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Textbook Outcomes in Solid Transplantation: A Systematic Review

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Background. The concept of TO is expanding across various surgical disciplines to establish a standardized, comprehensive quality benchmark. Traditional metrics such as 1-y patient and graft survival have been key for evaluating transplant program performance but are now deemed inadequate because of significant field advancements. This systematic review aims to provide a comprehensive understanding of the applicability and validity of textbook outcome (TO) in the setting of solid organ transplantation. **Methods.** A structured search, adhering to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, was conducted across PubMed, Embase, and Scopus databases on March 10, 2024. **Results.** Fourteen articles were identified for inclusion in this review. Of these, 2 studies addressed TO in heart transplantation, 3 in lung transplantation, 2 in kidney transplantation, and 7 in liver transplantation. A subgroup analysis was conducted to categorize the different definitions of TOs and identify the most common reasons for TO failure. **Conclusions.** Our systematic review highlights the ongoing efforts in the field of solid organ transplantation to define TO and emphasizes the importance of developing a universally recognized set of TO criteria for each type of transplant. TO provides a valuable framework for transplant centers to benchmark their performance against similar institutions on a risk-adjusted basis and to pinpoint specific areas for enhancing patient outcomes. Even the most successful programs may discover aspects within the composite outcome with scope for improvement.

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Initially introduced in the context of gastrointestinal cancer surgery, the nascent concept of textbook outcome (TO) is making strides in various surgical fields to establish a standardized and comprehensive quality benchmark.[1-3] This benchmark, derived from multiple postoperative endpoints, encapsulates the "ideal" characteristics of a hospitalization deemed as "textbook." By incorporating key parameters of the surgical procedure, TO provides a more accurate depiction of the overall quality of care, aligning closely with patients' preferences.[4,5] Moreover, TO enhances the incidence of events and amplifies the differences between hospitals. This characteristic makes TO a valuable tool for hospital comparisons, enabling the identification of "best-practice" instances that may serve as exemplary models.[6,7]

Organ transplantation is a lifesaving and cost-effective treatment for end-stage organ failure. Short- and long-term outcomes after transplant, including patient and graft survival rates, are closely monitored and publicly reported from all US transplant centers.[8] Despite the long-standing reliance on 1-y patient and graft survival outcomes as critical metrics for transplant programs, current metrics assessing transplant program performance are considered inadequate because of the field's significant advances over the past few decades.[9] Although the average 1-y survival for solid organ transplants now surpasses 90% nationwide, identifying underperforming centers has become challenging because of the modest differences in patient survival.[9] Consequently, transplant centers find themselves in a unique situation where they possess a comprehensive understanding of patient and graft outcomes but lack sufficient data regarding the comparative level of perioperative quality of care they deliver.[10] In this context, TO emerges as an innovative quality metric with the potential to significantly impact transplant medicine. Indeed, by implementing and monitoring TO rates in organ transplantation, centers can comprehensively understand their perioperative care processes, identifying areas for improvement and redirecting resources to address specific needs.

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TO is a comprehensive result measure that is easily interpreted. However, surgical services aiming to implement TO must systematically analyze postoperative complications. To render TO a valuable tool for evaluating and monitoring results, it is essential to establish an internationally accepted definition of TO parameters in each surgical domain, especially for specific instances.[11] This standardized definition would enable easy and objective comparisons among different surgery units. Therefore, this systematic review aims to investigate all defined TOs in solid transplantation to date to facilitate the initiation of an international and common definition in each field. This underscores the compelling need for consensus among transplant societies regarding the definition of TOs after transplantation.

MATERIALS AND METHODS

This systematic review aims to provide a comprehensive understanding of the applicability and validity of TOs in the setting of solid organ transplantation, considering the limitations of traditional quality metrics. By synthesizing existing evidence, the review aims to contribute to the refinement and standardization of outcome measures for solid transplantation in contemporary transplant practice.

PICO Process and Search Strategy

In patients undergoing solid organ transplantation (P), does TOs (I) compared with traditional quality metrics, such as 1-y survival, (C) influence a comprehensive set of primary and secondary outcomes (O) reflecting the multifaceted nature of solid organ transplantation?

In the context of this investigation, we undertook a comprehensive and systematic literature review. This holistic approach aimed to enhance understanding of the subject and contribute valuable insights to the medical community. Our research encompassed a computerized exploration of the PubMed, Embase, and Scopus databases. The following search terms were used "transplantation" and "textbook." Articles were also identified from references to the published articles. The last of these searches were performed on March 10, 2024.

Inclusion and Exclusion Criteria

We included all published English language studies discussing TOs in solid organ transplantation and excluded all non–English language studies, case series, and case reports. This stringent approach ensured that our analysis was focused solely on sources that provided relevant insights and information pertaining to the topic at hand, enhancing the precision and relevance of our research findings.

Study Selection and Data Extraction

Titles and/or abstracts of studies identified using our search criteria were screened independently by 2 authors (A.M. and D.M.) to identify all studies meeting our inclusion criteria. Any disagreement was resolved through discussion with a third author (J.M.L.). Figure 1 provides the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart for the study selection process. Two authors (A.M. and D.M.) reviewed the full texts for inclusion and data extraction. A.M. then reviewed all 14 articles, rechecked data, and analyzed them using an Excel(R) sheet. A total of 14 studies were deemed eligible for inclusion (Table 1). We did not perform a meta-analysis because of inconsistent reporting of outcome measures and differences in populations and study design. An AMSTAR 2 checklist is provided in **Table S1 (SDC,** http://links.lww.com/TXD/A698) to assist in the evaluation and assessment of the systematic review presented herein.[25]

RESULTS

Results of the Search Strategy

Our initial search resulted in 582 articles. After removing duplicates, title and abstract screening, and full-text assessment, 14 articles published by March 2024 were identified for inclusion in this review. Figure 1 highlights our search strategy and Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart.

Regarding the topics covered, there were 2 studies addressing TOs in heart transplantation, 3 in lung transplantation (LuTx), 2 in kidney transplantation, and 7 in liver transplantation. The study characteristics are shown in Table 1.

Heart Transplantation

Study Characteristics

Our comprehensive investigation revealed 2 articles that examine the TOs in heart transplantation (Table 2). Both articles, published in 2023, draw data from the United Network for Organ Sharing (UNOS) database. However, they focus on different time periods: one spans from 2005 to 2017 and the other one from 2011 to 2022. Despite the inclusion of a similar total number of patients (26 885 versus 24 620), the achieved TOs percentage differs, with values of 36.6% and 45.3%, respectively. The discrepancy, partially attributed to the 2 different time periods, is more likely to be explained by variations in the definition of TOs as defined by the 2 study groups.

TO Definitions

Bakhtiyar et al[12] formulated their TO based on previous research on other solid organ transplantations. In contrast, Zakko et al[13] convened a multidisciplinary group of transplant professionals from their institutions to brainstorm complications, success metrics, and potential quality indicators specifically for heart transplantation. Table 2 displays the TOs, categorized by article, and presents a color-coded organization for comparison (green: shared; yellow: similar; gray: unique).

TO Results

In the failed TO cohort (N = 17 044) of a study by Bakhtiyar et al, 8250 patients (48%) had a length of stay (LOS) exceeding 21 d, 5235 (31%) experienced primary graft dysfunction, and 3207 (19%) required postoperative dialysis. Graft failure was the predominant cause for not achieving a TO at 1 y, accounting for 6302 cases (37%). In Zakko's study, the primary reasons for not achieving TOs included treatment for rejection in the first year posttransplant (22.1%) and predischarge acute rejection (19.5%). On the contrary, the least common factors contributing to the failure of achieving TO were chronic dialysis in the first year posttransplant (1.2%) and predischarge stroke (2.9%).

Regardless, both authors are in consensus that TOs have the potential to offer patients, transplant centers, and governing

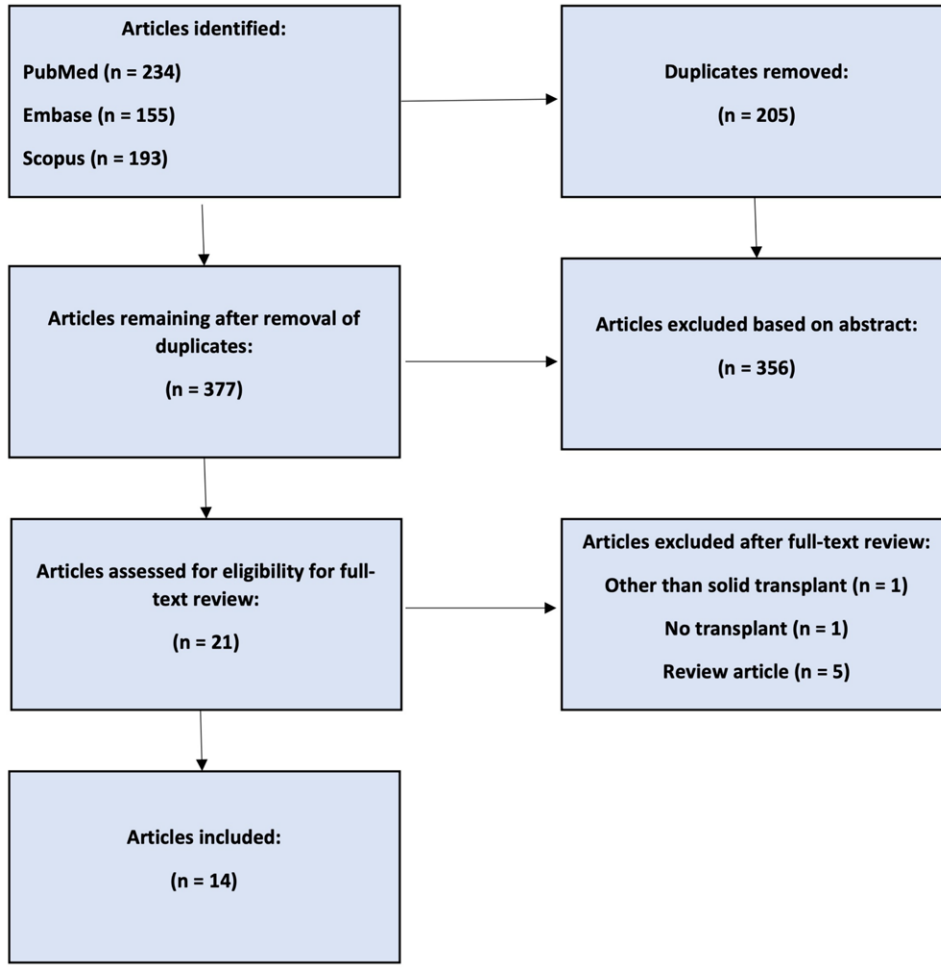

FIGURE 1. PRISMA flow diagram. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

institutions a more comprehensive evaluation of the entire transplantation experience and the quality of care provided. Additionally, they agreed on a correlation between TO and long-term patient and graft survival. Indeed, both analyses suggested that achieving a TO was correlated with improved 5- and 10-y survival. This observation is not surprising, considering that both their definition of TO encompasses transplant-specific variables such as primary nonfunction, acute graft rejection, and graft rejection episodes during the first year of transplantation, all known to influence posttransplant survival outcomes.[26,27]

Lung Transplantation

Study Characteristics

Three articles discussing TOs in LuTx were identified (Table 3). Nevertheless, only 2 studies established new definitions for TOs, whereas 1 study assessed a previously defined TO in a specific subgroup population. Although the time frame for these 2 studies is from 2016 to 2019, it is important to note that the settings are not comparable. Krischak et al[15] conducted an analysis using the UNOS database, which included 8959 LuTx recipients. In contrast, Halpern et al[14] conducted a retrospective study at a single center with a smaller number of patients (N = 401).

TO Definitions

Both studies shared 3 identical TO definitions and had 4 similar ones. The study by Krischak et al introduced a unique criterion, whereas the study by Halpern et al included 4 (Table 3). These differences in TO definitions, along with variations in patient populations between the 2 studies (multicenter versus single center), contribute to the contrasting rates of patients achieving TOs: 52% for Krischak et al and 24% for Halpern et al.

TO Results

In comparing the findings between the 2 studies regarding patients who experienced TO failure, the study by Krischak et al identified the most common reasons as intubation at 72 h posttransplant (64.0%) and a LOS exceeding 30 d (50.5%), whereas the study by Halpern et al highlighted extubation beyond 48 h posttransplant (39.1%) and reintervention (34.2%) as the predominant causes for TO failure. Both studies noted that the majority of patients with TO failure experienced multiple complications despite any single complication being sufficient to define failure. The study by Krischak et al additionally reported postoperative airway dehiscence as the least common reason (3.0%), whereas the study by Halpern et al indicated that 4.9% of cases were attributed to mortality within 90 d.

TABLE 1.

Studies included

	Year	Note
Heart transplantation		
Textbook outcomes in heart transplantation: a quality metric for the modern era[12]	2023	Definition of TO
Textbook outcome: a novel metric in heart transplantation outcomes[13]	2023	Definition of TO
Lung transplantation		
Textbook Outcome: definition and analysis of a novel quality measure in lung transplantation[14]	2021	Definition of TO
Textbook surgical outcome in lung transplantation: analysis of a US national registry[15]	2022	Definition of TO
Textbook outcome in lung transplantation: planned venoarterial extracorporeal membrane oxygenation versus off-pump support for patients without pulmonary hypertension[16]	2022	Assessment of previously defined TO (subgroup population)
Kidney transplantation		
Definition and analysis of textbook outcome: a novel quality measure in kidney transplantation[9]	2021	Definition of TO (recipient)
Textbook outcome as a quality metric in living and deceased donor kidney transplantation[17]	2022	Definition of TO (recipient)
Liver transplantation		
Textbook outcomes in liver transplantation[18]	2020	Definition of TO (recipient)
Textbook outcomes analysis of patients undergoing liver transplantation as treatment of hepatocellular carcinoma[19a]	2020	Definition of TO (recipient)
Textbook outcome following liver transplantation[20]	2021	Definition of TO (recipient)
Textbook outcome among voluntary donors undergoing major living donor hepatectomy[21]	2022	Definition of TO (donor)
Textbook outcome as a quality metric in liver transplantation[22]	2022	Definition of TO (recipient)
Textbook outcome among patients undergoing liver transplantation stratified by risk. a single-center retrospective observational cohort study[23]	2022	Definition of TO (recipient)
Renal function in the short and medium term is better preserved in patients who experience textbook outcomes after multimodal rehabilitation and liver transplantation[24b]	2023	Definition of TO (recipient)

[a]Conference abstract (oral), AHPBA 2020.
[b]Conference abstract (poster), AHPBA 2023.
AHPBA, Americas Hepato-Pancreato-Biliary Association; TO, textbook outcome.

TABLE 2.

Heart transplantation TOs

Article	Setting	Time period	Patients	TOs	Most frequent cause of TO failure
Bakhtiyar et al[12]	UNOS	2011–2022	Total: 26 885 Achieved TO: 9841 Not achieved TO: 17 044	a. No postoperative dialysis b. No acute rejection or primary graft dysfunction c. No 1-y retransplantation. d. Ejection fraction >50% at 1 y e. No postoperative stroke f. Index length of stay <21 d g. No readmission for rejection h. No readmission for infection. i. No postoperative pacemaker insertion j. No extracorporeal membrane oxygenation requirement within 72 h of transplantation	Length of stay >21 d (8250 patients; 48%)
Zakko et al[13]	UNOS	2005–2017	Total: 24 620 Achieved TO: 11 169 Not achieved TO: 13 451	a. No dialysis during index hospitalization b. No chronic dialysis dependence c. No acute rejection during index hospitalization d. No 1-y retransplantation. e. Ejection fraction >50% at 1 y f. No stroke during index hospitalization g. Length of stay ≤30 d h. No treated rejection i. No 1-y graft failure j. No 1-y mortality k. Karnofsky functional status of 80%–00% at 1 y	Treatment for rejection in the first year posttransplant (5430 patients; 22.1%)

Green: shared; yellow: similar; gray: unique.
TO, textbook outcome; UNOS, United Network for Organ Sharing.

TABLE 3.

Lung transplantation TOs

Article	Setting	Time period	Patients	TOs	Most frequent cause of TO failure
Krischak et al[15]	UNOS	2016–2019	Total: 8959 Achieved TO: 4664 Not achieved TO: 4295	a. No 90-d mortality b. No inpatient dialysis c. No grade 3 primary graft dysfunction at 72 h posttransplant d. No intubation at 72 h posttransplant e. No posttransplant ventilator support lasting ≥5 d f. No extracorporeal membrane oxygenation support at 72 h posttransplant g. No posttransplant length of stay >30 d h. No acute rejection before discharge i. No postoperative airway dehiscence	Intubation at 72 h posttransplant (2747 patients; 64.0%)
Halpern et al[14]	Single center	2016–2019	Total: 401 Achieved TO: 97 Not achieved TO: 304	a. No 90-d mortality b. No dialysis or continuous renal replacement therapy during the index hospitalization c. No grade 3 primary graft dysfunction at 48 or 72 h d. Extubation >48 h posttransplant e. No reintubation during the index hospitalization f. No postoperative extracorporeal membrane oxygenation g. LOS >75th percentile of lung transplant patients h. No biopsy-proven acute rejection within 30 d i. No intraoperative complication j. No reintervention (surgical, bronchoscopic, radiologic) within 30 d k. No tracheostomy within 7 d l. No ICU or hospital readmission within 30 d of discharge	Extubation >48 h posttransplant (119 patients; 39.1%)

Green: shared; yellow: similar; gray: unique.
ICU, intensive care unit; LOS, length of stay; TO, textbook outcome; UNOS, United Network for Organ Sharing.

As mentioned earlier, Halpern et al[16] examined their previously defined TO within a specific subgroup in a second study. Indeed, they compared rates of TO between bilateral orthotopic LuTx (BOLTs) performed with planned venoarterial extracorporeal membrane oxygenation (VA ECMO) or off-pump support for recipients with no or mild pulmonary hypertension. At many institutions, the established intraoperative support approach for BOLT recipients without pulmonary hypertension has been the implementation of off-pump sequential BOLT with single-lung ventilation, and the use of routine mechanical circulatory support during LuTx remains controversial.[28,29] Their results revealed that the use of planned VA ECMO was linked to an enhanced likelihood of achieving TO in comparison with the planned off-pump support. These conclusions support an argument that a planned VA ECMO strategy may provide optimal intraoperative support for BOLT.

Kidney Transplantation

Study Characteristics

Our systematic analysis uncovered two articles that explore TOs in the context of kidney transplantation, as shown in Table 4. Published in 2021, both studies address TO in the surgery of recipients but differ in their temporal scope and research settings.[9,17] One study covers the period from 2016 to 2019 and is conducted at a single institution, whereas the other spans from 2013 to 2017, using data from the UNOS database.

TO Definitions

As illustrated in Table 4, the definitions of TOs vary significantly, with "No delayed graft function" being the only parameter consistently shared among them. Although 4 parameters—LOS, hospital readmission, rejection, and mortality—are common across definitions, they are characterized by distinct criteria. Additionally, each definition incorporates unique criteria, further diversifying the parameters of TO.

TO Results

The former study (by Halpern et al) involves 557 participants, with 245 achieving TO, and the latter (by Schenk et al) encompasses 69,165 transplant recipients, reporting TO rates of 54.1% for living donors and 31.7% for deceased donors (DDs). Halpern et al indicated that among the 312 patients who did not achieve TO, DGF and hospital readmission were the most frequent reasons for TO failure, each cited for 50% of these patients. It is important to note that each patient who failed TO could have experienced multiple events, thus potentially being counted more than once in this analysis. Mortality was the least common cause, affecting only 2% of the patients. Schenk et al documented that for both living and DD transplants, an extended hospital stay emerged as the top factor preventing the achievement of TO, accompanied by hospital readmissions, rejection episodes, and a low 1-y glomerular filtration rate. In the case of DD recipients, the occurrence of delayed graft function was identified as the second most frequent obstacle in attaining TO.

In both investigations, achieving TOs was linked to significantly enhanced patient and graft survival and freedom from rejection. Applying TO as a benchmark to a widespread, contemporary national cohort, Schenk et al disclosed a substantial and risk-adjusted continuum of quality. Their findings

TABLE 4.
Kidney transplantation TOs (recipient)

Article	Setting	Time period	Patients	TOs	Most frequent cause of TO failure
Halpern et al[9]	Single center	2016–2019	Total: 557 Achieved TO: 245 Not achieved TO: 312	a. No DGF b. Length of stay >75th percentile of kidney transplant patients c. No 30-d intensive care unit or hospital readmission d. No 30-d biopsy-proven acute rejection e. No 90-d mortality f. No intraoperative complication g. No discharge with a Foley catheter h. No 30-d reintervention (surgical, endoscopic, radiologic)	DGF (156 patients; 50%) Hospital readmission (156 patients; 50%)
Schenk et al[17]	UNOS	2013–2017	Total: 20 102 (living donor)/49 063 (deceased donor) Achieved TO: 10 869 (living donor)/15 533 (deceased donor) Not achieved TO: 9233 (living donor)/33 530 (deceased donor)	a. No DGF b. Length of stay of ≤5 d c. No readmissions during the first 6 mo d. No episodes of rejection during the first year after transplantation. e. Patient survival of ≥1 y f. 1-y glomerular filtration rate of >40 mL/min g. Graft survival of ≥1 y	Both cohorts, prolonged length of stay

Green: shared; yellow: similar; gray: unique.
DGF, delayed graft function; TO, textbook outcome; UNOS, United Network for Organ Sharing.

TABLE 5.

Liver transplantation TOs (recipient)

Article	Setting	Time period	Patients	TOs	Most frequent cause of TO failure
Moris et al[18]	Single center	2014–2017	Total: 231 Achieved TO: 71 Not achieved TO: 160	a. No Clavien-Dindo grade III complication (reintervention) b. No hospital length of stay >75th percentile of all liver transplant patients c. No readmission with 30 d d. No mortality within 90 d e. No RBC transfusion requirement greater than the 75th percentile for all liver transplant patients f. No readmission to the ICU during index hospitalization g. No early allograft dysfunction h. No rejection within 30 d i. No major intraoperative complication j. No primary allograft nonfunction	Readmission within 30 d (57 patients; 37%)
Rodarte et al[19]	Single center	2002–2014	Total: 389 Achieved TO: 117 Not achieved TO: 272	a. No severe complications (Clavien-Dindo ≥III) b. No prolonged length of stay c. No 30-d readmissions d. No perioperative transfusions e. No 30-d mortality	NA
Lim et al[20]	Two centers	2011–2015	Total: 530 Achieved TO: 176 Not achieved TO: 354	A) No major complications within 90 d B) No prolonged hospital stay C) No mortality within 90 d D) No prolonged ICU stay E) No reintervention within 90 d (liver graft biopsy, radiological, endoscopic or surgical interventions, or retransplantation)	NA
Schenk et al[22]	UNOS	2013–2017	Total: 25877 Achieved TO: 9682 Not achieved TO: 16195	a. Length of stay ≤10 d b. Absence of rejection during first year posttransplant c. No readmissions within 6 mo d. Bilirubin <3 mg/dL between months 2 and 12 post-LT e. Patient survival >1 y f. Graft survival >1 y	Excessive length of stay and early readmission
Melgar et al[23]	Single center	2012–2017	Total: 181 Achieved TO: 59 Not achieved TO: 122	a. No 90-d Clavien-Dindo grade ≥ III complications b. No major postoperative complications c. No prolonged length of hospital stays (a length of hospital stays ≥75th percentile of the total cohort) d. No nonprolonged hospital stay e. No 30-d readmission. f. No 90-d mortality g. No intraoperative pRBC transfusion h. No postoperative renal replacement therapy i. No 90-d hepatic artery thrombosis j. No 90-d biliary complications	NA
Melgar et al[24]	Single center	NS	Total: 116 Achieved TO: NS Not achieved TO: NS	a. No readmission. b. No mortality after a procedure	NA

Green: shared (≥2 articles); yellow: similar; gray: unique (1 article only).
ICU, intensive care unit; NA, not available; pRBC, packed red blood cell; TO, textbook outcome; UNOS, United Network for Organ Sharing.

indicate that the hazard of dying within 5 y for those who do not achieve TO is twice as high. Moreover, Halpern et al[9] found that patients who met TO criteria had around $50 000 less in total inpatient expenses.

Liver Transplantation

Study Characteristics

The area of liver transplantation received the most attention in the context of TOs, with our search uncovering 6 articles focused on liver transplant recipients (referenced in Table 5) and 1 article on liver donation (Table 6). This field was also the earliest to be explored in the literature, with articles dating back to 2020.

TO Results

Among those studies that concentrate on liver transplant recipients, 2 were presented as abstracts at conferences. At Americas Hepato-Pancreato-Biliary Association 2020, Rodarte et al[19] shared their findings from a cohort study of patients with hepatocellular carcinoma who received LiTx at the Cleveland Clinic from 2002 to 2014. Their analysis through multivariate regression showed that patients older than 60 y of age and those with microvascular invasion were associated with lower rates of achieving TO.[19] Conversely, Melgar et al,[24] at Americas Hepato-Pancreato-Biliary Association 2023, pointed out that individuals achieving TO tended to sustain normal renal function during the short- to medium-term post-LiTx. Additionally, they noted that this improved renal function in TO achievers was not linked to reduced tacrolimus dosages.

For the 4-remaining full-text articles dedicated to organ recipients, only 1 study used data from UNOS, encompassing a total of 25 877 patients during the period from 2013 to 2017.[22] In the multivariable analysis, the primary factors influencing TO—intensive care unit (ICU) status, Model for End-stage Liver Disease score, and pretransplant dialysis—were all linked to the severity of the disease. This indicates, unsurprisingly, that achieving TO is particularly challenging in recipients who are critically ill. Schenk et al[22] highlighted that the primary barriers to achieving TO are the excessive length of hospital stay and early readmission. Similarly, Lim et al[20] pointed out that a prolonged stay in the ICU was the leading factor that hindered achieving TO. Adding to these insights, Melgar et al observed that the patients who did not meet TO criteria were more likely to have acute liver failure, to be in a more advanced stage of liver disease (Child-Pugh stage C), and to have ascites at the time of surgery.[23] Moris et al[18] also identified readmission within 30 d or the necessity for reoperation. From a financial perspective, patients who failed to achieve TOs tended to incur higher costs related to ICU stays, hospital admissions, and procedures in the initial month (TO costs were €11.3 thousand versus €16.3 thousand for non-TO, with a significant difference of $P < 0.001$). Similar results were found by Moris et al,[18] indeed achieving TO, which was associated with a reduction of approximately $60 000 in total expenses compared with those who did not meet TO criteria.

Living Donation

In our systematic investigation, we encountered just 1 study addressing living donation.[21] Living liver donation involves intricate surgical techniques with expectedly low morbidity and almost no mortality, underscoring the necessity of weighing the recipient's gain against the donor's risk.[30]

TABLE 6.
Liver transplantation TOs (donor)

Article	Setting	Time period	Patients	A) TOs	Most frequent cause of TO failure
Bhatti et al[21]	Single center	2012–2021	Total: 1022 Achieved TO: 714 Not achieved TO: 308	a. ICU stay (≤2 d) b. HS (≤10 d) c. No 30-d major complications (Clavien-Dindo ≥III) d. No post-hepatectomy liver failure e. No perioperative blood transfusion f. No 30-d readmission	NA

HS, hospital stay; ICU, intensive care unit; TO, textbook outcome.

This context highlights a significant demand for defining TOs as a comprehensive measure of outcome and an enhanced evaluation of care quality postsurgery. The following article excellently demonstrates the application of TO in monitoring advancements in clinical practices. Specifically, Hafeez Bhatti et al[21] investigated the success rates of TO across 2 distinct time periods within their cohort. They observed a significant improvement in TO after optimizing surgical pathways, which included designating surgeons for the entire donor or recipient operation, routinely performing a third precut cholangiogram, conducting transections with middle hepatic vein exposure, and favoring modified right lobe grafts over extended grafts.

CONCLUSIONS

Our systematic review highlights the ongoing efforts in the field of solid organ transplantation to define TOs and emphasizes the importance of developing a universally recognized set of TO criteria for each type of transplant. TO provides a valuable framework for transplant centers to benchmark their performance against similar institutions on a risk-adjusted basis and to pinpoint specific areas for enhancing patient outcomes. Even the most successful programs may discover aspects within the composite outcome where there is scope for improvement. Additionally, TO gives prospective transplant recipients a tool to estimate the likelihood of experiencing a seamless perioperative period and achieving improved survival rates based on their pretransplant characteristics. Finally, it is crucial to note that, unlike in surgical oncology, where an incomplete resection with positive margins might negate the surgery's advantages, not reaching TOs in transplantation because of a solitary event does not detract from the critical lifesaving significance of the procedure.

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