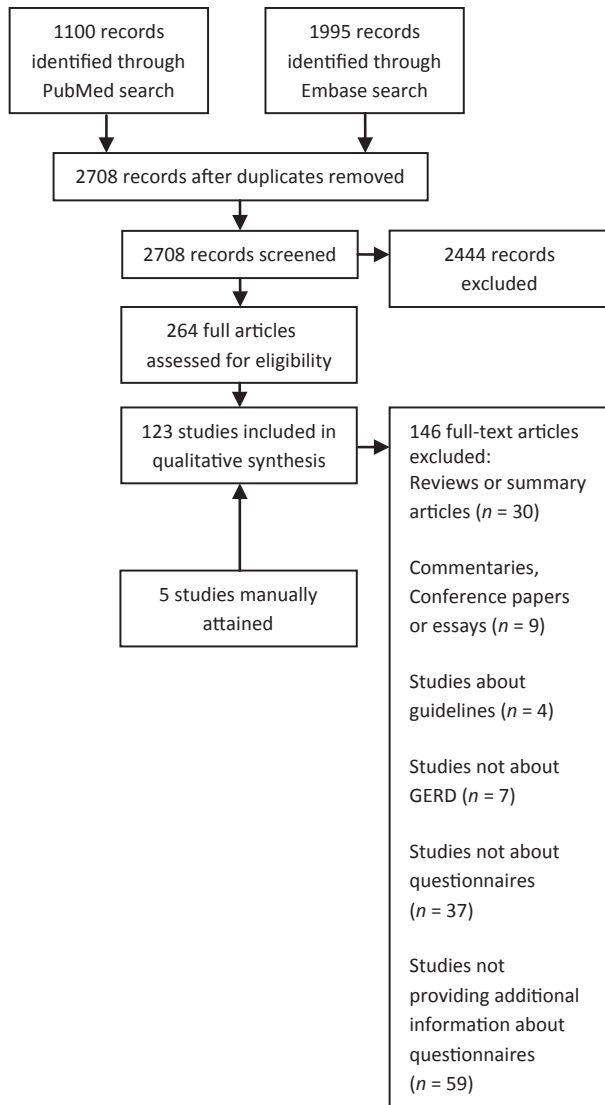


Fig. 1 Flow diagram. GERD, gastroesophageal reflux disease.

GERD-specific questionnaires, three had an emphasis on extra-esophageal symptom assessment. The 33 other questionnaires were considered esophageal.

### Generic gastrointestinal questionnaires

In total, three well-validated gastrointestinal-generic questionnaires applicable for assessment of GERD symptoms were found: the Patient Assessment of Upper Gastrointestinal Symptom Severity Index (PAGI-SYM), the DIGEST questionnaire, and the Gastrointestinal Symptom Rating Scale (GSRS). All three questionnaires have been translated in multiple languages. The questionnaire with the least symptom grouping in its assessment is the PAGI-SYM. The PAGI-SYM has six subscales: heartburn/regurgitation, fullness/early satiety, nausea/vomiting, bloating, upper abdominal pain, and lower abdominal pain.<sup>8</sup> The PAGI-SYM assesses symptom severity

in patients with GERD, dyspepsia, and gastroparesis, and is valid for consideration in clinical trials for healing of erosive esophagitis and maintenance of erosive esophagitis.<sup>9</sup> Table 1 presents an overview of gastrointestinal-generic questionnaires for the assessment of the GERD symptoms.

### GERD-specific symptom questionnaires: esophageal

A total number of 33 questionnaires with an emphasis on esophageal symptom assessment of GERD were evaluated. These questionnaires showed variety in criteria aspects and applicability in additional assessment dimensions (e.g. response to treatment). Nine bilingual questionnaires were found, and seven questionnaires were evaluated as multilingual. A multilingual questionnaire that was found to be well-validated was the Reflux Questionnaire (ReQuest). The ReQuest has a symptom subscale (ReQuest-GI) and a well-being subscale (ReQuest-WSO). The ReQuest is applicable for both erosive GERD and endoscopy-negative GERD patients.<sup>10</sup> The ReQuest in Practice is a brief version of the ReQuest, developed for use in everyday clinical practice with potential to monitor treatment-induced changes of symptoms in GERD patients.<sup>11</sup> Also, the multilingual Carlsson-Dent questionnaire (CDQ, QUEST) was found to be widely used in comparative studies. The CDQ evaluates the sensations related to GERD experienced by patients.<sup>12</sup> The performance of the CDQ on symptom-based diagnosis of GERD was found poor and thus not validated.<sup>12–15</sup> Table 2 presents an overview of disease-specific questionnaires for the assessment of esophageal symptoms of GERD.

### GERD-specific symptom questionnaires: extra-esophageal

Three validated questionnaires were found for the assessment of extra-esophageal manifestations of GERD. Two questionnaires were found assessing laryngopharyngeal reflux: the one-dimensional Pharyngeal Reflux Symptom Questionnaire (PRSQ) and the multidimensional Reflux Symptom Index (RSI). The RSI was found to be well-validated in multiple languages. A third questionnaire, the Supraesophageal Reflux Questionnaire (SERQ), was developed to assess symptoms attributed to supraesophageal manifestations of reflux and information about medication usage and history. The SERQ demonstrated predictive validity superior to the RSI.<sup>16</sup> Table 3 presents an overview of disease-specific questionnaires for the assessment of extra-esophageal symptoms of GERD.

### Response to treatment

Fourteen questionnaires were considered applicable in the assessment of response to treatment in patients

**Table 1** Gastrointestinal-generic instruments for the assessment of GERD symptoms

Instrument	Acronym	Languages	Validation	Number of items	Scale	Severity/frequency	Mode of application	Particulars
Patient Assessment of Upper Gastrointestinal Symptom Severity Index <sup>8,9,45</sup>	PAGI-SYM	US English, French, German, Italian, Polish, and Dutch	Validated (US English, French, German, Italian, Polish, and Dutch)	20 (6 subscales)	6-point (0–5)	Severity	Self-reported	Assesses main symptom groupings of GERD, dyspepsia, and gastroparesis
DIGEST Questionnaire <sup>46,47</sup>	—	English (USA and Canada), Italian, Japanese, Dutch, German (Switzerland), Danish, Finnish, Norwegian, and Swedish	Validated (German (Switzerland))	27	6-point (frequency), 4-point (severity), 7-point (longevity)	Severity and frequency	Interview (house-to-house recruitment and telephone recruitment)	Assessment of 11 upper GI symptoms, 3 lower GI symptoms, and their impact on health-care use and daily activities
Gastrointestinal Symptom Rating Scale <sup>31,32,34–38,48</sup>	GSRS	English, Afrikaans, German, Hungarian, Italian, Polish, and Spanish	Validated (English, Afrikaans German, Hungarian, Italian, Polish, and Spanish)	15	7-point Likert	Severity and frequency	Patient-rated	Ability to discriminate across different gastrointestinal disorders

—, no data; GERD, gastroesophageal reflux disease; GI, gastrointestinal.

with GERD. A questionnaire assessing upper gastrointestinal symptoms in general is the Proton Pump Inhibitor Acid Suppression Symptom (PASS) test. The PASS test was developed to identify patients with persistent acid-related symptoms during therapy and assesses their responses to change in therapy.<sup>17</sup> An extra-esophageal questionnaire, the RSI, is well validated for the assessment of symptoms and their response to treatment in laryngopharyngeal reflux.<sup>18</sup> Table 4 presents an overview of questionnaires for the assessment of response to treatment.

## Diagnosis

Three of the seven diagnosis-oriented questionnaires were not validated and initially Japanese.<sup>19,20</sup> The other four questionnaires used for diagnostic purposes were found valid, and two of those four were translated in multiple languages.<sup>21–23</sup> The latter were the Reflux Disease Questionnaire (RDQ) and the GerdQ. The RDQ was developed for diagnostic purposes and has been subjected to multiple validation studies.<sup>23–26</sup> The RDQ has moderate accuracy for symptom-based diagnosis of GERD, which is only slightly inferior to that of gastroenterologists.<sup>24</sup> The GerdQ reaches a diagnostic accuracy of that of investigator-based diagnosis<sup>21</sup> but, according to Jonasson *et al.*, should also not be used as a stand-alone diagnostic instrument for GERD.<sup>27</sup> Table 5 presents an overview of questionnaires used for diagnostic purposes.

## Quality of life

Eighteen questionnaires assessing quality of life were retrieved and evaluated. All were validated, and a variety in available languages was found, five of which had five or more different language versions. The questionnaires most validated in other languages were the Patient Assessment of Upper Gastrointestinal Disorders-Quality of Life (PAGI-QOL)<sup>9,28,29</sup> and the Quality of Life in Reflux and Dyspepsia (QOLRAD).<sup>30–41</sup> The well-validated PAGI-QOL was initially developed for the assessment of the upper gastrointestinal disorders GERD, dyspepsia, and gastroparesis.<sup>28</sup> For that use, the PAGI-QOL has been evaluated as a responsive and clinically relevant instrument in a multicenter study including patients from five European countries.<sup>29</sup> Also, the PAGI-QOL was valid for consideration in clinical trials for healing of erosive esophagitis and maintenance of erosive esophagitis.<sup>9</sup> The QOLRAD assesses emotional stress, sleep disturbance, food and drink problems, physical/social functioning, and vitality, and is well validated.<sup>30</sup> Multiple studies supported reliability and validity in numerous languages.<sup>31,33,38</sup> Table 6 presents an overview of disease-specific questionnaires for the assessment of quality of life.



**Table 2** Disease-specific instruments used for assessment of GERD symptoms: esophageal

Instrument	Acronym	Languages	Validation	Number of items	Scale	Severity/frequency	Mode of application	Particulars
Allen's Symptom Questionnaire <sup>49</sup>	—	English	Validated (English)	12	0–3 (severity) and 0–4 (frequency)	Severity and frequency	Independent observer-administered	Assesses six specific symptoms of GERD
Anarasiri's Symptom Score <sup>50</sup>	—	English, Sinhalese	Validated (English and Sinhalese)	7	5-point (frequency), 4-point (severity)	Severity and frequency	Investigator-administered	—
Brief Reflux Inventory <sup>51</sup>	—	English	Validated	5	5-point Likert	Frequency	Self-administered	—
Carlsson-Dent Questionnaire <sup>12,15,52–54</sup>	CDQ/QUEST	English, Dutch, Chinese, Thai, and Spanish	Not validated	7	3 or 4 boxes to tick, each with an attaining score (–2 to 5). Total score –7 to 16	—	Self-administered	—
Chinese GERD Questionnaire <sup>55</sup>	Chinese GERDQ	Chinese	Validated (Chinese)	20	5-point Likert	Severity and frequency	Self-reported	Could be used in epidemiological studies
Esophageal Symptoms Questionnaire <sup>56</sup>	ESQ	English	Brief 30-item ESQ validated, full ESQ not validated	Full 38, brief 30	5-point Likert (frequency) and 6-point Likert (severity)	Severity and frequency	Self-assessment	Dysphagia, globus, and reflux subscales
Four-graded Heartburn Severity Scale <sup>57</sup>	—	English	Validated (English)	2	4-graded (0–3)	Severity and frequency	Investigator-assessed and patient-assessed using daily diary cards	Valid as outcome measure of endoscopy-negative patients with symptoms of heartburn
Frequency Scale for Symptoms of GERD <sup>53</sup>	FSSG	English and Japanese	Not validated	12	5-point (0–4)	Frequency	Self-assessment	—
Gastroesophageal Reflux Disease-Health Related Quality of Life Instrument <sup>38–41</sup>	GERD-HRQL	English and Portuguese (Brazil)	Validated (English and Portuguese [Brazil])	10 (Portuguese 11)	6-point scale and 1 item 3 options (satisfied – neutral – dissatisfied)	Severity	Self-assessment	Assesses symptom severity and quality of life in GERD, predictor of patient satisfaction
Gastroesophageal Reflux Questionnaire <sup>62,63</sup>	GERQ	English and Spanish	Validated (English and Spanish)	80	7-point Likert (frequency), 4-point Likert (severity)	Severity and frequency	Self-assessment	Assess esophageal and extra-esophageal symptoms
Gastrointestinal Short Form Questionnaire <sup>64,65</sup>	GSFQ	English and Spanish	Validated (English and Spanish)	6	5-point, yes/no	Frequency	Self-administered	—
GERD Impact Scale <sup>41,66–69</sup>	GIS	English, Dutch, French, Spanish, Mandarin, and Italian	Validated (English, Spanish, Mandarin, and Italian)	9	4-graded Likert	Severity and frequency	Patient-completed	Assessment of impact of reflux-induced symptoms
GERD Screener <sup>70</sup>	—	English	Validated (English)	12	0–10 (heartburn and regurgitation subscales), 0–24 (medication subscale)	Severity and frequency	Face-to-face interview	Not validated as discriminative tool
GERD Symptom Assessment Scale <sup>59,71,72</sup>	GSAS	English and Portuguese (Brazil)	Validated (English)	15	Yes/no, 4-point (severity and distress)	Severity and frequency	Self-administered	Assesses severity, frequency and distress of GERD symptoms
GerDQ <sup>21,27,73–75</sup>	GerDQ	English, Malaysian, Chinese, Italian, and Japanese	Validated	6	4-graded scale	Frequency	Self-assessment	—
Horowitz's Questionnaire <sup>76</sup>	—	Hebrew	Validated	15	5-point Likert	Severity	Patient-administered	Discriminates between patients with GERD and those with other causes of dyspepsia
Manterola's Questionnaire <sup>22,77,78</sup>	—	Spanish and English	Validated (Spanish and English)	7	Scoring 0–13	Frequency	Clinician-applied	Valid for detection of GERD, useful for diagnosing reflux esophagitis
Mayo Dysphagia Questionnaire <sup>30,79</sup>	MDQ-30	English	Validated	28	Dichotomous Likert, and multiple (non) hierarchical	Severity and frequency	Self-assessment	Dysphagia, heartburn, and regurgitation domains
Modified Frequency Scale for Symptoms of GERD <sup>80</sup>	Modified FSSG	Japanese and English	Not validated	14	5-point (0–4)	Frequency	Self-assessment	Ability to distinguish functional dyspepsia from non-erosive GERD
Nepean Dyspepsia Index <sup>81,82</sup>	NDI	Australian English, French, Dutch, Italian, German, Spanish, American English, and Arabic	Validated (English)	42 (17 key aspects and symptom checklist)	5-point Likert	Frequency, intensity and bothersomeness (of symptoms)	Self-reported	Quality of life and symptom assessment in dyspepsia. Symptom checklist measures 15 upper gastrointestinal symptoms

Table 2 Continued

Instrument	Acronym	Languages	Validation	Number of items	Scale	Severity/frequency	Mode of application	Particulars
Nocturnal Gastroesophageal Reflux Disease Symptom Severity and Impact Questionnaire <sup>83</sup>	N-GSSIQ	English	Validated (English)	20	6-point Likert (15 items), 5-point Likert (5 items)	Severity (of symptoms and concern) and frequency (of morning impact)	Clinician- and patient-reported	Assesses severity, morning impact, and concern about nocturnal GERD
Oesophageal-Specific Module <sup>84</sup>	QLQ-OES18	Used in Swedish population	Validated	2	4-point	Severity and frequency	Self-assessment	Module of HRQL questionnaire (EORTC QLQ-C30)
Proton Pump Inhibitor Acid Suppression Symptom Test <sup>17</sup>	PASS test	English and Canadian French	Validated (English and Canadian French)	5	Yes/no	Severity	Patient-response	Evaluates persistent acid-related (upper gastrointestinal) symptoms in patients receiving proton pump inhibitor therapy
Puhan's Symptom Diary <sup>85</sup>	—	English	Validated (English)	3	Yes/no, 4-point (none-severe)	Severity	Self-assessment	Daily diary
Reflux Disease Questionnaire <sup>23,26,41,69,86-89</sup>	RDQ	English (UK), German, Italian, Swedish, Norwegian, Spanish, Mandarin, Chinese, and Dutch	Validated (English, German, Italian, Spanish, Mandarin, Chinese, and Dutch)	12	6-point	Severity and frequency	Self-administered	Heartburn, regurgitation and dyspepsia subscales
Reflux Questionnaire in Practice <sup>11</sup>	ReQuest in Practice	German	Validated (German)	6	100-mm visual analogue scale	Severity and frequency	Self-completion	Assesses typical and atypical GERD symptoms
Reflux Questionnaire <sup>10,90-92</sup>	ReQuest	German, British English, American English, French, and Spanish	Validated (German, British English, American English, French, and Spanish)	60	7-point Likert (frequency), 100-mm visual analogue scale (severity)	Severity and frequency	Self-reported	Symptom subscale and well-being subscale
Reflux Questionnaire <sup>93</sup>	—	English	Validated	31 (7 categories)	5-point scale, standardized in 0-100 scores	Severity and frequency	Self-completed	A reflux quality of life score (RQLS) and a series of seven reflux symptom scores
Reflux Symptom Questionnaire electronic Diary <sup>94</sup>	RESQ-eD	US and Canadian English and French (France and Canada), German, Hungarian, Romanian, Spanish (USA), Latvian, and Russian (Latvia)	Validated (USA and Canadian English and French [France and Canada], German, Hungarian, Romanian, Spanish [USA], Latvian, and Russian [Latvia])	13	6-point scale	Severity and frequency	Self-assessment (electronic)	All six RDQ items retained, 7 items new added
Reflux, Airway and Sleep Questionnaire <sup>95</sup>	RASQ	English	Validated	18	7-point Likert	Severity	Self-administered	Assessment of typical reflux symptoms, airway symptoms, and sleeping disturbances
Shimoyama's Simplified Questionnaire <sup>20</sup>	—	Japanese	No	9	Yes/no	—	Self-assessment	High sensitivity for GERD diagnosis, also highly specific, low false-positive rate for other diseases
Short-Form Leeds Dyspepsia Questionnaire <sup>96</sup>	SF-LDQ	English	Validated (English)	9	Tick boxes (5 per item)	Severity and frequency	Self-completion	'Part IV' assesses extra-esophageal symptoms
Turkish GERD Questionnaire <sup>97</sup>	—	Turkish	Validated (Turkish)	78 essential items, 14 sociodemographic items	Scoring 0-24	Severity and frequency	Self-assessment	

—, no data; GERD, gastroesophageal reflux disease.

**Table 3** Disease-specific instruments used for assessment of GERD symptoms: extra-esophageal

Instrument	Acronym	Languages	Validation	Number of items	Scale	Severity/ frequency	Mode of application	Particulars
Pharyngeal Reflux Symptom Questionnaire <sup>88</sup>	PRSQ	English	Validated (English)	17	6-point Likert	Severity and frequency	Self-administered	Assessment of laryngopharyngeal reflux
Reflux Symptom Index <sup>18,99-103</sup>	RSI	English, Greek, Hebrew, Spanish, Taiwanese, Chinese, and Italian	Validated (English, Greek, Italian, and Hebrew)	9 (10 Greek)	5-point Likert	Severity	Self-assessment	Assessment of laryngopharyngeal reflux
Supraesophageal Reflux Questionnaire <sup>16</sup>	SERQ	English	Validated (English)	27 symptom items, additional medication items	Not given	Severity and frequency	Patient-response	Assessment of supraesophageal manifestations of reflux

GERD, gastroesophageal reflux disease.

### Infants and/or children

Eight questionnaires used for the assessment of GERD in infants and children were retrieved and evaluated. Six questionnaires were used for the assessment of GERD symptoms, and two were used for diagnostic purposes. The Infant Gastroesophageal Reflux Questionnaire Revised (I-GERQ-R) was translated into most different languages. The I-GERQ-R was validated for evaluation of GERD symptoms in infants and translated into multiple European languages with cultural adaptation.<sup>42</sup> The I-GERQ-R was found to be of diagnostic use to screen infants for symptom burden; however, the diagnostic validity was limited because of poor specificity.<sup>43</sup> Questionnaires with diagnostic purposes were the GERD Symptom Questionnaire – Infants (GSQ-I) and the GSQ – Young Children (GSQ-YC). The GSQ-I and GSQ-YC were found to be able to differentiate infants and young children with GERD from healthy controls of the same age group, but were not validated as a diagnostic tool.<sup>44</sup> The I-GERQ identifies demographics, symptoms, remediable provocative factors, and other possible causes for the symptoms in infants. Table 7 presents an overview of questionnaires for the assessment dimensions of GERD in infants and children.

### Others

Six questionnaires used for other assessment dimensions were found. These included assessment of work productivity and activity impairment, treatment satisfaction, and beliefs about surgery. Table 8 presents an overview of questionnaires used for other assessment dimensions of GERD.

## DISCUSSION

The aim of this review was to provide a complete overview of available questionnaires for the assessment of GERD. The results show a large number and variety of questionnaires used for assessment of GERD symptoms, response to treatment, diagnosis, and quality of life and their main characteristics. This review provides the first overview of questionnaires used for all assessment dimensions of GERD and syndromes or diseases related to GERD. Overall, 65 distinct questionnaires were evaluated in this systematic review of literature. This complete overview of questionnaire-based assessment scales may facilitate and improve the selection of the most appropriate questionnaire for assessment of GERD in clinical use and research.

Based on the results, the gastrointestinal-generic PAGI-SYM and GSRS seem most useful for the assessment of GERD symptoms. Both are

**Table 4** Esophageal instruments for the assessment of response to treatment in GERD patients

Instrument	Acronym	Languages	Validation	Number of items	Scale	Severity/frequency	Mode of application	Sort of treatment	Particulars
Brief Reflux Inventory <sup>51</sup> Esophageal Symptoms Questionnaire <sup>56</sup>	— ESQ	English English	Validated Brief 30-item ESQ validated, full ESQ not validated	5 Full 38, brief 30	5-point Likert (frequency) and 6-point Likert (severity)	Frequency Severity and frequency	Self-administered Self-assessment	Medical —	— Dysphagia, globus and reflux subscales
Frequency Scale for Symptoms of GERD <sup>19,53</sup>	FSSG	English and Japanese	Not validated	12	5-point (0–4)	Frequency	Self-assessment	Medical	—
Gastrointestinal Short Form Questionnaire <sup>64,65</sup>	GSFQ	English and Spanish	Validated (English and Spanish)	6	5-point, yes/no	Frequency	Self-administered	Medical	—
Gastrointestinal Symptom Rating Scale <sup>31,32,34,38,48</sup>	GSRS	English, Afrikaans, German, Hungarian, Italian, Polish, and Spanish	Validated (English, Afrikaans, German, Hungarian, Italian, Polish, and Spanish)	15	7-point Likert	Severity and frequency	Patient-rated	Medical	Ability to discriminate across different GI disorders
GERD Impact Scale <sup>41,66–69</sup>	GIS	English, Dutch, French, Spanish, Mandarin, and Italian	Validated (English, Spanish, Mandarin, and Italian)	9	4-graded Likert	Severity and frequency	Patient-completed	Medical	Assessment of impact of reflux-induced symptoms
GerdQ <sup>21,27,73–75</sup>	GerdQ	English, Malaysian, Chinese, Italian, and Japanese	Validated	6	4-graded scale	Frequency	Self-assessment	Medical	—
Proton Pump Inhibitor Acid Suppression Symptom Test <sup>17</sup>	PASS test	English and Canadian French	Validated (English and Canadian French)	5	Yes/no	Severity	Patient response	Medical	Assessment of upper gastrointestinal symptoms
Puhan's Symptom Diary <sup>85</sup>	—	English	Validated (English)	3	Yes/no, 4-point (none–severe)	Severity	Self-assessment	Medical	Daily diary
Reflux Disease Questionnaire <sup>23–26,41,69,86–89</sup>	RDQ	English (UK), German, Italian, Swedish, Norwegian, Spanish, Mandarin, Chinese, and Dutch	Validated (English, German, Italian, Spanish, Mandarin, Chinese, Dutch)	12	6-point	Severity and frequency	Self-administered	Medical (prescribed and over-the-counter)	Heartburn, regurgitation and dyspepsia subscales
Reflux Questionnaire in Practice <sup>11</sup>	ReQuest in practice	German	Validated (German)	6	100-mm visual analogue scale	Severity and frequency	Self-completion	—	Assesses typical and atypical GERD symptoms
Reflux Questionnaire <sup>10,90–92</sup>	ReQuest	German, British English, American English, French, and Spanish	Validated (German, British English, American English, French, and Spanish)	60	7-point Likert (frequency) and 100-mm visual analogue scale (severity)	Severity and frequency	Self-reported	Medical	Symptom subscale and well-being subscale
Reflux Questionnaire <sup>93</sup>	—	English	Validated	31 (7 categories)	5-point scale, standardized in 0–100 scores	Severity and frequency	Self-completed	Medical and surgical	A reflux quality of life score (RQLS) and a series of seven reflux symptom scores
Reflux Symptom Index <sup>48,99,103</sup>	RSI	English, Greek, Hebrew, Spanish, Taiwanese, Chinese, and Italian	Validated (English, Greek, Italian, and Hebrew)	9 (10 Greek)	5-point Likert	Severity	Self-assessment	Behavioral modification and medical	Assessment of laryngopharyngeal reflux

—, no data; GERD, gastroesophageal reflux disease.



**Table 5** Diagnostic assessment scales for GERD

Instrument	Acronym	Languages	Validation	Number of items	Scale	Severity/frequency	Mode of application	Particulars
Frequency Scale for Symptoms of GERD <sup>19,53</sup>	FSSG	Japanese and English	Not validated	12	5-point (0–4)	Frequency	Self-assessment	—
GerdQ <sup>1,27,73–75</sup>	GerdQ	English, Malaysian, Chinese, Italian, and Japanese	Validated	6	4-graded scale	Frequency	Self-assessment	—
Manterola's Questionnaire <sup>22,77,78</sup>	—	Spanish and English	Validated (Spanish and English)	7	Scoring 0–13	Frequency	Clinician-applied	Valid for detection of GERD in epidemiological settings, useful for diagnosing reflux esophagitis
Modified Frequency Scale for Symptoms of GERD <sup>80</sup>	Modified FSSG	Japanese and English	Not validated	14	5-point (0–4)	Frequency	Self-assessment	Ability to distinguish functional dyspepsia from non-erosive GERD
Reflux Disease Questionnaire <sup>23–26,41,69,86–89</sup>	RDQ	English (UK), German, Italian, Swedish, Norwegian, Spanish, Mandarin, Chinese, and Dutch	Validated (English, German, Italian, Spanish, Mandarin, Chinese, and Dutch)	12	6-point	Severity and frequency	Self-administered	Heartburn, regurgitation and dyspepsia subscales
Shimoyama's Simplified Questionnaire <sup>20</sup>	—	Japanese	Not validated	9	Yes/no	—	Self-assessment	High sensitivity for GERD diagnosis, also highly specific, low false-positive rate for other diseases
Brief Reflux Inventory <sup>51</sup>	—	English	Validated	5	5-point Likert	Frequency	Self-administered	—

—, no data; GERD, gastroesophageal reflux disease; GI, gastrointestinal.

self-assessed by patients what might improve their content validity and reduces their outcome bias. Also, they seem applicable in cross-country studies because of the validation in multiple languages. For extensive assessment including both esophageal and extraesophageal symptoms, the results suggest the use of the relatively large and disease-specific Gastroesophageal Reflux Questionnaire (GERQ) or ReQuest. On one hand, the large number of items makes these questionnaires suitable to evaluate symptoms more accurate. On the other hand, they seem less applicable in primary care settings because of the long duration of administration. In case of the ReQuest, the development of the item reduced ReQuest in Practice seems to enhance applicability in primary care settings.

For the assessment of response to treatment solely, the PASS test is a good option. The PASS test is easily applicable in primary care settings. For evaluating esophageal symptoms in response to treatment (prescribed and over-the-counter medical treatment), the RDQ (discussed below) seems applicable. The RSI is useful for the assessment of extra-esophageal symptoms and their response to treatment (medical treatment and behavioral modifications). The RSI seems applicable in multiple-country studies and primary care settings.

The recently developed Reflux Symptom Questionnaire electronic Diary (RESQ-eD) seems to be the first electronic self-administered symptom diary. Its electronic administration makes it possible for patients to administer and submit the symptom diary at home or ambulatory using a mobile electronic device, which supports its applicability and accessibility in primary care and clinical trials. The RESQ-eD contains all six of the well-validated multidimensional RDQ (discussed below) and seven new items, and its multiple linguistic validation supports applicability in multinational multilingual studies. There are no publications yet describing the use of GERD questionnaires applications that can be downloaded to smartphones, but we believe that such an approach is promising, particularly for questionnaires that need to be administered repeatedly such as symptom diaries during trials.

According to the results, the validated RDQ and GerdQ are used to diagnose GERD. Their usefulness in symptom-based diagnosis of GERD is supported by their diagnostic accuracy, which approaches that of gastroenterologists taking a history. However, it is known that the clinical diagnosis of GERD is also far from the gold standards pH monitoring and endoscopy. The GerdQ is translated in other languages, and further validation in those languages seems useful for enhancing applicability in multinational settings. Although the validation studies suggest that the RDQ and GerdQ are useful for the diagnosis of GERD, it seems that no questionnaire may be used as

**Table 6** Instruments for the assessment of quality of life in patients with GERD

Instrument	Acronym	Languages	Validation	Number of items	Scale	Severity/frequency	Mode of application	Particulars
Gastroesophageal Reflux Disease Quality of Life Questionnaire <sup>104</sup>	GERD-QOL	Chinese and English	Validated (Chinese and English)	16	5-point Likert (4-0)	—	Self-administered	Subscales: daily activity, treatment effect, diet, psychological well-being
Gastroesophageal Reflux Disease-Health Related Quality of Life Instrument <sup>58-61</sup>	GERD-HRQL	English, Portuguese (Brazil)	Validated (English and Portuguese [Brazil])	10 (Portuguese 11)	6-point scale and 1 item 3 options (satisfied – neutral – dissatisfied)	Severity	Self-assessment	Assesses symptoms and quality of life in GERD, predictor of patient satisfaction
Gastrointestinal Quality of Life Index <sup>105,106</sup>	GIQLI	German, English, and French	Validated (German and French)	36 (5 response categories)	5 options	Frequency	—	Gastrointestinal-generic questionnaire
GERD Analyzer <sup>107</sup>	GERDyzer	Study conducted in Austria, Germany, and South Africa	Validated	17	100-mm VAS	—	Self-administered	Impact of GERD on quality of life
Health Related Quality of Life Questionnaire <sup>108</sup>	HRQoL Questionnaire	English	Validated (English)	57	Scale and item scores transformed to 0–100 range	Severity and frequency	Self-administered	—
Heartburn Specific Quality of Life Instrument <sup>59,109</sup>	HBQOL	English, Portuguese (Brazil)	Validated (Portuguese [Brazil])	15 (English), 12 (Portuguese)	Yes/no, 5-point, 6-point	—	—	—
Laryngopharyngeal Reflux Health-Related Quality of Life Questionnaire <sup>110,111</sup>	LPR-HRQL	English, Swedish	Validated (English and Swedish)	43 (over 5 domains)	7-point Likert	Frequency	Patient-reported	Assessment of laryngopharyngeal reflux
Liu's 3 GERD Assessment Scales <sup>112</sup>	—	English	Validated (English)	31 (3 scales)	0–100 range, 4-point Likert, and 5 point Likert	Frequency and bother	Self-administered	Scales: GERD burden, symptom, and treatment
Nepean Dyspepsia Index <sup>81,82</sup>	NDI	Australian English, French, Dutch, Italian, German, Spanish, American English, and Arabic	Validated (English)	42 (17 key aspects and symptom checklist)	5-point Likert	Frequency, intensity and bothersomeness (of symptoms)	Self-reported	QoL and symptom assessment in dyspepsia. Symptom checklist measures 15 upper gastrointestinal symptoms
Nocturnal Gastroesophageal Reflux Disease Symptom Severity and Impact Questionnaire <sup>83</sup>	N-GSSIQ	English	Validated (English)	20	6-point Likert (15 items) and 5-point Likert (5 items)	Severity (of symptoms and concern) and frequency (of morning impact)	Clinician- and patient-reported	Assesses severity, morning impact, and concern about nocturnal GERD

Patient Assessment of Upper Gastrointestinal Disorders-Quality of Life <sup>9,28,29</sup>	PAGI-QOL	English (US and South Africa), Dutch (the Netherlands and Belgium), French (France and Belgium), German (Germany and Austria), Italian, Polish, Czech, Danish, Greek, Hungarian, Hebrew, Israeli-Russian, Portuguese, Slovak, Afrikaans, and Spanish	Validated (American English, Dutch, French, German, Italian, and Polish)	30 (5 subscales)	6-point Likert (0-5)	Frequency of affect on overall quality of life and well-being	Self-administered	Assessment of GERD, dyspepsia, and gastroparesis
Quality of Life in Reflux and Dyspepsia <sup>30-41</sup>	QOLRAD	English, Dutch, Hungarian, Polish, Spanish, German, Italian, Afrikaans, Swedish, Norwegian, Danish, Finnish, Japanese, and Mandarin	Validated (English, Dutch, Hungarian, Polish, Spanish, German, Italian, Afrikaans, Swedish, Norwegian, Japanese, and Mandarin)	25 (5 domains)	7-point Likert	Severity and frequency	Self-reported	Assessment of quality of life in patients with GERD or dyspepsia
Quality-of-Life Questionnaire for Patients Undergoing Antireflux Surgery <sup>13</sup>	QOLARS	English and Hungarian	Validated (English and Hungarian)	50	5-point Likert	Severity	Patient-completed	Generic and GERD-specific domains for patients who have undergone laparoscopic fundoplication
Reflux Questionnaire in Practice <sup>11</sup>	ReQuest in practice	German	Validated (German)	6	100-mm visual analogue scale	Severity and frequency	Self-completion	Assesses typical and atypical GERD symptoms
Reflux Questionnaire <sup>10,90-92</sup>	ReQuest	German, British English, American English, French, and Spanish	Validated (German, British English, American English, French, and Spanish)	60	7-point Likert (frequency) and 100-mm visual analogue scale (severity)	Severity and frequency	Self-reported	Symptom subscale and well-being subscale
Reflux Questionnaire <sup>93</sup>	—	English	Validated	31 (7 categories)	5-point scale, standardized in 0-100 scores	Severity and frequency	Self-completed	A reflux quality of life score (RQLS) and a series of seven reflux symptom scores
Reflux-Qual Short Form <sup>14</sup>	RQS®	French and English	Validated (French)	8 (5 domains)	5-point Likert (0-4 or 4-0)	—	Self-assessment	Domains: daily life, well-being, psychological impact, sleep, and eating
Reflux-Qual® <sup>14,115</sup>	—	French, Dutch (the Netherlands and Belgium), English (UK and US), German, Italian, and Mexican Spanish (US)	Validated (French)	37 (7 domains)	5-point Likert	—	Self-assessment	Domains: daily life, discomfort, well-being, physical functioning, anxiety, sleep, and food

—, no data; GERD, gastroesophageal reflux disease; VAS, visual analogue scale.

**Table 7** Instruments used for assessment in children and/or infants with GERD

Instrument	Acronym	Languages	Validation	Number of items	Scale	Severity/frequency	Mode of application	Infant/children	Assessment dimension
GERD Symptom Questionnaire – Infants <sup>44</sup>	GSQ-I	English	Validated	13	7-point scale (severity)	Severity and frequency	Parent-/guardian-administered	Infants (1–11 months)	Symptoms and response to treatment: disease-specific
GERD Symptom Questionnaire – Young Children <sup>44</sup>	GSQ-YC	English	Validated	13	7-point scale (severity)	Severity and frequency	Parent-/guardian-administered	Children (1–4 years)	Symptoms and response to treatment: disease-specific
Infant Gastroesophageal Reflux Questionnaire <sup>116–118</sup>	I-GERQ	English	Validated	161	Various	Severity and frequency	Parent-administered	Infant	Symptoms and diagnosis: disease-specific
Infant Gastroesophageal Reflux Questionnaire Revised <sup>42,43</sup>	I-GERQ-R	English US, English UK, Dutch, Finnish, French, German, Italian, Polish, Portuguese, and Spanish	Validated	12	Response choices ranged from 2 to 5 categories	Severity and frequency	Caregiver-completed	Infant	Symptoms, response to treatment and diagnosis: disease-specific
Multidimensional Measure for Recurrent Abdominal Pain in Children <sup>119</sup>	MM-RAP	English	Validated	20 (4 scales)	Various	Severity and frequency	Self-administered (child/parent)	Children (4–7 years)	Symptoms: gastrointestinal-genetic disease
Pediatric Gastroesophageal Reflux Disease Symptom and Quality of Life Questionnaire <sup>120</sup>	PGSQ (PGSQ-Cp for children, PGSQ-A for adolescents)	English	Validated	37 (PGSQ-Cp) and 35 (PGSQ-A)	5-point	Severity and frequency	PGSQ-Cp: parent/caregiver report PGSQ-A: self-administered	PGSQ-Cp: 2–8 years PGSQ-A: 9–17 years	Symptoms and quality of life: disease-specific
Pediatric GERD Caregiver Impact Questionnaire <sup>21</sup>	PGCIQ	American English and American Spanish	Not validated (English and Spanish) Validated	49 (10 domains)	Yes/No, 5-point Likert	Severity and frequency	Caregiver-reported	Infant/child 3 groups (premature: to 3 months, 4–11 months and 1–12 years) 2–18 years	The impact of caring for a child with GERD
Pediatric Quality of Life Inventory Gastrointestinal Symptoms Module <sup>122</sup>	PedsQL Gastrointestinal Symptom Module	English	Validated	76 (11 domains)	5-point Likert	—	Parent self-report (5–18 years) and parent proxy report (2–18 years)	—	Quality of life: gastrointestinal symptom-specific

—, no data; GERD, gastroesophageal reflux disease.

**Table 8** Instruments used for other assessments of GERD

Instrument	Acronym	Languages	Validation	Number of items	Scale	Mode of application	Particulars
Believes about Surgery Questionnaire <sup>123</sup> Frequent Heartburn Index (-Full, and -Brief) <sup>124</sup>	BSQ FHBI-Full, FHBI-Brief	English English	Validated Not validated	8 9 (full), 7 (brief)	5-point Transformed to 0–100 range	— Self-assessment	— Assessment of overall psychological impact of frequent heartburn
Gastroesophageal Reflux Disease Treatment Satisfaction Questionnaire <sup>125</sup>	GTSQ	English	Validated	25	5-point Likert	Self-report	—
Treatment Satisfaction Questionnaire – GERD <sup>126</sup>	TSQ-G	English	Validated	41	6-point Likert	Self-assessment	—
Treatment Satisfaction Questionnaire of Medication <sup>127</sup>	TSQM	English	Validated	13 (version 1.4: 14 items)	5- or 7-point Likert scale, dichotomous	—	—
Work Productivity and Activity Impairment questionnaire <sup>128–130</sup>	WPAI-GERD	Swedish and English	Validated (Swedish and English)	7	0–100% VAS	Patient-administered	—

—, no data; GERD, gastroesophageal reflux disease; VAS, visual analogue scale.

a standalone diagnostic test, which supports the necessity of invasive objective diagnostic tests, such as endoscopy and 24-hour esophageal pH-metry.

The results suggest the use of the QOLRAD or the PAGI-QOL for the assessment of quality of life. Both well-validated multilingual questionnaires seem applicable in clinical and research settings in numerous countries. Using Likert scales, they seem easy to administer, and their self-administration by patients enhances content validity and reduces outcome bias.

Based on the evaluated questionnaires for the assessment of GERD in infants or children (Table 8), we consider the I-GERQ-R most useful for evaluating GERD symptoms and their change in response to treatment in infants, and this questionnaire may be of diagnostic value. The I-GERQ-R seems applicable in clinical use and research in multiple countries. Secondly, for assessment of symptoms and quality of life in children and adolescents the Pediatric Gastroesophageal Reflux Disease Symptom and Quality of Life Questionnaire seems to be useful.

For clinical purposes, a multidimensional questionnaire may provide more assessment outcomes in less time and may thus be preferred. In research, a multidimensional questionnaire can contribute to simultaneous data collection on multiple dimensions of GERD with reduced bias. The well-validated RDQ seems useful for diagnostic purposes and the simultaneous assessment of GERD symptoms and the response to treatment, as well as for separate assessment of these dimensions. Also, this multidimensional questionnaire seems applicable in multinational studies because of the availability in multiple languages. With only six items and self-administered by patients, it supports applicability in primary care and reduced outcome bias.

Based on the results, there seems to be no questionnaire that is suitable for all assessment dimensions of GERD. Although questionnaires assessing both quality of life and symptoms have been developed, as well as questionnaires assessing symptoms, response to treatment, and diagnosis, our results show no questionnaire applicable for the simultaneous assessment of those four assessment dimensions. Also, a questionnaire assessing GERD symptoms is not automatically responsive to change of symptoms in response to treatment. This might support, therefore, the necessity of knowledge on the purposes of a questionnaire and its characteristics for the decision making of preferred questionnaire for assessment of GERD in clinical use and research.

In conclusion, we found a wide variety of available questionnaires for the assessment of GERD, with a many differences in characteristics, design, and purposes. The majority of questionnaires are used for the assessment of GERD symptoms with a variety in esophageal and extra-esophageal symptoms. One should be aware of the characteristics and strengths

and shortcomings of individual questionnaires before selecting one. This overview of GERD questionnaires will aid the investigator and clinician in their search for a suitable questionnaire for their specific purposes.

## References

- Holtmann G. Reflux disease: the disorder of the third millennium. *Eur J Gastroenterol Hepatol* 2001; 13 (Suppl 1): S5–11.
- Napierkowski J, Wong R K. Extraesophageal manifestations of GERD. *Am J Med Sci* 2003; 326: 285–99.
- Vakil N, van Zanten S V, Kahrilas P, Dent J, Jones R. The Montreal definition and classification of gastroesophageal reflux disease: a global evidence-based consensus. *Am J Gastroenterol* 2006; 101: 1900–20.
- Mouli V P, Ahuja V. Questionnaire based gastroesophageal reflux disease (GERD) assessment scales. *Indian J Gastroenterol* 2011; 30: 108–17.
- Yacavone R F, Locke G R, III, Provenzale D T, Eisen G M. Quality of life measurement in gastroenterology: what is available. *Am J Gastroenterol* 2001; 96: 285–97.
- Stanghellini V, Armstrong D, Monnikes H, Bardhan K D. Systematic review: do we need a new gastro-oesophageal reflux disease questionnaire? *Digestion* 2007; 75 (Suppl 1): 3–16.
- Saritas Y E, Vaezi M F. Extraesophageal manifestations of gastroesophageal reflux disease: cough, asthma, laryngitis, chest pain. *Swiss Med Wkly* 2012; 142: w13544.
- Rentz A M, Kahrilas P, Stanghellini V *et al.* Development and psychometric evaluation of the patient assessment of upper gastrointestinal symptom severity index (PAGI-SYM) in patients with upper gastrointestinal disorders. *Qual Life Res* 2004; 13: 1737–49.
- Wyrwich K W, Mody R, Larsen L M, Lee M, Harnam N, Revicki D A. Validation of the PAGI-SYM and PAGI-QOL among healing and maintenance of erosive esophagitis clinical trial participants. *Qual Life Res* 2010; 19: 551–64.
- Bardhan K D, Stanghellini V, Armstrong D, Berghofer P, Gatz G, Monnikes H. International validation of ReQuest in patients with endoscopy-negative gastro-oesophageal reflux disease. *Digestion* 2007; 75 (Suppl 1): 48–54.
- Rubin G, Uebel P, Brimo-Hayek A, Hey K H, Doerfler H, Heading R C. Validation of a brief symptom questionnaire (ReQuest in Practice) for patients with gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 2008; 27: 846–51.
- Carlsson R, Dent J, Bolling-Sternevald E *et al.* The usefulness of a structured questionnaire in the assessment of symptomatic gastroesophageal reflux disease. *Scand J Gastroenterol* 1998; 33: 1023–9.
- Hung C S, Lee C L, Yang J N *et al.* Clinical application of Carlsson's questionnaire to predict erosive GERD among healthy Chinese. *J Gastroenterol Hepatol* 2005; 20: 1900–5.
- Netinatsunton N, Attasany S, Ovartharnporn B, Sangnil S, Boonviriy S, Piratvisuth T. The value of Carlsson-Dent questionnaire in diagnosis of gastroesophageal reflux disease in area with low prevalence of gastroesophageal reflux disease. *J Neurogastroenterol Motil* 2011; 17: 164–8.
- Numans M E, de Wit N J. Reflux symptoms in general practice: diagnostic evaluation of the Carlsson-Dent gastro-oesophageal reflux disease questionnaire. *Aliment Pharmacol Ther* 2003; 17: 1049–55.
- Dauer E, Thompson D, Zinsmeister A R *et al.* Supraesophageal reflux: validation of a symptom questionnaire. *Otolaryngol Head Neck Surg* 2006; 134: 73–80.
- Armstrong D, Veldhuyzen S J, Chung S A *et al.* Validation of a short questionnaire in English and French for use in patients with persistent upper gastrointestinal symptoms despite proton pump inhibitor therapy: the PASS (Proton pump inhibitor Acid Suppression Symptom) test. *Can J Gastroenterol* 2005; 19: 350–8.
- Belafsky P C, Postma G N, Koufman J A. Validity and reliability of the reflux symptom index (RSI). *J Voice* 2002; 16: 274–7.



- 19 Kusano M, Shimoyama Y, Sugimoto S *et al.* Development and evaluation of FSSG: frequency scale for the symptoms of GERD. *J Gastroenterol* 2004; 39: 888–91.
- 20 Shimoyama Y, Kusano M, Sugimoto S *et al.* Diagnosis of gastroesophageal reflux disease using a new questionnaire. *J Gastroenterol Hepatol* 2005; 20: 643–7.
- 21 Jones R, Junghard O, Dent J *et al.* Development of the GerdQ, a tool for the diagnosis and management of gastroesophageal reflux disease in primary care. *Aliment Pharmacol Ther* 2009; 30: 1030–8.
- 22 Manterola C, Munoz S, Grande L, Bustos L. Initial validation of a questionnaire for detecting gastroesophageal reflux disease in epidemiological settings. *J Clin Epidemiol* 2002; 55: 1041–5.
- 23 Shaw M J, Talley N J, Beebe T J *et al.* Initial validation of a diagnostic questionnaire for gastroesophageal reflux disease. *Am J Gastroenterol* 2001; 96: 52–7.
- 24 Dent J, Vakil N, Jones R *et al.* Accuracy of the diagnosis of GORD by questionnaire, physicians and a trial of proton pump inhibitor treatment: the Diamond Study. *Gut* 2010; 59: 714–21.
- 25 Ho K Y, Gwee K A, Khor J L, Selamat D S, Yeoh K G. Validation of a graded response questionnaire for the diagnosis of gastroesophageal reflux disease in an Asian primary care population. *J Clin Gastroenterol* 2008; 42: 680–6.
- 26 van Zanten S V, Armstrong D, Barkun A, Junghard O, White R J, Wiklund I K. Symptom overlap in patients with upper gastrointestinal complaints in the Canadian confirmatory acid suppression test (CAST) study: further psychometric validation of the reflux disease questionnaire. *Aliment Pharmacol Ther* 2007; 25: 1087–97.
- 27 Jonasson C, Wernersson B, Hoff D A, Hatlebakk J G. Validation of the GerdQ questionnaire for the diagnosis of gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 2013; 37: 564–72.
- 28 de la Loge C, Trudeau E, Marquis P *et al.* Cross-cultural development and validation of a patient self-administered questionnaire to assess quality of life in upper gastrointestinal disorders: the PAGI-QOL. *Qual Life Res* 2004; 13: 1751–62.
- 29 de la Loge C, Trudeau E, Marquis P *et al.* Responsiveness and interpretation of a quality of life questionnaire specific to upper gastrointestinal disorders. *Clin Gastroenterol Hepatol* 2004; 2: 778–86.
- 30 Wiklund I K, Junghard O, Grace E *et al.* Quality of Life in Reflux and Dyspepsia patients. Psychometric documentation of a new disease-specific questionnaire (QOLRAD). *Eur J Surg Suppl* 1998; 583: 41–9.
- 31 Talley N J, Fullerton S, Junghard O, Wiklund I. Quality of life in patients with endoscopy-negative heartburn: reliability and sensitivity of disease-specific instruments. *Am J Gastroenterol* 2001; 96: 1998–2004.
- 32 Kulich R K, Ujszaszy L, Toth G T, Barany L, Carlsson J, Wiklund I. Psychometric validation of the Hungarian translation of the gastrointestinal symptom rating scale (GSRS) and quality of life in reflux and dyspepsia (QOLRAD) questionnaire in patients with reflux disease. *Orv Hetil* 2004; 145: 723–44.
- 33 Kulich K R, Wiklund I, Junghard O. Factor structure of the Quality of Life in Reflux and Dyspepsia (QOLRAD) questionnaire evaluated in patients with heartburn predominant reflux disease. *Qual Life Res* 2003; 12: 699–708.
- 34 Kulich K R, Malferteiner P, Madisch A *et al.* Psychometric validation of the German translation of the Gastrointestinal Symptom Rating Scale (GSRS) and Quality of Life in Reflux and Dyspepsia (QOLRAD) questionnaire in patients with reflux disease. *Health Qual Life Outcomes* 2003; 1: 62–9.
- 35 Kulich K R, Calabrese C, Pacini F, Vigneri S, Carlsson J, Wiklund I K. Psychometric validation of the Italian translation of the gastrointestinal symptom-rating scale and quality of life in reflux and dyspepsia questionnaire in patients with gastro-oesophageal reflux disease. *Clin Drug Investig* 2004; 24: 205–15.
- 36 Kulich K R, Regula J, Stasiewicz J, Jasinski B, Carlsson J, Wiklund I. [Psychometric validation of the Polish translation of the Gastrointestinal Symptom Rating Scale (GSRS) and Quality of Life in Reflux and Dyspepsia (QOLRAD) Questionnaire in patients with reflux disease]. *Pol Arch Med Wewn* 2005; 113: 241–9.
- 37 Kulich K R, Pique J M, Vegazo O *et al.* [Psychometric validation of translation to Spanish of the gastrointestinal symptoms rating scale (GSRS) and quality of life in reflux and dyspepsia (QOLRAD) in patients with gastroesophageal reflux disease]. *Rev Clin Esp* 2005; 205: 588–94.
- 38 Kulich K R, Madisch A, Pacini F *et al.* Reliability and validity of the Gastrointestinal Symptom Rating Scale (GSRS) and Quality of Life in Reflux and Dyspepsia (QOLRAD) questionnaire in dyspepsia: a six-country study. *Health Qual Life Outcomes* 2008; 6: 12–24.
- 39 Hongo M, Kinoshita Y, Shimozuma K, Kumagai Y, Sawada M, Nii M. Psychometric validation of the Japanese translation of the Quality of Life in Reflux and Dyspepsia questionnaire in patients with heartburn. *J Gastroenterol* 2007; 42: 807–15.
- 40 Engels L G, Klinkenberg-Knol E C, Carlsson J, Halling K. Psychometric validation of the Dutch translation of the quality of life in reflux and dyspepsia (QOLRAD) questionnaire in patients with gastroesophageal reflux disease. *Health Qual Life Outcomes* 2010; 8: 85–93.
- 41 Cao Y, Yan X, Ma X Q *et al.* Validation of a survey methodology for gastroesophageal reflux disease in China. *BMC Gastroenterol* 2008; 8: 37–49.
- 42 Kleinman L, Rothman M, Strauss R *et al.* The infant gastroesophageal reflux questionnaire revised: development and validation as an evaluative instrument. *Clin Gastroenterol Hepatol* 2006; 4: 588–96.
- 43 Orenstein S R. Symptoms and reflux in infants: infant gastroesophageal Reflux Questionnaire Revised (I-GERQ-R)—utility for symptom tracking and diagnosis. *Curr Gastroenterol Rep* 2010; 12: 431–6.
- 44 Deal L, Gold B D, Gremse D A *et al.* Age-specific questionnaires distinguish GERD symptom frequency and severity in infants and young children: development and initial validation. *J Pediatr Gastroenterol Nutr* 2005; 41: 178–85.
- 45 Revicki D A, Rentz A M, Tack J *et al.* Responsiveness and interpretation of a symptom severity index specific to upper gastrointestinal disorders. *Clin Gastroenterol Hepatol* 2004; 2: 769–77.
- 46 Eggleston A, Farup C, Meier R. The Domestic/International Gastroenterology Surveillance Study (DIGEST): design, subjects and methods. *Scand J Gastroenterol Suppl* 1999; 231: 9–14.
- 47 Meier R, Beglinger C, Moser N, Meyer M, Brignoli R. [Validation of the 'Digest Questionnaire' for consistency and reproducibility with reference to upper abdominal symptoms]. *Schweiz Med Wochenschr* 1998; 128: 880–6.
- 48 Revicki D A, Wood M, Wiklund I, Crawley J. Reliability and validity of the Gastrointestinal Symptom Rating Scale in patients with gastroesophageal reflux disease. *Qual Life Res* 1998; 7: 75–83.
- 49 Allen C J, Parameswaran K, Belda J, Anvari M. Reproducibility, validity, and responsiveness of a disease-specific symptom questionnaire for gastroesophageal reflux disease. *Dis Esophagus* 2000; 13: 265–70.
- 50 Amarasiri L D, Pathmeswaran A, De Silva A P, Dassanayake A S, Ranasinha C D, De S J. Comparison of a composite symptom score assessing both symptom frequency and severity with a score that assesses frequency alone: a preliminary study to develop a practical symptom score to detect gastroesophageal reflux disease in a resource-poor setting. *Eur J Gastroenterol Hepatol* 2010; 22: 662–8.
- 51 Zimmerman J. Validation of a brief inventory for diagnosis and monitoring of symptomatic gastro-oesophageal reflux. *Scand J Gastroenterol* 2004; 39: 212–6.
- 52 Bolling-Sternevald E, Carlsson R, Aalykke C *et al.* Self-administered symptom questionnaires in patients with dyspepsia and their yield in discriminating between endoscopic diagnoses. *Dig Dis* 2002; 20: 191–8.
- 53 Danjo A, Yamaguchi K, Fujimoto K *et al.* Comparison of endoscopic findings with symptom assessment systems (FSSG and QUEST) for gastroesophageal reflux disease in Japanese centres. *J Gastroenterol Hepatol* 2009; 24: 633–8.
- 54 Gomez-Escudero O, Remes-Troche J M, Ruiz J C, Pelaez-Luna M, Schmulson M J, Valdovinos Diaz M A. [Diagnostic usefulness of the Carlsson-Dent questionnaire in gastroesophageal reflux disease (GERD)]. *Rev Gastroenterol Mex* 2004; 69: 16–23.

- 55 Wong W M, Lam K F, Lai K C *et al.* A validated symptoms questionnaire (Chinese GERDQ) for the diagnosis of gastroesophageal reflux disease in the Chinese population. *Aliment Pharmacol Ther* 2003; 17: 1407–13.
- 56 Kwieciek M A, Kiebles J L, Taft T H *et al.* Esophageal symptoms questionnaire for the assessment of dysphagia, globus, and reflux symptoms: initial development and validation. *Dis Esophagus* 2011; 24: 550–9.
- 57 Junghard O, Wiklund I. Validation of a four-graded scale for severity of heartburn in patients with symptoms of gastroesophageal reflux disease. *Value Health* 2008; 11: 765–70.
- 58 Fornari F, Gruber A C, Lopes A B, Cecchetti D, de Barros S G. [Symptom's questionnaire for gastroesophageal reflux disease]. *Arq Gastroenterol* 2004; 41: 263–7.
- 59 Pereira G I, Costa C D, Geocze L, Borim A A, Ciconelli R M, Camacho-Lobato L. [Cross-cultural adaptation and validation for Portuguese (Brazil) of health related quality of life instruments specific for gastroesophageal reflux disease]. *Arq Gastroenterol* 2007; 44: 168–77.
- 60 Velanovich V. Comparison of generic (SF-36) vs. disease-specific (GERD-HRQL) quality-of-life scales for gastroesophageal reflux disease. *J Gastrointest Surg* 1998; 2: 141–5.
- 61 Velanovich V. The development of the GERD-HRQL symptom severity instrument. *Dis Esophagus* 2007; 20: 130–4.
- 62 Locke G R, Talley N J, Weaver A L, Zinsmeister A R. A new questionnaire for gastroesophageal reflux disease. *Mayo Clin Proc* 1994; 69: 539–47.
- 63 Moreno Elola-Olaso C, Rey E, Rodriguez-Artalejo F, Locke G R, III, Diaz-Rubio M. Adaptation and validation of a gastroesophageal reflux questionnaire for use on a Spanish population. *Rev Esp Enferm Dig* 2002; 94: 745–58.
- 64 Pare P, Meyer F, Armstrong D, Pyzyk M, Pericak D, Goeree R. Validation of the GSFQ, a self-administered symptom frequency questionnaire for patients with gastroesophageal reflux disease. *Can J Gastroenterol* 2003; 17: 307–12.
- 65 Ruiz Diaz M A, Suarez Parga J M, Pardo M A, Garcia V M, Pascual R V. [Cultural adaptation to Spanish and validation of the Gastrointestinal Short Form Questionnaire]. *Gastroenterol Hepatol* 2009; 32: 9–21.
- 66 Fritz R, Goodman N, Duquenne V, Taeter C. Results of the ALEGRIA study in Luxembourg. An epidemiological, observational study to describe symptom impact and control in patients with GERD and an evaluation of the GERD Impact Scale. *Bull Soc Sci Med Grand Duche Luxemb* 2009; 2: 141–52.
- 67 Jones R, Coyne K, Wiklund I. The gastro-oesophageal reflux disease impact scale: a patient management tool for primary care. *Aliment Pharmacol Ther* 2007; 25: 1451–9.
- 68 Louis E, Tack J, Vandenhoven G, Taeter C. Evaluation of the GERD Impact Scale, an international, validated patient questionnaire, in daily practice. Results of the ALEGRIA study. *Acta Gastroenterol Belg* 2009; 72: 3–8.
- 69 Nuevo J, Tafalla M, Zapardiel J. [Validation of the Reflux Disease Questionnaire (RDQ) and Gastrointestinal Impact Scale (GIS) in patients with gastroesophageal reflux disease in the Spanish population]. *Gastroenterol Hepatol* 2009; 32: 264–73.
- 70 Ofman J J, Shaw M, Sadik K *et al.* Identifying patients with gastroesophageal reflux disease: validation of a practical screening tool. *Dig Dis Sci* 2002; 47: 1863–9.
- 71 Damiano A, Handley K, Adler E, Siddique R, Bhattacharyya A. Measuring symptom distress and health-related quality of life in clinical trials of gastroesophageal reflux disease treatment: further validation of the Gastroesophageal Reflux Disease Symptom Assessment Scale (GSAS). *Dig Dis Sci* 2002; 47: 1530–7.
- 72 Rothman M, Farup C, Stewart W, Helbers L, Zeldis J. Symptoms associated with gastroesophageal reflux disease: development of a questionnaire for use in clinical trials. *Dig Dis Sci* 2001; 46: 1540–9.
- 73 Della C D, Missale G, Cestari R. [GerdQ: tool for the diagnosis and management of gastroesophageal reflux disease in primary care]. *Recenti Prog Med* 2010; 101: 115–7.
- 74 Jonasson C, Moum B, Bang C, Andersen K R, Hatlebakk J G. Randomised clinical trial: a comparison between a GerdQ-based algorithm and an endoscopy-based approach for the diagnosis and initial treatment of GERD. *Aliment Pharmacol Ther* 2012; 35: 1290–300.
- 75 Wang K, Duan L P, Ge Y, Xu Z J, Xia Z W. [Diagnostic values of GerdQ, 24-h ambulatory oesophageal pH and impedance-pH monitoring in Barrett's esophagus, reflux esophagitis and non-erosive reflux disease]. *Zhonghua Yi Xue Za Zhi* 2011; 91: 1228–32.
- 76 Horowitz N, Moshkowitz M, Halpern Z, Leshno M. Applying data mining techniques in the development of a diagnostics questionnaire for GERD. *Dig Dis Sci* 2007; 52: 1871–8.
- 77 Manterola C, Munoz S, Grande L, Riedemann P. [Construction and validation of a gastroesophageal reflux symptom scale. Preliminary report]. *Rev Med Chil* 1999; 127: 1213–22.
- 78 Torres-Quevedo R, Manterola C, Sanhueza A, Bustos L, Pineda V, Vial M. Diagnostic properties of a symptoms scale for diagnosing reflux esophagitis. *J Clin Epidemiol* 2009; 62: 97–101.
- 79 McElhiney J, Lohse M R, Arora A S *et al.* The Mayo Dysphagia Questionnaire-30: documentation of reliability and validity of a tool for interventional trials in adults with esophageal disease. *Dysphagia* 2010; 25: 221–30.
- 80 Kusano M, Hosaka H, Kawada A *et al.* Development and evaluation of a modified Frequency Scale for the Symptoms of Gastroesophageal Reflux Disease to distinguish functional dyspepsia from non-erosive reflux disease. *J Gastroenterol Hepatol* 2012; 27: 1187–91.
- 81 Khalil M S, Wahass S H, Al-Qourain A A, Yassawy M I. Initial linguistic and psychometric validation of the Arabic version of Nepean Dyspepsia Index. *Saudi Med J* 2006; 27: 1554–60.
- 82 Talley N J, Haque M, Wyeth J W *et al.* Development of a new dyspepsia impact scale: the Nepean Dyspepsia Index. *Aliment Pharmacol Ther* 1999; 13: 225–35.
- 83 Spiegel B M, Roberts L, Mody R *et al.* The development and validation of a Nocturnal Gastro-oesophageal Reflux Disease Symptom Severity and Impact Questionnaire for adults. *Aliment Pharmacol Ther* 2010; 32: 591–602.
- 84 Lagergren P, Johar A M, Lagergren J. Validation of the reflux scale in the European Organisation for Research and Treatment of Cancer QLQ-OES18. *Eur J Cancer* 2012; 49: 1097–1103.
- 85 Puhan M A, Guyatt G H, Armstrong D *et al.* Validation of a symptom diary for patients with gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 2006; 23: 531–41.
- 86 Aanen M C, Numans M E, Weusten B L, Smout A J. Diagnostic value of the Reflux Disease Questionnaire in general practice. *Digestion* 2006; 74: 162–8.
- 87 Nocon M, Kulig M, Leodolter A, Malferteiner P, Willich S N. Validation of the Reflux Disease Questionnaire for a German population. *Eur J Gastroenterol Hepatol* 2005; 17: 229–33.
- 88 Pace F, Scarlata P, Casini V, Sarzi-Puttini P, Porro G B. Validation of the reflux disease questionnaire for an Italian population of patients with gastroesophageal reflux disease. *Eur J Gastroenterol Hepatol* 2008; 20: 187–90.
- 89 Shaw M, Dent J, Beebe T *et al.* The Reflux Disease Questionnaire: a measure for assessment of treatment response in clinical trials. *Health Qual Life Outcomes* 2008; 6: 31–7.
- 90 Bardhan K D, Stanghellini V, Armstrong D, Berghofer P, Gatz G, Monnikes H. Evaluation of GERD symptoms during therapy. Part I. Development of the new GERD questionnaire ReQuest. *Digestion* 2007; 75 (Suppl 1): 32–40.
- 91 Ducrotte P, Zerbib F. ReQuest: a new questionnaire for the simultaneous evaluation of symptoms and well-being in patients with gastro-oesophageal reflux. *Digestion* 2007; 75 (Suppl 1): 79–86.
- 92 Monnikes H, Bardhan K D, Stanghellini V, Berghofer P, Bethke T D, Armstrong D. Evaluation of GERD symptoms during therapy. Part II. Psychometric evaluation and validation of the new questionnaire ReQuest in erosive GERD. *Digestion* 2007; 75 (Suppl 1): 41–7.
- 93 Macran S, Wileman S, Barton G, Russell I. The development of a new measure of quality of life in the management of gastro-oesophageal reflux disease: the Reflux questionnaire. *Qual Life Res* 2007; 16: 331–43.

- 94 Vakil N, Bjorck K, Denison H *et al.* Validation of the reflux symptom questionnaire electronic diary in partial responders to proton pump inhibitor therapy. *Clin Transl Gastroenterol* 2012; 3: e7.
- 95 Johannessen R, Petersen H, Sue-Chu M, Aasebostol A K, Loge I, Kleveland P M. Validation of the Reflux, Airway and Sleep Questionnaire (RASQ). *Scand J Gastroenterol* 2012; 47: 499–508.
- 96 Fraser A, Delaney B C, Ford A C, Qume M, Moayyedi P. The Short-Form Leeds Dyspepsia Questionnaire validation study. *Aliment Pharmacol Ther* 2007; 25: 477–86.
- 97 Kitapcioglu G, Mandiracioglu A, Bor S. Psychometric and methodological characteristics of a culturally adjusted gastroesophageal reflux disease questionnaire. *Dis Esophagus* 2004; 17: 228–34.
- 98 Andersson O, Ryden A, Ruth M, Moller R Y, Finizia C. Development and validation of a laryngopharyngeal reflux questionnaire, the Pharyngeal Reflux Symptom Questionnaire. *Scand J Gastroenterol* 2010; 45: 147–59.
- 99 Cohen J T, Gil Z, Fliss D M. [The reflux symptom index—a clinical tool for the diagnosis of laryngopharyngeal reflux]. *Harefuah* 2005; 144: 826–9. 912.
- 100 Printza A, Kyrgidis A, Oikonomidou E, Triaridis S. Assessing laryngopharyngeal reflux symptoms with the reflux symptom index: validation and prevalence in the Greek population. *Otolaryngol Head Neck Surg* 2011; 145: 974–80.
- 101 Schindler A, Mozzanica F, Ginocchio D, Peri A, Bottero A, Ottaviani F. Reliability and clinical validity of the Italian Reflux Symptom Index. *J Voice* 2010; 24: 354–8.
- 102 Simons J P, Rosen C A, Casselbrant M L *et al.* Comparison of Pediatric Voice Outcome Survey, Reflux Symptom Index, Reflux Finding Score, and esophageal biopsy results. *Arch Otolaryngol Head Neck Surg* 2008; 134: 837–41.
- 103 Vazquez D L, I, Fernandez G S, Gomez M L. [Laryngopharyngeal reflux: correlation between symptoms and signs by means of clinical assessment questionnaires and fibroendoscopy. Is this sufficient for diagnosis?]. *Acta Otorrinolaringol Esp* 2007; 58: 421–5.
- 104 Chan Y, Ching J Y, Cheung C M *et al.* Development and validation of a disease-specific quality of life questionnaire for gastro-oesophageal reflux disease: the GERD-QOL questionnaire. *Aliment Pharmacol Ther* 2010; 31: 452–60.
- 105 Eypasch E, Williams J I, Wood-Dauphinee S *et al.* Gastrointestinal Quality of Life Index: development, validation and application of a new instrument. *Br J Surg* 1995; 82: 216–22.
- 106 Slim K, Bousquet J, Kwiatkowski F, Lescure G, Pezet D, Chipponi J. [First validation of the French version of the Gastrointestinal Quality of Life Index (GIQLI)]. *Gastroenterol Clin Biol* 1999; 23: 25–31.
- 107 Holtmann G, Chassany O, Devault K R *et al.* International validation of a health-related quality of life questionnaire in patients with erosive gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 2009; 29: 615–25.
- 108 Colwell H H, Mathias S D, Pasta D J, Henning J M, Hunt R H. Development of a health-related quality-of-life questionnaire for individuals with gastroesophageal reflux disease: a validation study. *Dig Dis Sci* 1999; 44: 1376–83.
- 109 Young T L, Kirchdoerfer L J, Osterhaus J T. A development and validation process for a disease-specific quality of life instrument. *Drug Inf J* 1996; 30: 185–193.
- 110 Andersson O, Ryden A, Ruth M, Ylitalo M R, Finizia C. Validation of the Swedish translation of LPR-HRQL. *Med Sci Monit* 2010; 16: CR480–CR487.
- 111 Carrau R L, Khidr A, Gold K F *et al.* Validation of a quality-of-life instrument for laryngopharyngeal reflux. *Arch Otolaryngol Head Neck Surg* 2005; 131: 315–20.
- 112 Liu J Y, Woloshin S, Laycock W S, Rothstein R I, Finlayson S R, Schwartz L M. Symptoms and treatment burden of gastroesophageal reflux disease: validating the GERD assessment scales. *Arch Intern Med* 2004; 164: 2058–64.
- 113 Zeman Z, Rozsa S, Tihanyi T, Tarko E. Psychometric documentation of a quality-of-life questionnaire for patients undergoing antireflux surgery (QOLARS). *Surg Endosc* 2005; 19: 257–61.
- 114 Amouretti M, Nalet B, Robaszekiewicz M *et al.* Validation of the short-form REFLUX-QUAL (RQS), a gastro-esophageal reflux disease (GERD) specific quality of life questionnaire. *Gastroenterol Clin Biol* 2005; 29: 793–801.
- 115 Raymond J M, Marquis P, Bechade D *et al.* [Assessment of quality of life of patients with gastroesophageal reflux. Elaboration and validation of a specific questionnaire]. *Gastroenterol Clin Biol* 1999; 23: 32–9.
- 116 Salvatore S, Hauser B, Vandemaële K, Novario R, Vandenplas Y. Gastroesophageal reflux disease in infants: how much is predictable with questionnaires, pH-metry, endoscopy and histology. *J Pediatr Gastroenterol Nutr* 2005; 40: 210–5.
- 117 Orenstein S R, Cohn J F, Shalaby T M, Kartan R. Reliability and validity of an infant gastroesophageal reflux questionnaire. *Clin Pediatr (Phila)* 1993; 32: 472–84.
- 118 Orenstein S R, Shalaby T M, Cohn J F. Reflux symptoms in 100 normal infants: diagnostic validity of the infant gastroesophageal reflux questionnaire. *Clin Pediatr (Phila)* 1996; 35: 607–14.
- 119 Malaty H M, Abudayyeh S, O'Malley K J *et al.* Development of a multidimensional measure for recurrent abdominal pain in children: population-based studies in three settings. *Pediatrics* 2005; 115: e210–5.
- 120 Kleinman L, Nelson S, Kothari-Talwar S *et al.* Development and psychometric evaluation of 2 age-stratified versions of the Pediatric GERD Symptom and Quality of Life Questionnaire. *J Pediatr Gastroenterol Nutr* 2011; 52: 514–22.
- 121 Kim J, Keininger D L, Becker S, Crawley J A. Simultaneous development of the Pediatric GERD Caregiver Impact Questionnaire (PGCIQ) in American English and American Spanish. *Health Qual Life Outcomes* 2005; 3: 5–17.
- 122 Varni J W, Kay M T, Limbers C A, Franciosi J P, Pohl J F. PedsQL gastrointestinal symptoms module item development: qualitative methods. *J Pediatr Gastroenterol Nutr* 2012; 54: 664–71.
- 123 Francis J J, Wileman S M, Bekker H, Barton G R, Ramsay C R. Beliefs about surgery: development and validation of an instrument to assess cognitive representations about surgery, in the context of a chronic illness. *Psychol Health* 2009; 24: 1125–37.
- 124 Stull D E, van Hanswijck de J P, Houghton K, Kocun C, Sandor D W. Development of a frequent heartburn index. *Qual Life Res* 2011; 20: 1023–34.
- 125 Shikhar R, Flood E, Siddique R, Howell J, Dodd S L. Development and validation of the Gastroesophageal Reflux Disease Treatment Satisfaction Questionnaire. *Dig Dis Sci* 2005; 50: 2025–33.
- 126 Coyne K S, Wiklund I, Schmier J, Halling K, Degl I A, Revicki D. Development and validation of a disease-specific treatment satisfaction questionnaire for gastro-oesophageal reflux disease. *Aliment Pharmacol Ther* 2003; 18: 907–15.
- 127 Atkinson M J, Sinha A, Hass S L *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: 12–25.
- 128 Wahlqvist P, Medin J, Karlsson M, Reilly M C. Responsiveness to change and construct validity of the work productivity and activity impairment questionnaire for gastroesophageal reflux disease (WPAI:GERD) in Swedish patients. 2009 Value in Health Conference: ISPOR 14th Annual International Meeting Orlando, FL United States Conference Start: 20090516 Conference End: 20090520 Conference Publication: (var pagings) 12: May.
- 129 Wahlqvist P, Carlsson J, Stalhammar N O, Wiklund I. Validity of a Work Productivity and Activity Impairment questionnaire for patients with symptoms of gastro-esophageal reflux disease (WPAI-GERD)—results from a cross-sectional study. *Value Health* 2002; 5: 106–13.
- 130 Wahlqvist P, Guyatt G H, Armstrong D *et al.* The Work Productivity and Activity Impairment Questionnaire for Patients with Gastroesophageal Reflux Disease (WPAI-GERD): responsiveness to change and English language validation. *Pharmacoeconomics* 2007; 25: 385–96.