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International Delphi consensus to define textbook outcome parameters for oncological gastrectomy (togs project)

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Abstract

Background Textbook Outcome (TO) is a quality indicator representing the ideal surgical postoperative course. The lack of consensus on TO parameters in Gastric Oncological Surgery (TOGS) hinders comparative outcomes analysis. This study aimed to establish a universally accepted set of TOGS parameters using Delphi consensus made by international experts in gastric cancer surgery.

Method The Delphi process involved four phases: 1. Evidence Acquisition: A systematic review revealed significant variability in TOGS parameters. 2. Expert Panel Discussion: Eight international experts developed 18 preliminary questions for a survey. 3. Delphi Process: Two rounds of anonymous surveys among key opinion leaders measured agreement using a 5-point Likert scale, with consensus defined as ≥ 70%. A third round was conducted to revise questions on mortality, lymph nodes, and hospital stay. 4. Generation of Recommendations were created based on consensus from the three rounds

Results Of 53 invited surgeons, 39 responded, and 34 completed both rounds. By the second round, ten parameters were agreed upon. 1) No 90-day mortality; 2) No complications ≥ III according to Clavien-Dindo classification; 3) No intraoperative complications according to the GASTRODATA classification; 4) R0 resection; 5) More than 25 lymph nodes analyzed in the surgical specimen; 6) No reoperation; 7) No readmission to the Intensive care Unit (ICU); 8) No readmission in the first 30 postoperative days; 9) Length of stay below the 75th percentile of the series; 10) Resumption of chemotherapy treatment, if indicated, within 8 weeks after surgery.

Conclusion TOGS consensus definition includes ten parameters specific to gastric cancer treatment. Validation in clinical practice is needed to confirm the proposed TOGS definition as a universal quality metric.

Keywords Surgical benchmarking, Quality indicators, Clinical performance metrics, Expert panel methodology, Standardization of care, Healthcare quality improvement

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Introduction

Textbook outcome (TO) has emerged as a composite quality metric that integrates several perioperative variables to describe an optimal postoperative course [1]. The concept was first introduced in 2013 by Kolfschoten et al. in the setting of colorectal cancer surgery, where six criteria were proposed: length of hospital stay, postoperative mortality, need for reoperation, readmission, achievement of an R0 resection, and performance of surgery without stoma formation. Since then, TO has been increasingly applied across a wide range of oncological and non-oncological surgical procedures, often incorporating additional or alternative variables to those originally described [2–4].

As a result, published TO rates are highly heterogeneous, reflecting substantial variation in the parameters used to define this outcome across surgical fields and even within the same pathology. Consequently, although TO represents a useful global indicator of surgical quality, the lack of uniformity in its definition hampers the comparability of results and limits the validity of cross-study conclusions [4, 5].

Esophagogastric surgery (EGS) is characterized by particularly high morbidity and mortality. The first TO definition specific to EGS was proposed by Busweiler et al. in 2017 [3]. This model, one of the most stringent reported, comprised ten individual variables and yielded lower TO rates than those observed in other oncological procedures. Since then, several updated TO definitions for gastric cancer surgery have been published, incorporating elements such as R0 resection status and lymph node yield [6–9]. However, important discrepancies persist, including differences in the exact composition of TO and in the timeframes used to assess outcomes (e.g., 30-day versus 90-day mortality). Furthermore, many studies have reported TO results for heterogeneous esophagogastric procedures as a single group, despite their markedly different risk profiles. Given that TO is increasingly used as a benchmark for quality assessment in gastric cancer surgery, the absence of an internationally agreed definition for textbook outcome in gastric surgery (TOGS) represents a major limitation.

The Delphi method is a structured and validated technique designed to achieve expert consensus on complex topics. It promotes iterative reflection, allowing participants to reassess their opinions in light of anonymized feedback from their peers [10, 11]. Typically, existing evidence is first reviewed to inform the development of a structured questionnaire, which is subsequently used in successive Delphi rounds to generate recommendations [10].

The aim of the present project was to establish an internationally accepted set of TOGS parameters, enabling meaningful comparison of surgical outcomes across different centers.

Methods

This Delphi-based consensus project was conducted in four sequential phases, each one informing the next. Ethical approval was not required, as no patients or identifiable personal data were involved.

Phase 1: Evidence acquisition

A systematic review of the textbook outcome in gastric surgery (TOGS) was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [12]. An unrestricted search was conducted in MEDLINE (via PubMed), EMBASE, the Cochrane Library, Latindex, SciELO, and Koreamed, without language limitations. The search was last updated on December 31, 2022.

The following search strategy was applied: (("Textbook outcome" OR "Textbook outcomes")) AND (("Gastric" OR "Stomach")) AND ("Surgery").

In addition, reference lists of all eligible studies were manually screened to identify further relevant publications.

The search retrieved 31 articles, of which 19 were excluded after screening. Ultimately, 12 studies were included in the qualitative synthesis. Considerable heterogeneity was observed, both in the selection of TO parameters and in their definitions. Mortality was included in all but one study, assessed either at 30 or 90 days. Readmission, defined using different criteria, was reported in all but one publication. All studies evaluated lymph node yield, although only one applied a cutoff of ≥ 15 nodes. Complete resection was reported in 66.7% of studies, and R0 status was reported in all reviewed articles [4]. Postoperative complications were incorporated as a TOGS component in eight studies (66.7%), most frequently defined using the Clavien–Dindo classification, with grades > III excluding TOGS achievement. One study applied a Comprehensive Complication Index (CCI) threshold of ≥ 30.4. The length of hospital stay was included in 10 studies, with variable cutoff points. Additional parameters—such as intraoperative complications, blood transfusion, ICU readmission, and neoadjuvant treatment—were inconsistently incorporated [4].

Phase 2: Expert panel discussion

A core committee of eight experts with recognized experience in gastric surgery and textbook outcome methodology was invited and agreed to participate. The panel represented institutions from three continents. Based on the findings of Phase 1, structured virtual meetings were held to discuss key domains and controversial aspects of

TOGS. As a result of these sessions, 18 preliminary questions were formulated for inclusion in the Delphi survey (Table 1).

Phase 3: Delphi process

A formal Delphi methodology was used to establish expert consensus. The survey was conducted electronically using Google Forms® (Mountain View, CA, USA) and administered in English. Questionnaire development was based on qualitative content analysis of the Phase 2 discussions.

The survey was distributed to the Phase 2 panel members and 45 additional international key opinion leaders, selected based on their peer-reviewed publications on gastric cancer and surgical outcomes. Participants were recruited from multiple countries across three continents to ensure diversity of clinical practice and healthcare systems.

Each expert received a personalized email invitation containing a link to the online questionnaire. Two Delphi rounds were conducted (Round 1: January 15 to May 15, 2023; Round 2: June 15 to October 15, 2023). At the beginning of each round, a formal invitation email was sent, followed by two reminders. A four-week interval between rounds was planned to allow analysis and preparation of subsequent questionnaires.

Participants rated their level of agreement with each proposed item using a 5-point Likert scale (1: totally disagree; 2: disagree; 3: neither agree nor disagree; 4: agree; 5: totally agree). Free-text fields were provided in both rounds to allow participants to propose additional criteria or comments. All responses were anonymized. Only participant initials, institution, and country were recorded to avoid duplicate entries.

Items reaching ≥ 80% agreement were removed from subsequent rounds, and their consensus status was communicated to all participants. To be included in the final recommendations, an item was required to reach ≥ 70% agreement by the end of the Delphi process. Items failing to reach consensus were addressed in Phase 4. Repeated anonymous voting was performed over two rounds, with participants informed of the aggregated group responses from the previous round [13].

Agreement levels were predefined as follows:

- Unanimity: 100% agreement.
- Agreement: ≥ 80% agreement.
- Majority: ≥ 70% agreement.
- Discrepancy: < 70% agreement.

Phase 4: Development of recommendations

The steering committee synthesized the Delphi findings and formulated the final recommendations, which are reported in this manuscript.

Statistical analysis

Only fully completed questionnaires were included in the analysis. Response rates were calculated for each Delphi round. For each survey item, results were reported as percentages for each Likert response category, together with median values and interquartile ranges, given the ordinal nature of the scale. Changes between rounds were described using differences in median Likert scores (Δ = Round 2 − Round 1) and percentage agreement to

Table 1 Results of round 1 of the Delphi study showing medians and percentages of responses on the Likert scale for each of the items

Item	Median	1(%)	2(%)	3(%)	4(%)	5(%)	4 + 5(%)
1.Any postoperative complication (Clavien-Dindo 0 to V) measured at 90 days	4	7.7	35.9	10.3	28.2	17.9	46.1
2. Any major postoperative complication (Clavien-Dindo III to V) measured at 90 days	5	0	2.6	2.6	23.1	71.8	94.9
3. Intraoperative complications assessed according to the Gastrodata classification	4	0	12.8	10.3	33.3	43.6	76.9
4. Readmission in ICU	5	2.6	7.7	2.6	28.2	59	87.2
5. Reintervention	5	0	7.7	2.6	23.1	66.7	89.8
6. Mortality at 30 days	5	2.6	10.3	12.8	23.1	51.3	74.4
7. Mortality at 90 days	5	0	7.7	0	15.4	76.9	92.3
8. Lymph nodes examined ≥ 15	4	5.1	12.8	23.1	20.5	38.5	59
9. Lymph nodes examined ≥ 20	4	0	20.5	28.2	12.8	38.5	51.3
10. Lymph nodes examined ≥ 25	4	2.6	12.8	23.1	25.6	35.9	61.5
11. Negative margins R0 resection	5	0	0	0	17.9	82.1	100
12. Length of stay ≤ 7 days	3	7.7	15.4	30.8	30.8	15.4	46.2
13. Length of stay ≤ 10 days	4	5.1	20.5	15.4	23.1	35.9	59
14. Length of stay ≤ 14 days	3	7.7	28.2	30.8	20.5	12.8	33.3
15. Length of stay p75	3	7.7	10.3	48.7	15.4	17.9	33.3
16. Readmission measured at 30 days	4	2.6	12.8	10.3	25.6	48.7	74.3
17. Readmission measured at 90 days	3	7.7	28.2	17.9	17.9	28.2	46.1
18. Chemotherapy restart (if there is indication) < 8 weeks after surgery	4	2.6	5.1	7.7	43.6	41	84.6

assess response stability and convergence. No inferential hypothesis testing was performed, as the primary objective of the Delphi process was to evaluate consensus rather than statistical significance. Data were extracted from the online survey platform and analysed using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarised as frequencies and percentages.

Results

The survey was sent to 45 surgeons, plus the Core group of 8. There were 39 responses in the first round, and 34 completed both rounds (87.17% of first-round responders); those responses were included in the analysis. Surgeons were from Japan (1), Korea (2), Spain (9), Italy (8), Netherlands (4), Sweden (1), Poland (2), United Kingdom (2), USA (1), Germany (3), Brazil (1), Chile (1), Canada (1), Portugal (1), Switzerland (2). In the first round, nine questions reached 70% (Table 1) and passed to the 2nd round. The questions were: Question 1: Any major postoperative complication (Clavier-Dindo 3 to 5) measured at 90 days (94.1%); Question 2: Intraoperative complications assessed according to GASTRODATA classification (76.9%); Question 3: Readmission in ICU (87.2%); Question 4: Reintervention (89.85%); Question 5: Mortality at 30 days (74.4%); Question 6: Mortality at 90 days (92.3%); Question 7: Negative margins R0 resection (100%); Question 8: Readmission measured at 30 days (74.3%) Question 9: Chemotherapy restart (if indicated) < 8 weeks after surgery (84.6%)(Fig. 1). Questions that passed 70% consensus). In the second round, nine of nine questions reached > 70%. (Tables 2 and 3) The Changes between rounds were described using differences in median Likert scores (Δ = Round 2 − Round 1) and percentage agreement to assess response stability and convergence (Table 4).

Problems after the first round

When analyzing the first round, we noticed that several items (such as the number of harvested lymph nodes and length of hospital stay) had been excluded and did not pass to the second round. The core group held a meeting to analyze the reasons. We realized that the multiple-choice format (for example, the number of lymph nodes) was why essential questions, such as the optimal number of lymph nodes to include in the textbook outcome, were excluded from the second round. This was a critical point in the process. For this reason, we decided to reformulate these questions in a 3rd round. After reformulating the questions in a third round, there was > 70% agreement on incorporating hospital stay, mortality, and the number of lymph nodes into the definition of a textbook outcome for gastric cancer. (Table 5).

Specifically, we asked about cutoff points: for mortality, 83.3% agreed that 90-day mortality is the most appropriate cutoff to include in the TOGS. Regarding the number of lymph nodes considered adequate as a TOGS parameter, 40% of respondents considered > 25 the most

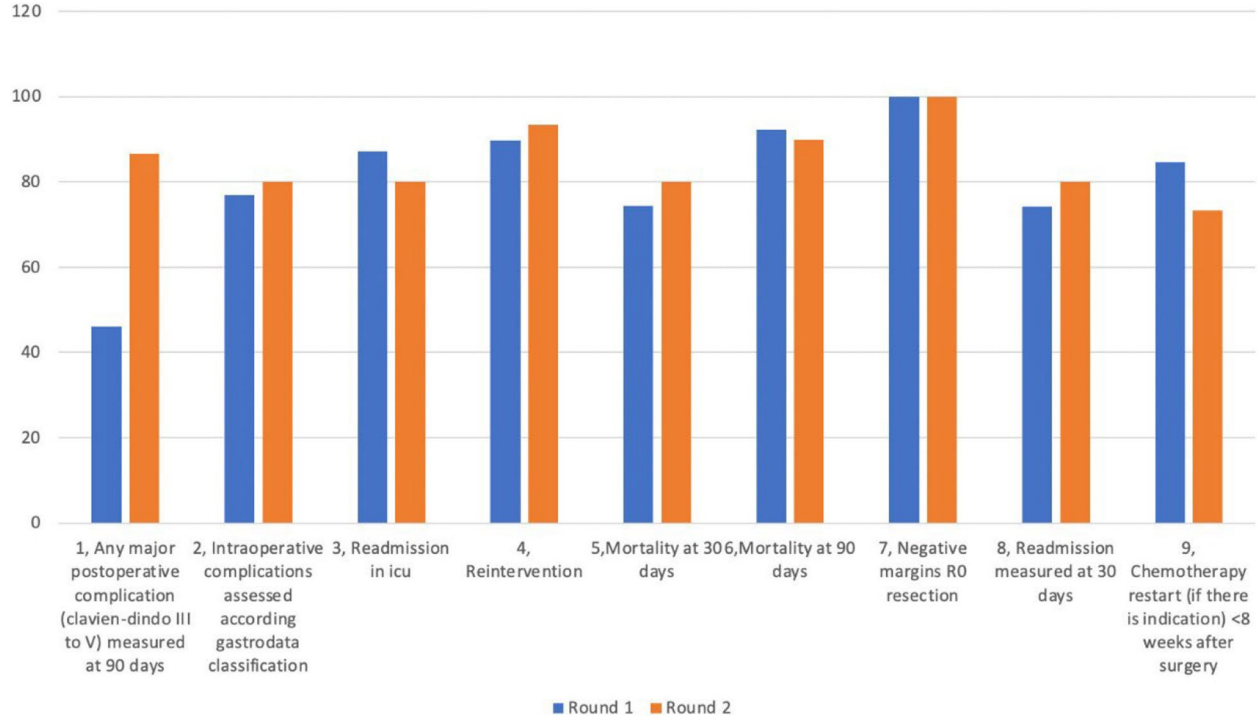

Fig. 1 Questions that passed 70% consensus

Table 2 Results of round 2 of the Delphi study. Medians and percentages for responses on the Likert scale for each of the 9 items obtained in round 1 and included in the form sent out in round 2. Δ is calculated as round 2 – round 1

		MEDIAN	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
1. Any major postoperative complication (Clavien-Dindo III to V) measured at 90 days	Round 2	4	0	6.70	6.70	30.0	56.7
	Δ		−7.7	−29.2	−3.6	1.8	38.8
2. Intraoperative complications assessed according to the Gastrodata classification	Round 2	4	0	3.3	16.7	36.7	43.3
	Δ		0	−9.5	6.4	3.4	0
3. Readmission in ICU	Round 2	4	0	3.3	16.7	40.0	40.0
	Δ		−2.6	−4.4	14.1	11.8	−19
4. Reintervention	Round 2	5	0	3.3	3.3	26.7	66.7
	Δ		0	−4.4	0.7	−3.6	0
5.Mortality at 30 days	Round 2	4	0	13.3	6.7	33.3	46.7
	Δ		−2.6	3	−6.1	10	−4.6
6.Mortality at 90 days	Round 2	5	0	3.3	6.7	20.0	70.0
	Δ		0	−4.4	−6.7	4.6	−6.9
7. Negative margins R0 resection	Round 2	5	0	0	0	20.0	80.0
	Δ		0	0	0	2.1	−2.1
8. Readmission measured at 30 days	Round 2	4	0	6.7	13.3	30.0	50.0
	Δ		−2.6	−6.1	3	4.4	1.3
9. Chemotherapy restart (if there is indication) < 8 weeks after surgery	Round 2	4	0	3.3	23.3	30	43.3
	Δ		−2.6	−1.8	15.6	−13.6	2.3

Table 3 Items included in the questionnaire sent out in round 2 together with the medians and percentages of responses 4 + 5 (agree and totally agree) for each one

	MEDIAN	4 + 5
1. Any major postoperative complication (Clavien-Dindo III to V) measured at 90 days	4	86.7
2. Intraoperative complications assessed according to the GASTRODATA classification	4	80
3. Readmission in ICU	4	80
4. Reintervention	5	*93.3*
5.Mortality at 30 days	4	80
6.Mortality at 90 days	5	90
7. Negative margins R0 resection	5	100
8. Readmission measured at 30 days	4	80
9. Chemotherapy restart (if there is indication) < 8 weeks after surgery	4	73.3

Table 4 Percentage agreement (Likert 4–5) in Rounds 1 and 2 for the nine retained items. Δ represents the difference in percentage agreement between Round 2 and Round 1

	Round 1	Round 2	Delta
1. Any major postoperative complication (Clavien-Dindo III to V) measured at 90 days	46.1	86.7	40.6
2. Intraoperative complications assessed according to the GASTRODATA classification	76.9	80	3.1
3. Readmission in the ICU	87.2	80	−7.2
4. Reintervention	89.8	*93.3*	3.5
5.Mortality at 30 days	74.4	80	5.6
6.Mortality at 90 days	92.3	90	−2.3
7. Negative margins R0 resection	100	100	0
8. Readmission measured at 30 days	74.3	80	5.7
9. Chemotherapy restart (if there is indication) < 8 weeks after surgery	84.6	73.3	−11.3

appropriate, 33.3% considered > 15, and 23.3% considered > 20. Regarding length of stay, the 75th percentile of the series was considered the most appropriate parameter to define TOGS, with a 33.3% agreement. The results are shown in Table 5 and Supplementary Figs. 1, 2, and 3.

So finally, the TOGS parameters were: 1) No 90-day mortality; 2) No complications ≥ III according to Clavien-Dindo classification; 3) No intraoperative complications according to the GASTRODATA classification; 4) R0 resection; 5) More than 25 isolated lymph nodes in the surgical specimen; 6) No reoperation; 7) No readmission to the intensive care unit; 8) No readmission in the first 30 postoperative days; 9) Length of hospital stay below the 75th percentile of the series; 10) Resumption of chemotherapy treatment, if indicated, within 8 weeks after surgery.

Discussion

Textbook outcome in gastric cancer surgery encompasses a broader and more demanding set of criteria than those used in many other surgical specialties. As a result, reported TOGS achievement rates are generally low [4]. Consistent with this complexity, consensus in the present Delphi process was reached for only half of the proposed items, with agreement obtained in nine of the eighteen questions addressing the different TOGS domains. Among all evaluated parameters, R0 resection was the only one to achieve unanimous support. Complete microscopic and macroscopic tumor clearance is a cornerstone of oncological surgery and has been consistently associated with improved overall survival and prolonged disease-free intervals [14].

Table 5 Questions that were not in round 1 and were reformulated

Item	Median	1(%)	2(%)	3(%)	4(%)	5(%)	4 + 5(%)
1. Length of stay should be included as parameter in TOGS	4	0	13.3	6.7	40	40	80
2. Which Length of stay should be cut off	-	-	-	-	-	-	-
3. Mortality should be included as parameter in TOGS	5	0	3.3	0	16.7	80	96.7
4. Which Mortality should be cut off	-	-	-	-	-	-	-
5. Lymph nodes should be included as parameter in TOGS	5	0	0	10	20	70	90
6. Which number of lymph nodes should be the cut off	-	-	-	-	-	-	-

Severe postoperative morbidity, defined as Clavien–Dindo grade ≥ III, also reached a high level of consensus. Although reported complication rates after gastrectomy vary widely, ranging from approximately 4% to 45% across series, postoperative morbidity remains a major determinant of short- and long-term outcomes [15, 16]. The use of standardized and universally accepted systems, such as the Clavien–Dindo classification, is essential to ensure reliable reporting and interstudy comparability [17]. Although complications graded ≥ III according to the Clavien–Dindo classification conceptually encompass events such as reoperation, ICU management, and mortality, the expert panel deliberately retained these variables as separate components of the Textbook Outcome definition. Clavien–Dindo reflects the most severe complication recorded, whereas reoperation, ICU readmission, and mortality are discrete and objectively measurable clinical events that are widely used as independent quality indicators. In multicenter and international settings, variability in complication grading practices may lead to discrepancies between formal classification and event reporting. Maintaining these parameters individually enhances auditability, reproducibility, and construct validity, ensuring that critical adverse outcomes are explicitly captured within the composite benchmark. In addition, the expert panel supported the inclusion of intraoperative complications, assessed according to the GASTRODATA classification, as part of the TOGS definition [18]. Mortality was also considered a fundamental domain, and although both 30- and 90-day time points were discussed, 90-day mortality was ultimately selected as the most appropriate indicator.

The resumption of chemotherapy within eight weeks after surgery, when indicated, is a parameter that has seldom been incorporated into previous TOGS definitions. Nevertheless, the panel strongly supported its inclusion. This likely reflects current treatment paradigms in gastric cancer, where perioperative strategies—particularly FLOT-based regimens—are widely adopted [19]. Postoperative complications and delayed recovery frequently preclude completion of adjuvant therapy, which has been associated with poorer oncological outcomes [20]. A potential limitation of this parameter is the variability in adjuvant treatment protocols across countries and healthcare systems. However, advances such as minimally invasive techniques and enhanced recovery after surgery (ERAS) programs have demonstrated benefits in accelerating functional recovery and facilitating timely continuation of systemic therapy [21–25].

Lymph node yield was recognized as a key indicator of surgical and oncological quality. Adequate nodal assessment enables accurate staging and carries important prognostic implications, as increasing nodal involvement correlates with worse long-term survival. After its omission in the second Delphi round was identified, the item was reintroduced and reformulated. Ultimately, 90% of participants agreed that lymph node count should be included in the TOGS definition, with the highest level of support for a threshold exceeding 25 examined nodes. Techniques such as meticulous bench dissection and the use of indocyanine green fluorescence imaging may contribute to optimizing lymphadenectomy quality [26–29]. Although current Western guidelines, including those from the National Comprehensive Cancer Network (NCCN), recommend the examination of at least 15 lymph nodes to ensure adequate staging, this threshold represents a minimum requirement rather than a benchmark of optimal oncologic surgery [30]. In the context of a standardized D2 lymphadenectomy, higher lymph node yields are routinely achieved in experienced centers, and multiple studies have demonstrated an association between increased nodal retrieval and improved stage accuracy and survival outcomes [27, 28, 31]. The Delphi panel therefore selected a threshold of ≥ 25 lymph nodes to reflect a standard of surgical excellence consistent with contemporary high-quality gastric cancer care. Importantly, the aim of defining a Textbook Outcome is not merely to capture compliance with minimal guideline criteria, but to identify an optimal composite benchmark that reflects the highest attainable quality of care. While this higher threshold may influence TO rates in lower-volume settings, it provides a meaningful quality target and facilitates benchmarking across institutions committed to oncologic best practice.

Length of hospital stay also required rephrasing in the second round. Eighty percent of experts agreed that it should be part of TOGS, and most supported defining prolonged hospitalization as exceeding the 75th percentile of each institutional series. This relative cutoff likely represents the most appropriate approach in an

international context, given the substantial differences between healthcare systems, discharge policies, social factors, and geographical considerations that may influence length of stay independently of postoperative morbidity [4].

This study has limitations inherent to the Delphi methodology, including reliance on expert opinion and the need for future external validation in clinical cohorts. In addition, textbook outcome is intrinsically an all-or-none composite endpoint. In most cases, failure to achieve TO reflects the coexistence of several interrelated adverse events—for example, severe complications leading to delayed recovery and inability to resume chemotherapy—while a smaller subset of patients may miss TO by a single isolated criterion. This characteristic is inherent to the TO construct and should be considered when interpreting results.

The main strength of this work lies in its originality and in the international composition of the expert panel, which included recognized leaders in gastric cancer surgery from three continents.

In summary, following this Delphi consensus process, ten parameters were identified as essential components of TOGS: (1) absence of 90-day mortality; (2) absence of complications ≥ grade III according to the Clavien–Dindo classification; (3) absence of intraoperative complications as defined by the GASTRODATA classification; (4) R0 resection; (5) more than 25 lymph nodes examined in the surgical specimen; (6) no need for reoperation; (7) no unplanned ICU readmission; (8) no hospital readmission within 30 postoperative days; (9) length of hospital stay below the 75th percentile of the series; and (10) resumption of chemotherapy, when indicated, within eight weeks after surgery.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12957-026-04314-6.

Supplementary Material 1. Supplementary Figure 1. Percentage distribution of the cutoff points for length of stay. Supplementary Figure 2. Percentage distribution of the coincidence of the cut-off points for mortality. Supplementary Figure 3. Percentage distribution of the cut-off points for the number of nodes in the surgical specimen.

Supplementary Material 2

Supplementary Material 3

Supplementary Material 4

Authors' contribution

Authors' contributions: Role Definition Conceptualization Silvia Carbonell-Morote; Hiroyuki Daiko; Giovanni de Manzoni; Suzanne Gisbertz; Han-Kwang Yang; Wojciech Polkowski; Jose Manuel Ramia; Manuel Pera Data curation Silvia Carbonell-Morote; Hiroyuki Daiko; Giovanni de Manzoni; Suzanne Gisbertz; Han-Kwang Yang; Wojciech Polkowski; Jose Manuel Ramia; Manuel Pera and all members collaborators of TOGS project. Formal analysis CARBONELL Funding acquisition NO FUNDS Investigation Silvia Carbonell-Morote; Hiroyuki Daiko; Giovanni de Manzoni; Suzanne Gisbertz; Han-Kwang Yang; Wojciech Polkowski; Jose Manuel Ramia; Manuel Pera Methodology Silvia Carbonell-Morote; Hiroyuki Daiko; Giovanni de Manzoni; Suzanne Gisbertz; Han-Kwang Yang; Wojciech Polkowski; Jose Manuel Ramia; Manuel Pera Project administration Silvia Carbonell-Morote; Hiroyuki Daiko; Giovanni de Manzoni; Suzanne Gisbertz; Han-Kwang Yang; Wojciech Polkowski; Jose Manuel Ramia; Manuel Pera Resources non Software CARBONELL Supervision CARBONELL, RAMIA Validation Silvia Carbonell-Morote; Hiroyuki Daiko; Giovanni de Manzoni; Suzanne Gisbertz; Han-Kwang Yang; Wojciech Polkowski; Jose Manuel Ramia; Manuel Pera Visualization CARBONELL, RAMIA Writing – original draft CARBONELL Writing – review & editing Silvia Carbonell-Morote; Hiroyuki Daiko; Giovanni de Manzoni; Suzanne Gisbertz; Han-Kwang Yang; Wojciech Polkowski; Jose Manuel Ramia; Manuel Pera and all members collaborators of TOGS project.

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Data availability

The data sets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study did not involve patients or the use of clinical or personal health data. It consisted of an anonymous Delphi consensus process among expert surgeons. Therefore, formal approval from an Institutional Review Board or Ethics Committee was not required. The study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent to participate was obtained electronically from all participants prior to inclusion in the Delphi process.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. Kolfschoten NE, Kievit J, Gooiker GA, et al. Focusing on desired outcomes of care after colon cancer resections; hospital variations in "textbook outcome." Eur J Surg Oncol. 2013;39(2):156–63. https://doi.org/10.1016/j.ejso.2012.10.007.
2. Levy J, Gupta V, Amirazodi E, et al. Textbook outcome and survival in patients with gastric cancer. Ann Surg. 2020. https://doi.org/10.1097/sla.0000000000003849.
3. Busweiler LAD, Schouwenburg MG, van Berge Henegouwen MI, et al. Textbook outcome as a composite measure in oesophagogastric cancer surgery. Br J Surg. 2017;104(6):742–50. https://doi.org/10.1002/bjs.10486.
4. Carbonell-Morote S, Yang H-K, Lacueva J, et al. Textbook outcome in oncological gastric surgery: a systematic review and call for an international

consensus. World J Surg Oncol. 2023;21:288. https://doi.org/10.1186/s12957-023-03166-8.
5. Mehta R, Paredes AZ, Tsilimigras DI, et al. Influence of hospital teaching status on the chance to achieve a textbook outcome after hepatopancreatic surgery for cancer among Medicare beneficiaries. Surgery. 2020;168(1):92–100. https://doi.org/10.1016/j.surg.2020.02.024.
6. Cibulas MA, Avila A, Mahendra AM, Samuels SK, Gannon CJ, Llaguna OH. Impact of textbook oncologic outcome attainment on survival after gastrectomy: a review of the National Cancer Database. Ann Surg Oncol. 2022;29(13):8239–48. https://doi.org/10.1245/S10434-022-12388-1.
7. Van Der Werf LR, Wijnhoven BPL, Fransen LFC, et al. A national cohort study evaluating the association between short-term outcomes and long-term survival after esophageal and gastric cancer surgery. Ann Surg. 2019;270(5) https://doi.org/10.1097/SLA.0000000000003520
8. Cero MD, Rodríguez-Santiago J, Miró M, et al. Evaluation of data quality in the Spanish EURECCA esophagogastric cancer registry. Eur J Surg Oncol. 2021;47(12):3081–7. https://doi.org/10.1016/J.EJSO.2021.04.025.
9. Sędłak K, Rawicz-Pruszyński K, Mlak R, et al. Union is strength: textbook outcome with perioperative chemotherapy compliance decreases the risk of death in advanced gastric cancer patients. Eur J Surg Oncol. 2022;48(2):356–61. https://doi.org/10.1016/j.ejso.2021.08.005.
10. Burke JR, Fleming CA, King M, et al. Utilising an accelerated delphi process to develop consensus on the requirement and components of a pre-procedural core robotic surgery curriculum. J Robot Surg. 2023;17(4):1443–55. https://doi.org/10.1007/s11701-022-01518-2.
11. Dalkey N, Helmer O. An experimental application of the Delphi method to the use of experts. Manag Sci. 1963;9(3):458–67.
12. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ. 2021;372. https://doi.org/10.1136/bmj.n71
13. de Villiers MR, de Villiers PJT, Kent AP. The delphi technique in health sciences education research. Med Teach. 2005;27(7):639–43. https://doi.org/10.1080/13611260500069947.
14. Biondi A, Persiani R, Cananzi F. R0 resection in the treatment of gastric cancer: room for improvement. World J Gastroenterol. 2010;16(27):3358–70. https://doi.org/10.3748/wjg.v16.i27.3358.
15. Argillander TE, Festen S, van der Zaag-Loonen HJ, et al. Outcomes of surgical treatment of non-metastatic gastric cancer in patients aged 70 and older: a systematic review and meta-analysis. Eur J Surg Oncol. 2022;48(9):1882–94. https://doi.org/10.1016/J.EJSO.2022.05.003.
16. Li SS, Costantino CL, Mullen JT. Morbidity and mortality of total gastrectomy: a comprehensive analysis of 90-day outcomes. J Gastrointest Surg. 2019;23(7):1340–8. https://doi.org/10.1007/S11605-019-04228-7.
17. Clavien PA, Barkun J, De Oliveira ML, et al. The clavien-dindo classification of surgical complications: five-year experience. Ann Surg. 2009;250(2):187–96. https://doi.org/10.1097/SLA.0b013e3181b13ca2.
18. Baiocchi GL, Giacopuzzi S, Marrelli D, et al. International consensus on a complications list after gastrectomy for cancer. Gastric Cancer. 2019;22(1):172–89. https://doi.org/10.1007/s10120-018-0839-5.
19. Al-Batran SE, Homann N, Pauligk C, et al. Perioperative chemotherapy with fluorouracil plus leucovorin, oxaliplatin, and docetaxel versus fluorouracil or capecitabine plus cisplatin and epirubicin for locally advanced, resectable gastric or gastro-oesophageal junction adenocarcinoma (FLOT4): a randomised, phase 2/3 trial. Lancet (London, England). 2019;393(10184):1948–57. https://doi.org/10.1016/S0140-6736(18)32557-1.
20. Brenkman HJF, van Putten M, Visser E, et al. Timing of postoperative chemotherapy in patients undergoing perioperative chemotherapy and gastrectomy for gastric cancer. Surg Oncol. 2018;27(3):421–7. https://doi.org/10.1016/j.suronc.2018.05.026.
21. Jun I, Wee Y, Li N, et al. Enhanced recovery versus conventional care in gastric cancer surgery: a meta-analysis of randomized and non-randomized controlled trials. Gastric Cancer. 2019;22:423–34. https://doi.org/10.1007/s10120-019-00937-9.
22. Feldheiser A, Aziz O, Baldini G, et al. Enhanced Recovery After Surgery (ERAS) for gastrointestinal surgery, part 2: Consensus statement for anaesthesia practice. Acta Anaesthesiol Scand. 2016;60(3):289–334. https://doi.org/10.1111/aas.12651.
23. Scott MJ, Baldini G, Fearon KCH, et al. Enhanced recovery after surgery (ERAS) for gastrointestinal surgery, part 1: pathophysiological considerations. Acta Anaesthesiol Scand. 2015;59(10):1212–31. https://doi.org/10.1111/aas.12601.
24. Bolger JC, Al Azzawi M, Whooley J, et al. Surgery by minimally invasive approach improves textbook outcomes in oesophageal and gastric cancer. Eur J Surg Oncol. 2021;47(7):1661–7. https://doi.org/10.1016/j.ejso.2021.03.240.
25. Zizzo M, Zanelli M, Sanguedolce F, et al. Robotic versus laparoscopic gastrectomy for gastric cancer: an updated systematic review. Med. 2022;58(6). https://doi.org/10.3390/medicina58060834
26. Hu Y, Huang C, Sun Y, et al. Morbidity and mortality of laparoscopic versus open D2 distal gastrectomy for advanced gastric cancer: a randomized controlled trial. J Clin Oncol. 2016;34(12):1350–7. https://doi.org/10.1200/JCO.2015.63.7215.
27. Baiocchi GL, Molfino S, Molteni B, et al. Fluorescence-guided lymphadenectomy in gastric cancer: a prospective western series. Updates Surg. 2020;72(3):761–72. https://doi.org/10.1007/s13304-020-00836-0.
28. Chen QY, Xie JW, Zhong Q, et al. Safety and efficacy of indocyanine green tracer-guided lymph node dissection during laparoscopic radical gastrectomy in patients with gastric cancer: a randomized clinical trial. JAMA Surg. 2020;155(4):300–11. https://doi.org/10.1001/jamasurg.2019.6033.
29. Hyung WJ, Yang HK, Park YK, et al. Long-term outcomes of laparoscopic distal gastrectomy for locally advanced gastric cancer: the KLASS-02-RCT randomized clinical trial. J Clin Oncol. 2020;38(28):3304–13. https://doi.org/10.1200/JCO.20.01210.
30. Ajani, J. A., D'Amico, T. A., Bentrem, D. J., Corvera, C. U., Das, P., Enzinger, P. C., Enzler, T., Gerdes, H., Gibson, M. K., Grierson, P., Gupta, G., Hofstetter, W. L., Ilson, D. H., Jalal, S., Kim, S., Kleinberg, L. R., Klempner, S., Lacy, J., Lee, B., Licciardi, F., … Stein, M. (2025). Gastric Cancer, Version 2.2025, NCCN Clinical Practice Guidelines In Oncology. Journal of the National Comprehensive Cancer Network : JNCCN 23(5);169–191. https://doi.org/10.6004/jnccn.2025.0022.
31. Marubini E, Bozzetti F, Miceli R, Bonfanti G, Gennari L, Gastrointestinal Tumor Study Group. Lymphadenectomy in gastric cancer: prognostic role and therapeutic implications. Eur J Surg Oncol (EJSO). 2002;28(4):406–12. https://doi.org/10.1053/ejso.2001.1247.
32. Busweiler LAD, Jeremiasen M, Wijnhoven BPL, et al. International benchmarking in oesophageal and gastric cancer surgery. BJS Open. 2019;3(1):62–73. https://doi.org/10.1002/bjs5.50107.

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