Consensus statement

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International consensus definition of low anterior resection syndrome

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Abstract

Aim Low anterior resection syndrome (LARS) is pragmatically defined as disordered bowel function after rectal resection leading to a detriment in quality of life. This broad characterization does not allow for precise estimates of prevalence. The LARS score was designed as a simple tool for clinical evaluation of LARS. Although the LARS score has good clinical utility, it may not capture all important aspects that patients may experience. The aim of this collaboration was to develop an international consensus definition of LARS that encompasses all aspects of the condition and is informed by all stakeholders.

Method This international patient–provider initiative used an online Delphi survey, regional patient consultation meetings, and an international consensus meeting. Three expert groups participated: patients, surgeons and other health professionals from five regions (Australasia, Denmark, Spain, Great Britain and Ireland, and North America) and in three languages (English, Spanish, and Danish). The primary outcome measured was the priorities for the definition of LARS.

Results Three hundred twenty-five participants (156 patients) registered. The response rates for successive rounds of the Delphi survey were 86%, 96% and 99%. Eighteen priorities emerged from the Delphi survey. Patient consultation and consensus meetings refined these priorities to eight symptoms and eight consequences that capture essential aspects of the syndrome. Sampling bias may have been present, in particular, in the patient panel because social media was used extensively in recruitment. There was also dominance of the surgical panel at the final consensus meeting despite attempts to mitigate this.

Conclusion This is the first definition of LARS developed with direct input from a large international patient panel. The involvement of patients in all phases has ensured that the definition presented encompasses the vital aspects of the patient experience of LARS. The novel separation of symptoms and consequences may enable greater sensitivity to detect changes in LARS over time and with intervention.

Keywords Consensus definition, low anterior resection syndrome, patient-reported, rectal resection

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[1]LARS International Collaborative Group members are listed in the Acknowledgements.

Introduction

Colorectal cancer is the third most common cancer worldwide, with 1.8 million cases reported in 2018 [1]. The introduction of stapling devices and other techniques has facilitated a rise in sphincter-saving surgery for rectal cancer [2]. Total mesorectal excision and radiotherapy have dramatically improved oncological outcomes [3,4]. Improved survival has heightened awareness of survivorship issues, including bowel dysfunction [5]. Consequently, clinicians and researchers have been urged to look beyond survival and recurrence as the sole measures of treatment success [6]. Core outcome sets that specify a minimum set of outcomes to be measured have been proposed to reduce the heterogeneity of outcome reporting and reporting bias in clinical trials [7]. The proposed core outcome sets for colorectal cancer surgery include quality of life and functional outcomes, highlighting the importance of these outcomes [7].

The term low anterior resection syndrome (LARS) describes 'disordered bowel function after rectal resection, leading to a detriment in quality of life' [8]. Although pragmatic, this definition can incorporate a vast array of symptoms from faecal incontinence and urgency to evacuation difficulties. Consequent heterogeneity in reporting makes it impossible to accurately identify the prevalence of LARS [9–11]. Development of a validated patient-reported outcome measure, the LARS score, has improved the standardization of reporting [12] and prevalence of LARS using this tool is reported to be 41% (95% CI 34%–48%) [13]. The LARS score has good psychometric properties and has been validated in multiple languages [14–17]. However, the LARS score may significantly underestimate the impact of evacuatory dysfunction and may not accurately assess the impact of symptoms on an individual patient's quality of life [18].

Like most patient-reported outcome measures, the LARS score was initially produced by expert clinician researchers who then consulted patient populations [12]. Active involvement of all major stakeholders, especially patients, early in the construction of any outcome measure is necessary to ensure that the resulting tool is fit for purpose, as outlined by the COMET [19] and COSMIN [20] guidelines. The aim of this study is to use an international patient–provider initiative with robust methodology to produce a consensus definition of LARS. This is the first phase of a wider project to construct a tool to accurately identify survivors who have LARS, assess severity and enable evaluation of treatment approaches.

Method

Scientific committee

A scientific committee of patients and clinicians was convened to oversee the study. Clinician representatives were also lead investigators for each region involved in the study: Australasia, Denmark, North America, Spain, Great Britain and Ireland. Two patient representatives formed part of the scientific committee and contributed directly to conception, methodology, recruitment, interpretation and presentation of results. Ethical approval for this study was granted by the University of Auckland Human Participants Ethics Committee (ref. 019179).

Participants

Three groups of experts were enrolled in this study: patients (panel A), surgeons (panel B) and other healthcare professionals (panel C). There is no agreed method of determining required sample size for a consensus method Delphi survey [21], so a minimum recruitment target was set to balance the need for breadth of opinion and international involvement with the resources available. The recruitment target was 120 patients (24 per region), 60 surgeons and 60 other healthcare professionals (12 of each per region). Regional lead investigators were responsible for recruitment in their region. Maximum diversity sampling (nonprobabilistic purposeful sampling) was used to recruit a wide range of perspectives. The study was advertised via social media through charitable colorectal cancer organizations and peer support groups. Patient participants could volunteer by registering online. Care was taken to enrol patient participants who did not have a clinician–patient relationship with the lead investigators. All participants completed an enrolment registration form to obtain demographic details and, for patients, eligibility criteria and treatment information. Participants who completed a registration form were deemed to have given their consent to participate in the study; an additional consent form was not required.

Panel A

Patients were eligible to participate if they had undergone an anterior resection for rectal cancer more than 12 months earlier, with or without diverting ileostomy, providing any ileostomy had then been closed for at least 6 months and that adjuvant treatment had been completed. Patients who did not meet the inclusion criteria, who were receiving ongoing treatment for

recurrent or metastatic disease or who had cognitive impairment were excluded. Poor bowel function was not a requirement for eligibility; patients with good bowel function were also encouraged to participate.

Panel B

Surgeons were recruited via lead investigators in consultation with relevant societies: The Association of Coloproctology of Great Britain and Ireland (ACPGBI), The Royal Society of Medicine Section of Coloproctology (RSM Coloproctology), The Colorectal Surgical Society of Australia and New Zealand (CSSANZ), the Colon and Rectal Surgery Section of The Royal Australasian College of Surgeons (RACS), The European Society of Coloproctology (ESCP) and The American Society of Colon and Rectal Surgeons (ASCRS).

Panel C

Other specialists who treat or conduct research into LARS were identified by lead investigators and invited to participate. This panel included specialist nurses, biofeedback specialists, physiotherapists, gastroenterologists, oncologists with a special interest in functional outcome after rectal cancer treatment and pelvic floor specialists with an interest in managing LARS.

Longlisting of potential outcomes

Systematic review of literature published between 1986 and 2016 that reported functional outcomes after sphincter-preserving rectal resection was undertaken to produce a comprehensive list of bowel function outcomes that were then tested in a pilot study. The results of this review have been published [9] and were used in round 1 of the Delphi survey. Participants were invited to add novel items during round 1.

Phase 1: online Delphi survey

Delphi methodology aims to produce a convergence of opinion using multiple iterative rounds of a questionnaire [22,23]. The Delphi survey consisted of three rounds, available to participants in three languages: Danish, English and Spanish. The first round was sent to all eligible registered participants – patients, healthcare professionals and surgeons. Subsequent rounds were only sent to participants who completed the previous round and were accompanied by a graphical summary of how each expert group responded to each question ('item') in the previous round (see Appendix S1, http://links.lww.com/DCR/B127). The Survey Monkey platform was used to manage surveys. Patient representatives sent newsletters to maintain participant engagement and highlight the focus on the patient perspective.

In each survey, participants were asked to rank each item on a 1–9 point Likert scale from 'Not important' (1) to 'Essential' (9) for the definition of LARS, with an additional response option 'Unable to comment' (0) (see Appendix S1 for the format of a question, http://links.lww.com/DCR/B127). Likert rankings of 7–9 in any round were considered to indicate high-priority items, ratings of 4–6 indicated moderate-priority items that were important but not critical for the definition and rankings of 1–3 were low priority. The scientific committee applied *a priori* decision rules to determine which items progressed to the next round (see Appendix S2, http://links.lww.com/DCR/B128). During the first round, participants were invited to provide additional items important for the definition of LARS. Thematic analysis of all additional items was undertaken and these items were included in round 2 (see Appendix S3 for questions included in each round, http://links.lww.com/DCR/B129). Round 3 incorporated items that met consensus criteria for 'high priority' in round 1 or round 2 and items that had not met consensus in round 2.

Phase 2: patient consultation meetings

Each region convened a patient consultation meeting to elicit detailed information on patient views by using the nominal group technique [24]. A uniform template of phase 1 results was prepared, and the discussion was centred around items that had not met consensus in the Delphi survey. The meetings allowed discussion of items that may have been misrepresented or divided votes due to overlap. Face-to-face meetings were held in London, Barcelona and Aarhus. Because of geographical constraints, 2-h teleconference meetings were held for Australasian and North American patient expert panels using the Zoom web-based conferencing platform. Online meetings were recorded and transcribed.

Phase 3: consensus meeting

Participants who completed all three Delphi survey rounds were invited to attend the international multidisciplinary consensus meeting held in Nice, France, at the 2018 Annual ESCP meeting. Feedback from all patient consultation meetings was presented before discussion to achieve final consensus. Polling was used to assess whether items that had met 'high priority' consensus during the Delphi survey were required for the definition and to determine whether related items could be amalgamated.

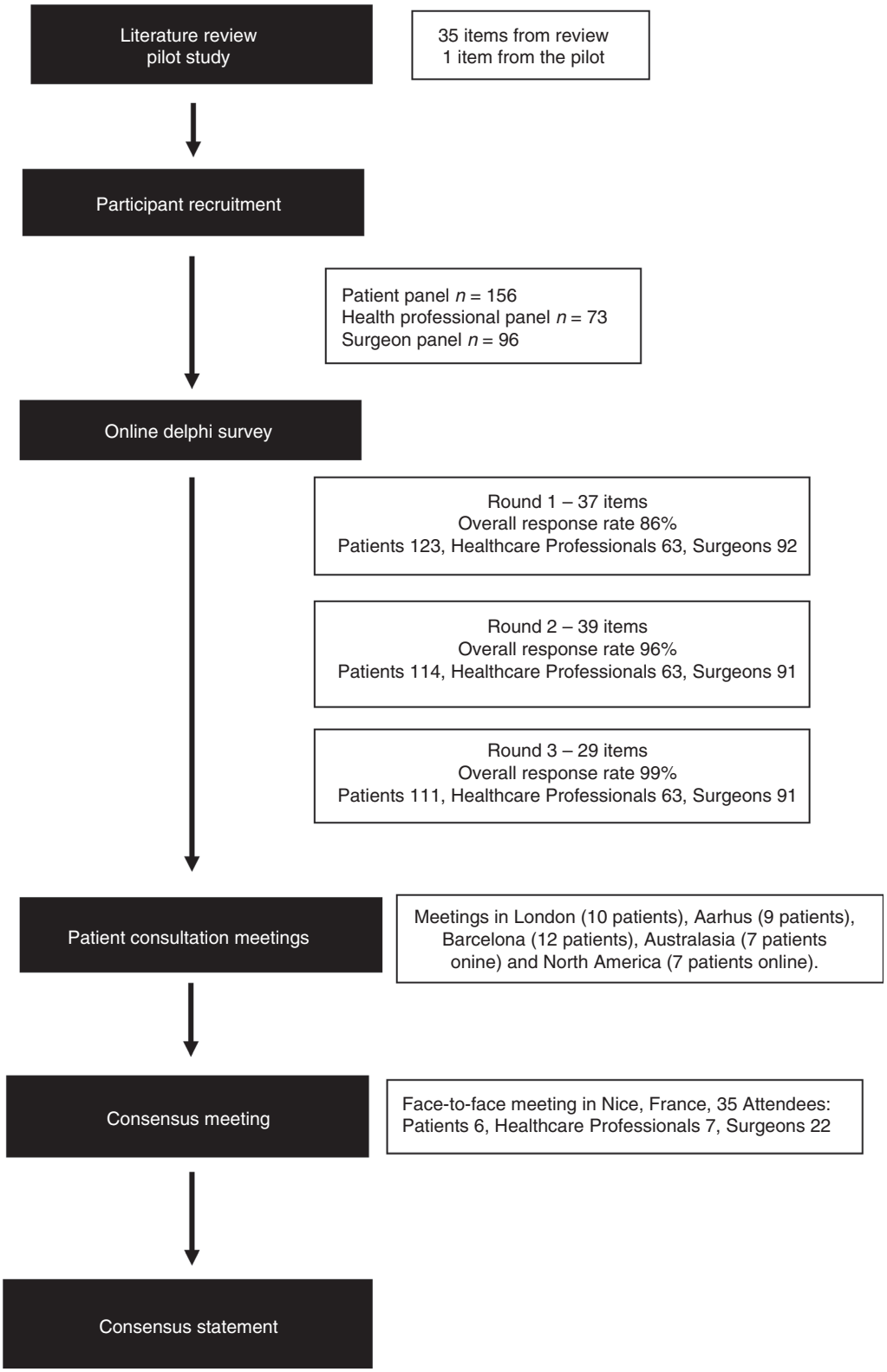

Figure 1 Study methodology.

Table 1 Participant characteristics.

Characteristics	Patient panel (n = 156)	Health professional panel (n = 73)	Surgeon panel (n = 96)
Sex (female %/male %)	66/34	92/8	31/69
Age (years, %)			
20–29	0	5	1
30–39	6	10	8
40–49	19	28	28
50–59	32	39	31
60–69	30	18	25
70–79	13	0	8
Years in practice, median (range)		20 (1–42)	11 (1–40)
Year since surgery, median (range)	3 (1–15)		
Treatment included radiotherapy, %	55		
Treatment included chemotherapy, %	69		
Temporary stoma, %	86		
Satisfied with bowel function, %			
Yes	21		
Sometimes	36		
No	43		

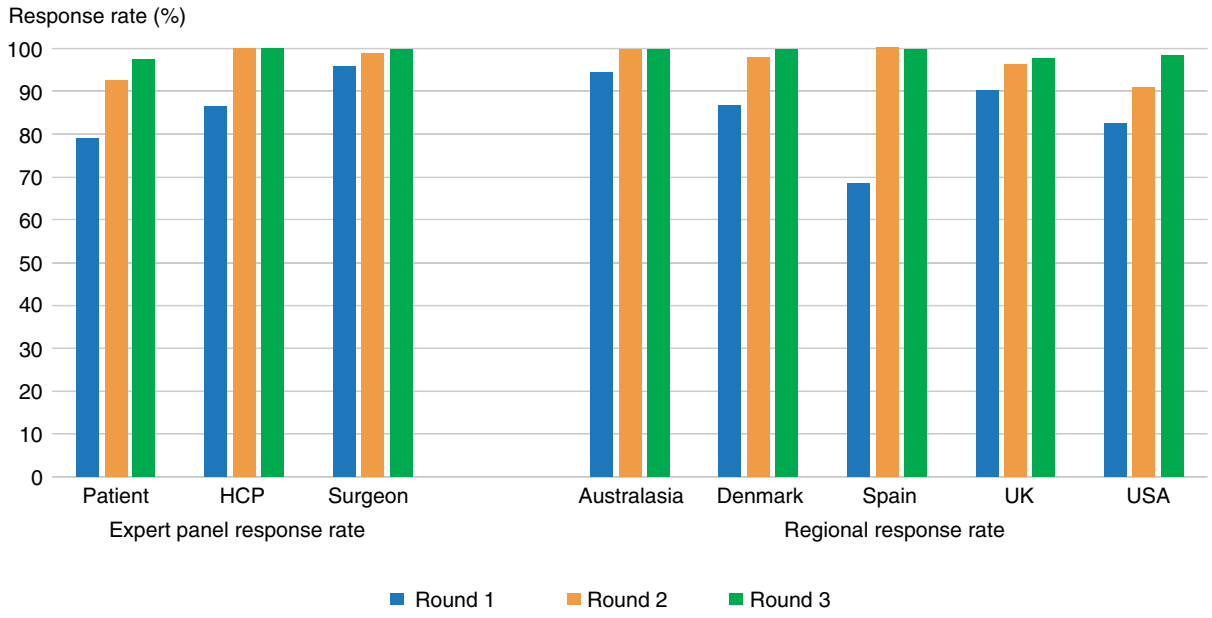

Figure 2 Response rate for each group. Round 1 (left, blue bar), round 2 (middle, orange bar), to round 3 (right, green bar).

Data analysis

Descriptive statistics including percentages and median (range) are presented. The chi-square test was used for comparisons between categorical data. Correlations were assessed using the nonparametric Spearman rho (ρ) test. IBM SPSS Statistics for Macintosh v.24.0 (IBM Corp, Armonk, NY, USA) and GRAPHPAD PRISM v.7 for Mac OS X (GraphPad Software, La Jolla, California, USA) were used for the statistical analyses.

Results

The study methodology and number of participants at each stage are summarized in Fig. 1.

Participants

Three hundred twenty-five participants registered: 156 patients, 96 colorectal surgeons, and 73 healthcare professionals; 55 from Australasia, 53 from Denmark, 44 from Spain, 93 from Great Britain and Ireland and 80 from North America. Details of participants registered for each expert panel are shown in Table 1. Participants completing each Delphi survey round were invited to participate in the next rounds, so the response rate denominator is the number of participants in the previous round. Overall response rates were 86% (278/325) for round 1, 96% (268/278) for round 2 and 99% (265/268) for round 3. Response rates for each region and expert panel are shown in Fig. 2.

Delphi survey

Round 1 contained 37 items. The patient panel produced the most discriminatory rankings, but overall group and patient panel rankings were similar. Eight items were ranked 'high priority' (scores of 7–9 out of 9) by the majority (67%) of all three panels and a further five items were ranked 'high priority' by the majority (67%) of the patient participants, so these items progressed directly to round 3. 'Incontinence (of any kind): unintended passage of solid, liquid or gaseous faecal material' was removed because it was redundant [the responses to this were highly correlated with the responses to the questions regarding solid stool incontinence ($\rho = 0.84$) and liquid faecal incontinence ($\rho = 0.88$)]. Two items that met the criterion for high priority were amalgamated to reduce splitting of the vote between related items ($\rho = 0.59$): *Stool frequency: number of bowel movements per 24 h* and *Stool frequency > 4 per 24 h*. No items in round 1 met the consensus criterion for 'low priority'; therefore, all other items were re-presented in round 2 for further consideration (see Appendices S3 and S4, http://links.lww.com/DCR/B129 and http://links.lww.com/DCR/B130).

Round 2 included 24 items that did not meet consensus in round 1 and 15 new items generated by both patients and clinicians from round 1. The patient panel again produced the most discriminatory rankings. Patient representatives on the steering group raised concerns that certain items were being ranked lower because of wording issues and split voting. The steering group recognized that patients were less likely than clinicians to discard important symptoms and so the majority criterion was lowered from 67% to 55% to ensure important items were not lost before the final round of voting. Eighteen items progressed to round 3 based on the criteria that the majority (55%) of patient panellists ranked an item as high priority and < 33% of panellists ranked it as a low-priority item.

Round 3 included 29 items: 11 from round 1 and 18 items from round 2. Two items were reworded based on survey feedback and advice from patient representatives. *Inability to cope with bowel function* was reworded to *Need to use coping strategies to manage bowel function*. *Effect on sexual function* was reworded to *Impact on sexuality and sexual life*. A discernible cutoff point was evident above which the proportion of participants giving a high-priority ranking sharply increased, and the proportion of participants giving a low- or moderate-priority ranking sharply decreased. This cutoff point (a majority of 70%) was the criterion on which all items were assessed for inclusion in

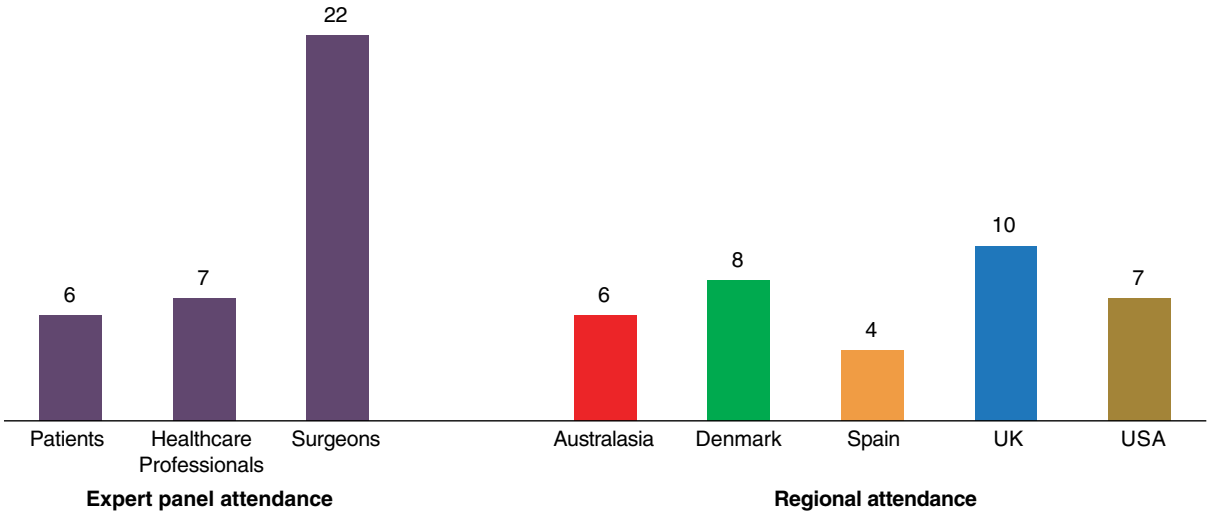

Figure 3 Attendance at the final consensus meeting by group and by region.

round 3. Appendix S5 (http://links.lww.com/DCR/B131) shows expert panel and overall rankings for all items.

Eighteen items met the consensus criteria: clustering/fragmentation, incomplete emptying, difficulty emptying, stool frequency, soiling, faecal incontinence, urgency, inability to defer defaecation, variable/unpredictable bowel function, dissatisfaction with bowel function, preoccupation with bowel function, toilet dependence, need to use coping strategies to manage bowel function, fear and/or anxiety over bowel control, effect on quality of life, effect on overall well-being, effect on lifestyle/daily activities, and effect on social activities.

Patient consultation meetings

A total of 42 patients participated in five meetings. Carers also attended and contributed. One important concept identified as missing was *Effect on mental health/psychological consequences of changes in bowel function*. There was general agreement that pain related to defaecation or to the urge to defaecate was important despite variable interpretations of tenesmus. There was agreement that *Impact on sexuality and sexual life* and *Effect on ability to perform usual work* are very important but needed rewording. Patients suggested expanding *Effect on ability to perform usual work* to include roles within family, community and other organizations, not just paid employment. There was agreement that the impact of LARS on sexuality was not solely due to changes in sexual function, but related more broadly to the impact on intimacy. Change in stool consistency was considered important, but *Diarrhoea* was mostly inevitable and was not itself the problem, whereas *Unpredictability of bowel movements* and *Paste-like stool consistency* made it difficult to evacuate. There was general agreement that some items may be amalgamated because they represented similar underlying concepts.

Final consensus meeting

Thirty-five Delphi participants attended the facilitated consensus meeting (Fig. 3). Discussion was structured around items that had met consensus but had potential to be amalgamated and items for which there were significant discrepancies in ranking among groups. Real-time electronic polling was used to identify whether a consensus had been reached after discussion of each item. The criterion for consensus was 70% of attendees.

Visual aids were used to ensure that patient voice was present during the meeting, including continuous PowerPoint presentation of patient participant quotes as well as posters of statements from patient participants during previous phases. The meeting opened with presentations from each regional lead investigator

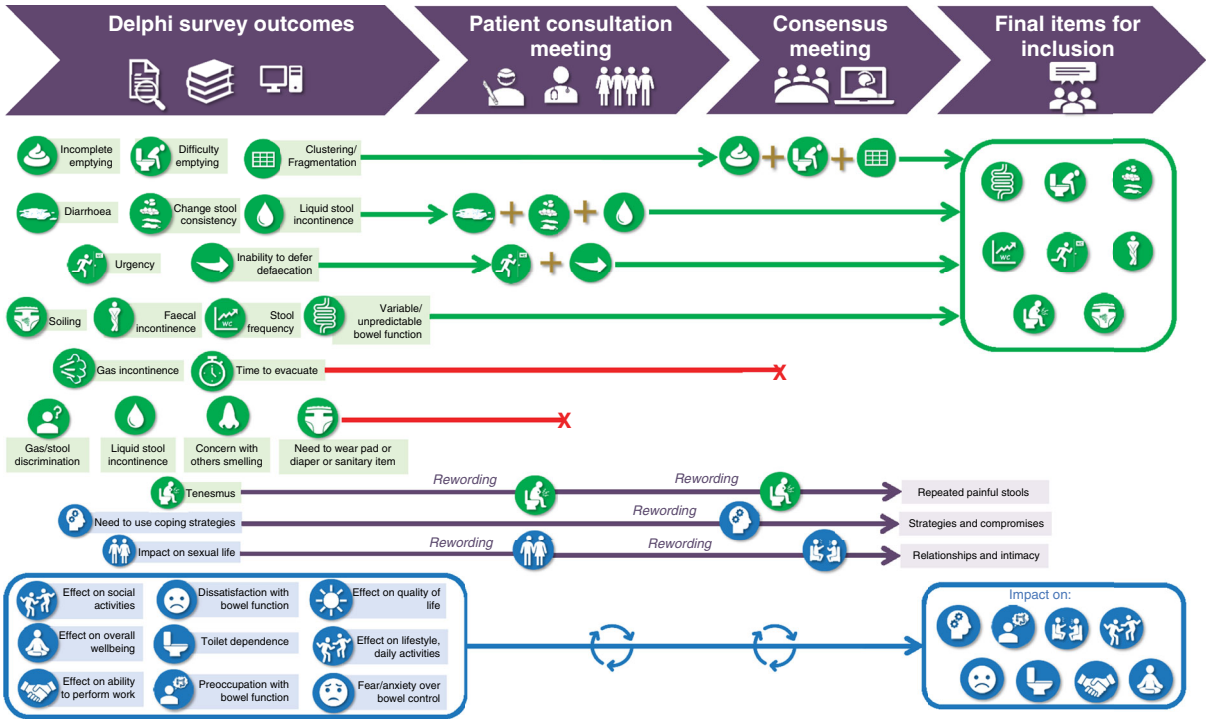

Figure 4 Priorities identified in each phase of the study.

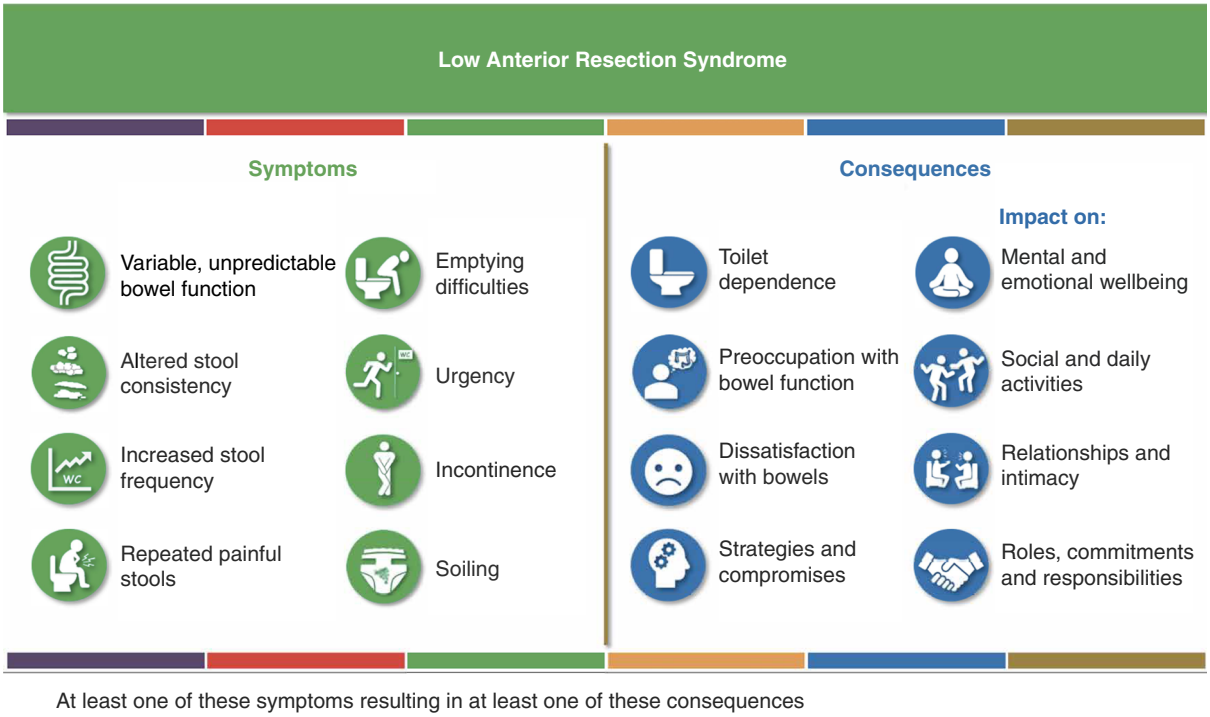

Figure 5 Consensus definition of low anterior resection syndrome. To meet the definition, a patient must have had an anterior resection (sphincter-preserving rectal resection) and experience at least one of these symptoms that results in at least one of these consequences.

summarizing the patient consultation meetings. During group discussion of each item, patient representatives were invited to articulate the patient voice.

Consensus meeting discussion clarified that symptoms should be differentiated from the impact or consequences of LARS. Figure 4 describes outcomes throughout each phase of the study (details in Appendix S6 http://links.lww.com/DCR/B132). Eight symptom complexes and eight consequences were agreed on as the most important priorities for definition of LARS (Fig. 5). To meet the definition of LARS, a patient must have had an anterior resection (sphincter-preserving rectal resection) and have at least one of these symptoms that results in at least one of these consequences. Increased stool frequency was compared with preoperative stool frequency. Repeated painful stools include pain on urge, on passing a bowel movement and/or after passing a bowel movement. Emptying difficulties include difficulty emptying the bowel for any reason, a feeling that the bowel has not completely emptied after passing a bowel movement and need to return to the toilet multiple times to empty the bowel. Faecal incontinence is defined as the unintended passage of a large volume of faecal material. Faecal urgency is the need to rush to the toilet to defaecate and/or the inability to delay passing a bowel movement. Soiling is the involuntary passage of a small amount of material onto clothing or a sanitary item.

Discussion

This international patient–provider initiative used robust methodology throughout three phases to reach a consensus definition of LARS. This is the first attempt to define LARS that from conception has incorporated multiple stakeholders and prioritized patient views. The major finding of this consensus definition is that both symptoms and consequences are important. The study has identified eight symptom complexes and eight consequences that are considered to be of the highest priority when defining LARS.

LARS has previously been pragmatically defined as ‘disordered bowel function after rectal resection, leading to a detriment in quality of life.’ [8] This broad definition does not allow the precise measurement of LARS. The LARS score was developed to overcome inconsistencies in reporting functional outcome and was designed to be a quick clinical evaluation tool to screen patients for LARS [12]. The LARS score has been widely adopted but appears to suffer from insensitivity to evacuatory dysfunction and may overestimate the impact on quality of life for some patients [18].

Weighting of the LARS score response categories makes the LARS score differentially responsive to change in certain dimensions (such as urgency) and may mean that more subtle improvements on other dimensions are not documented. There is also a high rate of LARS in the general population. When the LARS score was applied to the Danish population, 19% of women and 10% of men aged between 50 and 79 years experience symptoms that meet the criteria for major LARS [25]. This reflects the high sensitivity but low specificity of the LARS score. The more comprehensive Bowel Function Instrument (BFI) developed at the Memorial Sloan Kettering Cancer Center was also designed to measure bowel dysfunction after sphincter-preserving surgery but has not been used widely in the literature [26].

The major methodological difference between this work and previous attempts to measure LARS is the patient–provider approach. Patients were not only participants, but also investigators. Active steps were taken throughout to ensure that the patient perspective was recognized and amplified. This key factor is likely to have contributed to a more efficacious definition that accurately captures real-world clinical experience. Engagement of the wider patient community through advertising the project via social media and involvement of patient participants active in peer support groups may allow wider dissemination of the proposed definition.

The overarching difference between the current results and the previously published LARS score and BFI is that the outcome is a definition not a scoring system. However, there is some overlap that is worthy of comment. Both the LARS score and BFI enquire about stool frequency, incontinence, urgency and clustering or fragmentation, which is consistent with the proposed definition. The BFI also investigates diarrhoea or loose stool, soiling, emptying difficulties (incomplete evacuation) and whether patients have to alter their activities because of bowel function, which are all concepts that reached consensus in the current work. However, the LARS score and the BFI include flatus incontinence, which did not reach consensus for inclusion in the proposed definition. The BFI also inquires about dietary restrictions and distinguishes between daily and nocturnal symptoms, which were not borne out in the consensus work. The LARS score incorporated quality of life by weighting the response categories based on a statistical association with the overall effect of bowel function on the quality of life, whereas the BFI simply included a question about altering activities because of bowel function. The consensus work suggests that the impact of LARS is such an important component that it is necessary to specify the various dimensions that may be impacted by the symptoms of LARS.

There are multiple novel components identified in this work that may be due to the early and consistent inclusion of the patient perspective. In particular, the concept of variable or unpredictable bowel function and altered stool consistency may align better with patient experience. Patient participants reported that diarrhoea was less of an issue than unpredictable movements and paste-like consistency that makes evacuation difficult. Clear differentiation into symptoms and consequences is novel. Further work is needed to transform the definition presented here into a scoring system, but we suggest that inclusion of specific patient-centred consequences may allow development of a refined tool with greater discrimination of changes that occur over time and with treatment.

Our study attempted to obtain a broad range of opinion from all important stakeholders across a diverse cultural, ethnic and geographical area, but it was limited by the resources available. Ideally, more than five geographical regions would have participated. Strategies were used to enhance the patient voice, including preference to patient panel rankings in the Delphi survey; patient consultation meetings were held to allow proxies to take the patient voice to the consensus meeting; and visual aids were used to prompt awareness of the patient voice during the consensus meeting. However, these strategies are not substitutes for the presence of patient representatives, and we must acknowledge the dominance of the surgical panel at final consensus despite attempts to mitigate this issue. There was the possibility for sampling bias, in particular, in the patient panel, because social media was used extensively in patient participant recruitment. However, many patient participants were active members or even conveners of support groups, and they endeavoured to present majority opinions from their wider groups.

The LARS score was designed as a simple tool for clinical evaluation of LARS, and, although developed with robust methodology, it was not developed on the basis of an accepted definition of LARS. This has resulted in the inability of the LARS score to capture evacuatory dysfunction [18]. To produce a more robust scoring system, we have developed a sequential approach; the initial phase is this consensus definition based on broadly agreed upon priorities of LARS, the second will involve transformation of these priorities into questions with weighting, and finally the new tool will be assessed in both cross-sectional and longitudinal validation studies. We have not attempted to present a new 'LARS score' in this article, merely the results of the initial phase. Before moving on to the transformation, we need to assess whether the priorities we have presented are acceptable to the wider community. We

aimed to develop a definition that aligned with the patient experience so that it will enable greater recognition of LARS in routine clinical practice. The production of an easily recognizable visual aid will hopefully allow for greater awareness of LARS by both patients and clinicians, and will hopefully enable more patients to receive professional help for their symptoms. We do not expect the work presented here to directly improve the assessment of the prevalence of LARS, nor the assessment of LARS over time or with treatment, but we will base subsequent work toward these aims on the priorities identified here.

Conclusion

This is the first attempt to define LARS using robust methodology that included multiple stakeholders, particularly patients. This novel approach has identified that both symptoms and consequences are important priorities in LARS. Acknowledging this by transforming these important priorities into a new tool to measure LARS may enable better identification of rectal cancer survivors who experience bowel dysfunction, more accurately assess its severity and enable more precise evaluation of treatment approaches for LARS.

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Conflicts of interest

None reported.

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Supporting Information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Example of the question layout from round 3.
Appendix S2. The decision rules including application and deviation from these rules.
Appendix S3. Table of questions in each round of the Delphi survey.
Appendix S4. Median scores for the panels for each round of the Delphi Survey.
Appendix S5. Rankings for each expert group and overall rankings for all items at the end of round 3 of the online Delphi survey.
Appendix S6. Priorities identified in each phase of the study.

