

International expert consensus guidance on indications, implementation and quality measures for transanal total mesorectal excision

The TaTME Guidance Group representing the ESCP (European Society of Coloproctology), in collaboration with the ASCRS (American Society of Colon and Rectal Surgeons), ACPGBI (Association of Coloproctology of Great Britain and Ireland), ECCO (European Crohn's and Colitis Organisation), EAES (European Association of Endoscopic Surgeons), ESSO (European Society of Surgical Oncology), CSCRS (Canadian Society of Colorectal Surgery), CNSCRS (Chinese Society of Colorectal Surgery), CSLES (Chinese Society of Laparo-Endoscopic Surgery), CSSANZ (Colorectal Surgical Society of Australia and New Zealand), JSES (Japanese Society of Endoscopic Surgery), SACP (Argentinian Society of Coloproctology), SAGES (Society of American Gastrointestinal and Endoscopic Surgeons), SBCP (Brazilian Society of Coloproctology), Swiss-MIS (Swiss Association for Minimally Invasive Surgery)

Received 15 March 2020; accepted 17 March 2020

Abstract

Aim To provide dynamic guidance from a rigorous and up-to-date consensus on the safe implementation and application of transanal total mesorectal excision (TaTME) from an international panel of expert surgeons and educationalists supported by 14 international surgical societies.

Method An adapted Delphi method and focus group discussion approach was implemented for this consensus process, with expert advice from a guidelines methodologist. Statements were generated focusing on three main topics relating to the safe implementation of TaTME: (1) indications, (2) quality and outcome measures, (3) training and implementation of TaTME.

Results Five rounds of the Delphi consensus process were completed over a 13-month period. A total of 56 surgeons experienced in TaTME and surgical education participated in this project. By Delphi round four, 80.0% or greater agreement was reached for all statements except for two, which were further reviewed during a fifth round. More complex cases that are likely to benefit from TaTME were identified, with the recommendation that they should be referred to TaTME expert centres. The most agreed upon definition of expert centres is outlined.

Conclusion We have provided a current framework of best practice related to implementation of TaTME. The statements are not indefinite and will continue to be 'dynamic' and updated as new evidence emerges.

Keywords Consensus, guidance, rectal cancer, rectal surgery, TaTME, TME

What does this paper add to the literature?

This paper describes a new adapted Delphi consensus method that has engaged international expertise and collaboration in order to provide more detailed guidance on the safe adoption and practice of TaTME.

Introduction

The introduction of transanal total mesorectal excision (TaTME), following initial positive reports on the feasibility of this method [1–4] was largely unregulated and unstructured. Although steps were taken to follow the

*Correspondence to: Roel Hompes, MD, PhD, Department of Surgery, Amsterdam University Medical Centres, University of Amsterdam, Meibergdreef 9, 1105 AZ Amsterdam, the Netherlands.
E-mail: r.hompes@amc.uva.nl

Participants (in alphabetical order by surname): Michel Adamina, Felix Aigner, Sergio Araujo, Alberto Arezzo, Shady Ashamalla, Teresa deBeche-Adams, Stephen Bell, Willem Bemelman, Carl Brown, Walter Brunner, Nicolas Buchs, Antonio Caycedo, Sami Chadi, Park Sung Chan, David Clark, Quentin Denost, André D'Hoore, Nicola Fearhead, Nader Francis, Eelco de Graaf, Suguru Hasegawa, Julian Hayes, Alexander Heriot, Roel Hompes, Bert Houben, Masaaki Ito, Mark Katory, Jos Kleijnen, Werner Kneist, Joep Knol, Tsuyoshi Konishi, John Marks, Beatriz Martin-Perez, Justin Maykel, Elisabeth McLemore, Danilo Miskovic, Isacco Montroni Gabriela Möslein, Jae Hwan Oh, Rodrigo Oliva Perez, Marta Penna, Frederic Ris, Gustavo Rossi, Eric Rullier, Gerald Seitinger, Antonino Spinelli, Andrew Stevenson, Patricia Sylla, Ichiro Takemasa, Pieter Tanis, Jared Torkington, Juriaan Tuynman, Elena Vikis, Janindra Warusavitame, Mark Whiteford, Hongwei Yao, Seong Hyeon Yun, Zhongtao Zhang, Minhua Zheng.

IDEAL recommendations for surgical innovation [5], the technique moved rapidly from the translational (early adopters) to the explorative phase (larger surgical community) [6–10]. The concept of accessing the notoriously difficult anatomical environment of the lower pelvis through the anus offered a seemingly logical and innovative solution to optimize safe resection margins during rectal cancer surgery. Subsequently, indications were expanded to other fields, such as transanal proctectomy for inflammatory bowel disease and management of chronic pelvic sepsis following failed colorectal anastomoses [11–13]. While published data on short-term oncological outcomes from the international LOREC TaTME registry have not been inferior to those of laparoscopic or open TME [14], a recent report on high rates of multifocal pelvic recurrences in a cohort in Norway has led to serious concerns regarding the oncological safety of TaTME and resulted in a moratorium in that country until further robust data are available [15,16]. Previous reports on technique-specific complications, such as urethral injuries and CO₂ embolism, have also raised concerns regarding the procedural safety of TaTME [8,14,17,18]. It remains unclear whether these issues are related to poor adherence to recommendations regarding safe adoption and performance of TaTME, including insufficient procedural training and lack of prerequisite technical skills, or inappropriate patient selection. Recent data highlighting the long learning curve required to master TaTME, even by experts, have led to the debate as to whether this technique can be safely implemented outside of high-volume, tertiary referral centres for rectal cancer [19,20].

More recently, a proposal was made for a structured training programme specifically for TaTME [21–23] aiming for a more controlled and safer implementation by safeguarding training of surgeons with the necessary prerequisite skills, appropriate case selection and proctoring of initial cases. A recent expert consensus statement was a further attempt to structure the safe implementation of TaTME, but it was felt that the consensus was not complete and not rigorous enough in its content [24].

The European Society of Coloproctology (ESCP) instigated a new consensus with the aim of developing guidelines regarding safe implementation and application of TaTME. Active collaboration with other colorectal societies was sought, and led to this consensus guidance regarding indications and implementation with broad international support.

Method

Process

For this expert consensus project, an adapted Delphi method and focus group discussion approach was used.

A core group of 17 expert surgeons from eight countries who were either early adopters of TaTME, and/or high-volume TaTME surgeons, and/or actively involved in TaTME training as workshop faculty members or proctors, and/or who had extensively published on the topic, met during the annual ESCP conference in Berlin in September 2017. Four topics related to safe implementation of TaTME were identified: (1) indications, (2) quality and outcome measures, (3) training and (4) technique. Each topic was assigned a working group that was given the task of drafting expert statements and recommendations related to their assigned topic, based on review of published evidence as well as expert opinions.

A second face-to-face meeting was held in December 2017 during the European Colorectal Congress in St Gallen, Switzerland to review the initial draft statements and further define the methodology for this consensus project. In consultation with an expert in clinical guideline development (JK), the group determined that in the absence of high-level evidence (such as randomized controlled trials), the expert panel would use a pragmatic structured expert consensus in order to provide an ‘International Expert Guidance on the safe implementation of TaTME’ document rather than more prescriptive evidence-based, best-practice guideline on safe implementation of TaTME. The panel also agreed that a wider and more diverse group of TaTME experts should be selected from various surgical societies around the world. Consequently, additional experts were invited from the American Society of Colon and Rectum Surgeons (ASCRS), the Association of Coloproctology of Great Britain and Ireland (ACPGBI), the European Crohn’s and Colitis Organisation (ECCO), the European Association of Endoscopic Surgeons (EAES), the European Society of Surgical Oncology (ESSO), the Canadian Society of Colorectal Surgery (CSCRS), the Chinese Society of Colorectal Surgery (CNSCRS), the Chinese Society of Laparo-Endoscopic Surgery (CSLES), the Colorectal Surgical Society of Australia and New Zealand (CSSANZ), the Japanese Society of Endoscopic Surgery (JSES), the Argentinian Society of Coloproctology (SACP), the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), the Brazilian Society of Coloproctology (SBCP) and the Swiss Association for Minimally Invasive Surgery (Swiss-MIS).

Each working group subsequently revised the initial set of guidance statements for each of the four topics related to safe implementation of TaTME. The statements were organized into an electronic Delphi questionnaire (SurveyMonkey®). The first round of voting was sent electronically to 50 participating surgeons, with 24 responses being received (48.0%). A second round of the Delphi questionnaire was sent to the

group that increased to 55 members at this point, and 33 (60.0%) responded.

The third meeting in person took place in London, UK, during the EAES conference in May 2018 with some surgeons attending via an internet-based teleconference link. Results from the second round of voting were reviewed, and the guidance statements were further modified during focus group discussions. At this point, it was decided to abandon the statements regarding surgical technique (group 4). The group recognized that the development of technical guidelines would require too many resources and therefore should be explored as a separate project. After this meeting, a further round of voting (the third) was carried out with the revised guidance statements with a response rate of 78.2% (43/55 members).

A fourth meeting and final face-to-face meeting was held during the ESCP conference in Nice in September 2018. Again, previous results were analysed, and comments reviewed. Further amendments were made by the group during group discussions.

The final group of expert participants consisted of 56 surgeons from 19 different countries (Argentina, Australia, Austria, Belgium, Brazil, Canada, China, England, France, Germany, Italy, Japan, Korea, the Netherlands, New Zealand, Spain, Switzerland, the USA and Wales) (Appendix S1). The fourth round of voting was completed by 54/56 members (96.4%) following the group meeting in Nice. A final, fifth round of voting was sent to address two statements where consensus could not be reached. An 87.5% (49/56) response rate was obtained.

Analysis

Delphi questionnaires were structured as guidance statements and consensus was assessed based on the level of

agreement/disagreement for each item. Free text comments were elicited during each round of Delphi questionnaires and reviewed during focus group discussions with revision of statements at each meeting. While there was no limit on the number of rounds of reiterative questionnaires sent out, for the purpose of this guidance document, consensus was considered achieved when agreement level of over 80% was reached.

Results

Five rounds of the Delphi consensus process were completed over a 13-month period. A total of 56 surgeons experienced in TaTME and surgical education participated in this project. The guidance statements, level of agreement achieved and written comments were reviewed and discussed at face-to-face meetings after the initial three rounds. By Delphi round 4, agreement of 80.0% or more was reached for all statements except for two (indications for completion TME surgery and definition of an expert centre). A fifth Delphi round was conducted in September 2019 in an effort to resolve both statements. A summary of the consensus process for this guidance document can be found in Table 1. Guidance statements regarding indications, surgical quality and training and implementation of TaTME are listed in Tables 2–5 with the final levels of agreement for each statement.

Discussion and conclusions

In the current climate of uncertainty regarding outcomes, indications and implementation of TaTME, the development of guidance statements on safe adoption and implementation of TaTME have been long awaited by surgical societies and rectal cancer surgeons. Since implementation of novel surgical techniques is not

Table 1 Summary of the process for developing guidance statements.

Date	Type	Comments	Average agreement level (%)
September 2017	Focus group (Berlin)	Defining purpose and subjects, formation of working groups	N/A
December 2017	Focus group (St Gallen)	Determining methodology, initial guidance statements	N/A
May 2018	Delphi round 1	Participation 24/50 (48%)	81.9
May 2018	Delphi round 2	Participation 33/55 (60%)	78.8
May 2018	Focus group (London)	Reviewing and adapting previous statements	N/A
August 2018	Delphi round 3	43/55 (78.2%)	84.2
September 2018	Focus group (Nice)	Reviewing and adapting previous statements	N/A
October 2018	Delphi round 4	Participation 54/56 (96.4%)	91.3
June 2019	Delphi round 5	Selected statements only. Definition of expert centre	70.8

N/A, not applicable.

Table 2 Guidance statements on indications for TaTME.

No.	Guidance statement	Agreement (%)
1	A transanal approach could be used for any benign or malignant rectal resection where there is anticipated technical difficulty in pelvic dissection	93.40
2	Patients with previous prostatectomy, previous pelvic radiation (other than neoadjuvant treatment) or previous complex pelvic surgery can be considered for TaTME but the operation should only be performed in expert centres	98.40
3	TaTME should be used in rectal cancers only when TME is indicated	80.30
4	A transanal approach should be recommended in rectal cancer patients where a clear distal margin cannot be guaranteed by a pure abdominal approach	90.20
5	cT4 and Rullier Type 3 intra-anal rectal cancers can be considered for a transanal approach but should only be performed in expert centres	83.60
6	A transanal approach could be used if completion TME is indicated after previous full-thickness local excision	77.6
7	A transanal approach could be recommended for completion proctectomy in inflammatory bowel disease (IBD)	95.10
8	In both IBD and familial adenomatous polyposis patients, a transanal approach should be recommended for an ileoanal pouch procedure where there is anticipated difficulty in judging the level of distal transection by a pure abdominal approach	86.90
9	A transanal approach can be considered for revision of an ileoanal pouch but should only be performed in expert centres	95.10
10	A transanal approach for revision of refractory anastomosis-related sepsis can be considered but should only be performed in expert centres	96.70

Table 3 Guidance statements on surgical quality of TaTME.

No.	Guidance statement	Agreement (%)
11	An institutional protocol for TaTME must be established including operative set-up, procedural guide and perioperative management of the patient	93.30
12	TaTME histopathological and oncological outcomes must be prospectively recorded and benchmarked against the institution's historical performance. These must include specimen quality, circumferential resection margin, distal resection margin, local recurrence rates, disease-free survival and overall survival	90.00
13	TaTME surgical outcome measures must be prospectively recorded and benchmarked against the institution's historical performance. These must include operative time, intra-operative adverse events, conversion rates, postoperative morbidity and long-term anastomotic failure rate	85.00
14	TaTME functional outcomes could be prospectively recorded. These could include questionnaires on general and disease-specific quality of life, bowel, urinary and sexual function	85.00

usually regulated (albeit local protocols for such process may be in place [25]), guidance recommendations can provide a framework for the safe introduction of TaTME [5]. These recommendations can be seen as a framework, and are a component of the development phase of the IDEAL guidance for surgical innovation. They should allow for a safer progression to the exploration phase, in which the larger surgical community becomes involved.

The authors considered these statements to be timely because TaTME has been rapidly adopted globally, despite a lack of robust evidence regarding safety from multicentre randomized controlled trials,

often with insufficient training and/or lack of adherence to recommendations regarding appropriate indications or best practices [8]. This has led directly, and unnecessarily, to high rates of adverse clinical events. Reports on unusual complications, such as urethral injuries and, more recently, CO₂ embolism have raised significant concerns in the surgical community [14,17,18]. Concerns regarding unexpected high rates of multifocal cancer recurrence, despite being isolated, have led to a national moratorium on TaTME in Norway, with other units in different countries abandoning the technique due to similar concerns [15,16].

Table 4 Guidance statements on implementation and training of TaTME.

No.	Guidance statement	Agreement (%)
15	A formal structured training pathway should be completed to safely implement TaTME into clinical practice	95.00
16	The recommended requirements before undertaking a structured training pathway in TaTME must include established experience in minimally invasive TME and an annual institutional volume of at least 30 rectal resections	91.70
17	TaTME should be implemented by at least two surgeons per institution who have completed structured training	90.00
18	TaTME should be implemented within a multidisciplinary dedicated operative theatre team	91.70
19	A structured TaTME training curriculum should include: (i) didactic learning, (ii) observation of live TaTME procedures, including theatre set-up, (iii) a hands-on cadaver workshop, and (iv) a formal proctorship programme	95.00
20	The didactic learning contents must include: (i) patient selection, (ii) pelvic, perineal and transanal anatomy, (iii) operative set-up, techniques, and detailed procedural steps, (iv) strategies to avoid and manage procedural difficulties and complications, and (v) practical steps of how to implement the technique into clinical practice	96.70
21	Clinical training (proctorship) on TaTME should commence as early as possible after attending the cadaveric workshop with assigned proctors	98.30
22	Case selection must be discussed with the proctor	96.70
23	Proctorship training should continue until safe independent performance is achieved	93.30
24	Formative assessment (e.g. Global Assessment Score forms) should be applied during the entire length of the proctorship to monitor learning and to guide the duration of proctorship	93.30
25	Regular review and evaluation of clinico-pathological data with proctor feedback during the implementation phase must be carried out. Data should be collected in an established TaTME registry	93.30

Agreement was most difficult to reach in generating guidance statements regarding indications for TaTME. Disagreement on the wording and definitions became apparent, for example in statement 4 on the TaTME approach ‘guaranteeing’ a clear distal margin, which was criticized by some who felt that a clear margin can never be guaranteed. Technical difficulties in completing TME with an abdominal approach (statement 1) could not be further defined; it was recognized that such difficulties cannot always be predicted preoperatively, and the choice of approach may be changed intra-operatively (‘conversion to TaTME’). Some experts also wanted to include partial mesorectal excision (PME) as an indication for a transanal approach, but a majority supported the notion that, in cancer, a transanal approach should only be considered when TME is indicated (statement 3). However, it was acknowledged that in specific circumstances, when an abdominal approach was deemed hazardous due to tumour size or anatomical constraints, TaTME should be considered for PME.

A number of statements on specific indications for TaTME relied on the prerequisite that procedures should be performed in expert centres. Reaching consensus on the definition of an expert centre was difficult, and several revisions were required. Some of the supporting organizations disagree at society level with

the final consensus on expert centres agreed by the participants.

Guidance statements regarding the quality and outcome measures for TaTME included strong recommendations regarding the need for prospective clinical audits of TaTME outcomes. Some authors expressed concerns that in some cases this would require resources that may not be available in all units. In other countries, national mandatory databases for colorectal cancer are already in place and meet the criteria for clinical auditing.

Assessing the TaTME learning curve using negative clinical outcomes such as complication rates and/or incomplete resections is ethically very problematic as it demonstrates the inability of a surgeon to perform a procedure safely during the early phase of the learning curve. Hence, efforts should be directed towards the implementation of mechanisms that mitigate the risk of negative patient outcomes during skill acquisition by surgeons. The guidance statements regarding TaTME training and implementation include the strict requirement for workshops and proctoring, including a formative assessment framework (statements 19 and 24). The detailed structure and content of workshops was outlined, including the need for careful case selection in the early learning phase (statements 20 and 22). These requirements currently exceed available resources in

Table 5 Definition of expert centres.

No.	Definition of expert centres	Agreement (%)
1	Centre specifications: i Established tertiary referral centre for rectal cancer ii Centre for transanal and transabdominal minimally invasive surgery iii Established multidisciplinary team iv Intensive care unit available v A minimum of 25 annual cancer resections by TaTME following the indications described above; ideally reaching more than 40 annual resections involving the rectum for benign and/or malignant disease	62.5
2	Surgeon expertise: i At least two gastrointestinal (GI) specialist surgeons ii At least one GI surgeon with expertise in TaTME (overcome their learning curve) iii Experience in intersphincteric dissection iv Surgeon contribution to TaTME training preferable (e.g. course faculty, proctoring, fellowships)	97.9
3	Centre performance/outcomes: i More than 75% of primary rectal cancer (\leq T3) surgery performed with minimally invasive surgery ii High standard of clinical and pathological outcomes when compared with registry data	91.7

most countries, but some examples show that such training programmes are feasible and effective [21–23]. Nevertheless, for a majority of surgeons who wish to initiate TaTME, these programmes are not accessible and there is a clear need to develop these structured training programmes globally. The debate regarding formulation of a guidance statement on the minimum volume of rectal cancer surgery required at institutional level highlighted major differences in centralization of rectal cancer care, regional patterns of cancer referral and strong opinions on how proficiency should be defined. A minimum number of 30 rectal cancer cases per year reached the highest level of agreement (statement 16). Although the recommendation that at least two surgeons should be trained per hospital reached consensus (statement 17), some experts mentioned that in some circumstances a single surgeon may be sufficient, and that some centres may not support synchronous operating due to limited resources.

This guidance document is based on a consensus process representing expert opinion, due to lack of high-quality evidence to support many of the recommendations. While this may be seen as a major limitation of the document, these statements are not indefinite and may evolve as new evidence emerges. The intent of this document is to provide a current framework of best practices related to implementation of TaTME; it will subsequently be updated to reflect new evidence.

Acknowledgements

We would like to thank Professor Jos Kleijnen, Professor of Systematic Reviews and Clinical Guidelines from the School for Public Health and Primary care

(CAPRHI) at Maastricht University (the Netherlands) for his invaluable input and advice during the development of this guidance statement paper. Thank you to Marta Penna, clinical research fellow, for her hard work and contribution to this project.

Conflicts of interest

None of the co-authors/participants have any direct conflict of interest with regards to this paper. The participants below declare the following commitments/financial disclosures: Teresa deBeche-Adams, Applied Medical honoraria for TaTME courses; Andre D'Hoore, educational grant from Olympus nv; Julian Hayes, Applied Medical honoraria for TaTME courses and proctorship; Alexander Heriot, teaching on industry-supported TaTME courses; Roel Hompes, Applied Medical and Conmed honoraria for lectures and TaTME courses; Danilo Miskovic, honoraria from Medtronic to teach TaTME within the UK national training programme; Isacco Montroni, OLYMPUS SE Europe, invited speaker at TaTME courses; Antonino Spinelli, Ethicon and Frankenman honoraria; Patricia Sylla, consultant (for honoraria) with the following companies: Karl Storz, Olympus, Safeheal, Medtronic, Ethicon and Boston Scientific. The Multicenter TaTME trial (US and Canada) receives grant support from Karl Storz, Stryker, Intuitive, Ethicon, Conmed, Ethicon and Medtronic.

References

- Sylla P, Willingham FF, Sohn DK, Gee D, Brugge WR, Rattner DW. NOTES rectosigmoid resection using

- transanal endoscopic microsurgery (TEM) with transgastric endoscopic assistance: a pilot study in swine. *J Gastrointest Surg* 2008; **12**: 1717–23.
- 2 Trunzo JA, Delaney CP. Natural orifice proctectomy using a transanal endoscopic microsurgical technique in a porcine model. *Surg Innov* 2010; **17**: 48–52.
 - 3 Telem DA, Han KS, Kim MC *et al*. Transanal rectosigmoid resection via natural orifice transluminal endoscopic surgery (NOTES) with total mesorectal excision in a large human cadaver series. *Surg Endosc* 2013; **27**: 74–80.
 - 4 Sylla P, Rattner DW, Delgado S, Lacy AM. NOTES transanal rectal cancer resection using transanal endoscopic microsurgery and laparoscopic assistance. *Surg Endosc* 2010; **24**: 1205–10.
 - 5 McCulloch P, Altman DG, Campbell WB *et al*. Balliol Collaboration. No surgical innovation without evaluation: the IDEAL recommendations. *Lancet* 2009; **374**: 1105–12.
 - 6 Hompes R, Arnold S, Warusavitarne J. Towards the safe introduction of transanal total mesorectal excision: the role of a clinical registry. *Colorectal Dis* 2014; **16**: 498–501.
 - 7 Penna M, Whiteford M, Hompes R, Sylla P. Developing and assessing a cadaveric training model for transanal total mesorectal excision: initial experience in the UK and USA. *Colorectal Dis* 2017; **19**: 476–84.
 - 8 Atallah SB, DuBose AC, Burke JP *et al*. Uptake of transanal total mesorectal excision in north america: initial assessment of a structured training program and the experience of delegate surgeons. *Dis Colon Rectum* 2017; **60**: 1023–31.
 - 9 Lacy AM, Tasende MM, Delgado S *et al*. Transanal total mesorectal excision for rectal cancer: outcomes after 140 patients. *J Am Coll Surg*. 2015; **221**: 415–23.
 - 10 Penna M, Hompes R, Arnold S *et al*. Incidence and risk factors for anastomotic failure in 1594 patients treated by transanal total mesorectal excision. *Ann Surg* 2019; **269**: 700–11.
 - 11 Leo CA, Samaranyake S, Perry-Woodford ZL *et al*. Initial experience of restorative proctocolectomy for ulcerative colitis by transanal total mesorectal excision and single-incision abdominal laparoscopic surgery. *Colorectal Dis* 2016; **18**: 1162–6.
 - 12 Zaghiyan K, Warusavitarne J, Spinelli A, Chandrasinghe P, Di Candido F, Fleshner P. Technical variations and feasibility of transanal ileal pouch-anal anastomosis for ulcerative colitis and inflammatory bowel disease unclassified across continents. *Tech Coloproctol*. 2018; **22**: 867–73.
 - 13 Dapri G, Guta D, Grozdev K *et al*. Colorectal anastomotic leakage corrected by transanal laparoscopy. *Colorectal Dis* 2016; **18**: O210–O213.
 - 14 Penna M, Hompes R, Arnold S *et al*. Transanal total mesorectal excision: international registry results of the first 720 cases. *Ann Surg* 2017; **266**: 111–7.
 - 15 Larsen SG, Pfeffer F, Kørner H, Norwegian Colorectal Cancer Group. Norwegian moratorium on transanal total mesorectal excision. *Br J Surg* 2019; **106**: 1120–1.
 - 16 Wasmuth HH, Faerden AE, Myklebust TÅ *et al*. Transanal total mesorectal excision for rectal cancer has been suspended in Norway. *Br J Surg* 2020; **107**: 121–30.
 - 17 Dickson EA, Penna M, Cunningham C *et al*. Carbon dioxide embolism associated with transanal total mesorectal excision surgery: a report from the international registries. *Dis Colon Rectum* 2019; **62**: 794–801.
 - 18 Harnsberger CR, Alavi K, Davids JS, Sturrock PR, Zayaruzny M, Maykel JA. CO₂ embolism can complicate transanal total mesorectal excision. *Tech Coloproctol*. 2018; **22**: 881–5. Epub 2018 Dec 6.
 - 19 Lee L, Kelly J, Nassif GJ, DeBeche-Adams TC, Albert MR, Monson JRT. Defining the learning curve for transanal total mesorectal excision for rectal adenocarcinoma. *Surg Endosc* 2020; **34**: 1534–1542. <https://doi.org/10.1007/s00464-018-6360-4>
 - 20 Koedam TWA, Velcamp Helbach M, van de Ven PM *et al*. Transanal total mesorectal excision for rectal cancer: evaluation of the learning curve. *Tech Coloproctol* 2018; **22**: 279–87. Epub 2018 Mar 22.
 - 21 Francis N, Penna M, Mackenzie H, Carter F, Hompes R, International TaTME Educational Collaborative Group. Consensus on structured training curriculum for transanal total mesorectal excision (TaTME). *Surg Endosc* 2017; **31**: 2711–9.
 - 22 Velcamp Helbach M, van Oostendorp SE, Koedam TW *et al*. Structured training pathway and proctoring; multi-center results of the implementation of transanal total mesorectal excision (TaTME) in the Netherlands. *Surg Endosc* 2020; **34**: 192–201. <https://doi.org/10.1007/s00464-019-06750-w>
 - 23 Abbott S, Stevenson A, Bell S *et al*. An assessment of an Australasian pathway for the introduction of transanal total mesorectal excision (taTME). *Colorectal Dis* 2018; **20**: O1–O6.
 - 24 Adamina M, Buchs NC, Penna M, Hompes R, St.Gallen Colorectal Consensus Expert Group. St.Gallen consensus on safe implementation of transanal total mesorectal excision. *Surg Endosc* 2018; **32**: 1091–103.
 - 25 National Institute for Health and Care Excellence. *Transanal total mesorectal excision of the rectum. Interventional procedure guidance*, 2015. Available at <http://nice.org.uk/guidance/ipg514>. (accessed 8th January 2020).

Supporting Information

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

Appendix S1. TaTME guidance group collaborators.