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PERIOPERATIVE ASSESSMENT IN CANCER PATIENTS: A SYSTEMATIC REVIEW OF EXISTING DOMAINS AND PRACTICES

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ABSTRACT
Perioperative assessment is essential to optimize surgical outcomes and reduce complications, especially in cancer patients who often have complex clinical conditions. This systematic review aims to provide an overview of existing domains and practices in perioperative assessment specific to cancer patients. A systematic search was conducted in databases including ScienceDirect, Scopus, PubMed, and Google Scholar, identifying 1,071 articles. After removing 384 duplicates, 687 articles underwent title and abstract screening, leading to the exclusion of 980 articles. Forty-five full-text articles were reviewed for eligibility; 16 were excluded due to inaccessibility, resulting in 12 articles included in the final analysis. Data were synthesized descriptively to identify common assessment domains and practices. The review found several key domains commonly assessed perioperatively in cancer patients, such as nutritional status, frailty, psychological health, cardiopulmonary function, and immunological parameters. However, there is notable variability in the instruments and methods used across studies, indicating a lack of standardized assessment protocols. Comprehensive perioperative evaluations that integrate these domains may enhance surgical planning and risk prediction in oncology patients. While multiple domains are recognized as important in perioperative cancer assessment, standardized and integrated approaches remain limited. Addressing these gaps could improve risk stratification and patient outcomes, although challenges like tool inconsistency, interdisciplinary coordination, and resource availability must be overcome.

Keywords: cancer surgery; peroperative assessment; preoperative evaluation

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INTRODUCTION

Cancer remains a major global health challenge, with surgical intervention serving as a cornerstone treatment for many solid tumors (Sung et al., 2021). Despite advances in surgical techniques, cancer patients often face elevated perioperative risks due to complex comorbidities such as malnutrition, frailty, cardiopulmonary dysfunction, and psychological distress, which can significantly compromise surgical outcomes (Alvarez et al., 2020; Chen et al., 2019). The perioperative period, which includes preoperative assessment, plays a critical role in identifying patient vulnerabilities and optimizing their condition before surgery (Zhu et al., 2022). Recent studies have reported that malnutrition affects up to 40-80% of oncology patients depending on cancer type and stage, leading to higher rates of postoperative complications, prolonged hospital stays, and increased mortality (Gupta et al., 2021). Furthermore, frailty a state of decreased physiological reserve has gained attention as a powerful predictor of postoperative morbidity and mortality in cancer surgery, independent of chronological age (Martinez et al., 2019). Cardiopulmonary reserve assessments, such as spirometry and cardiopulmonary exercise testing, have been shown to effectively stratify surgical risk in patients undergoing thoracic and abdominal cancer surgeries (Smith et al., 2020).

Psychological factors, including anxiety and depression, are frequently underrecognized in perioperative evaluations, despite evidence that they adversely impact postoperative recovery, pain management, and overall quality of life (Lee et al., 2018). Immune status and inflammatory markers

have also been increasingly studied for their role in predicting surgical outcomes and cancer recurrence, highlighting the multidimensional nature of perioperative risk (Wang et al., 2023). Despite this growing body of evidence, perioperative assessments for cancer patients lack standardized, integrated protocols tailored to the unique needs of this population. Current practice shows heterogeneity in the domains assessed and tools used, resulting in variable clinical decision-making and resource utilization (Nguyen et al., 2022). Such inconsistencies may contribute to preventable complications and suboptimal outcomes. Therefore, a systematic review of existing perioperative assessment domains and practices is crucial to map the current landscape, identify gaps, and inform the development of comprehensive, evidence-based assessment tools. This review aims to synthesize recent studies on perioperative evaluation in cancer patients to support improved risk stratification, personalized surgical planning, and ultimately better clinical outcomes.

METHOD

This systematic review employed a rigorous and structured approach to identify and analyze relevant literature on perioperative assessment in cancer patients. A comprehensive search was conducted across four major electronic databases: ScienceDirect, Scopus, PubMed, and Google Scholar. The search strategy utilized Boolean operators to combine keywords including “Cancer Surgery,” “Perioperative Assessment,” and “Preoperative Evaluation.” The search was limited to articles published within the last six years (2017-2024), written in English, and available in full text. Initially, a total of 1,071 articles were identified from all databases. After removing 384 duplicates, 687 unique articles remained for further screening. Titles and abstracts were reviewed to exclude irrelevant studies, resulting in 45 articles selected for full-text review. Of these, 16 articles were excluded due to lack of access to full texts or failure to meet the inclusion criteria. Ultimately, 12 studies were included in the final analysis.

Inclusion criteria were: (1) studies published in peer-reviewed journals between 2017 and 2024; (2) research focused on perioperative assessment practices and domains specifically in cancer patients undergoing surgery; (3) studies employing quantitative, qualitative, or mixed-method designs, including cohort studies, cross-sectional studies, reviews, and clinical trials; and (4) articles written in English. Data extraction involved systematically gathering information on study design, sample characteristics, assessment domains evaluated (such as nutritional status, frailty, cardiopulmonary reserve, psychological factors, and immune status), and perioperative assessment practices. The data were then synthesized descriptively to identify common domains and assessment approaches across studies. The review process adhered to guidelines for systematic reviews, ensuring transparency and reproducibility. Following the PRISMA framework, studies were systematically screened and selected through a structured process that included duplicate removal, title and abstract screening, and full-text assessment based on predefined inclusion and exclusion criteria. Critical appraisal of the included studies was performed to assess quality and relevance. Data were systematically extracted and synthesized to identify common assessment domains and practices. This systematic synthesis aimed to provide a comprehensive overview of current perioperative assessment methods in cancer surgery, highlighting gaps and informing future clinical practice and research.

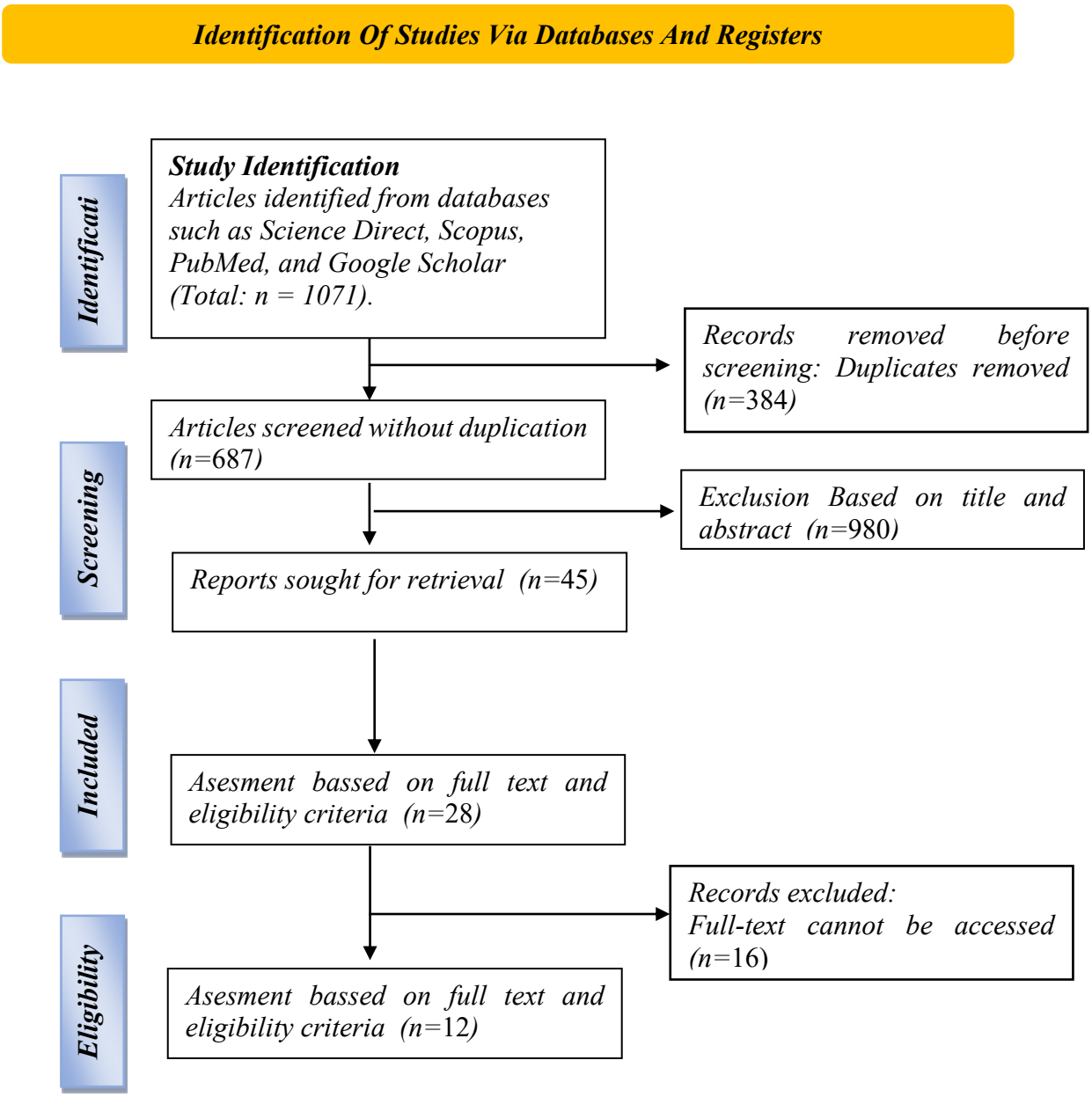

Figure 1. PRISMA Selection Process

RESULT

A systematic search was conducted in databases including ScienceDirect, Scopus, PubMed, and Google Scholar, identifying a total of 1,071 articles. After removing 384 duplicates, 687 articles remained for title and abstract screening. During this screening process, 980 articles were excluded. Subsequently, 45 full-text articles were reviewed for eligibility, but 16 were excluded due to inaccessibility. Ultimately, 12 articles met the inclusion criteria and were included in the final analysis. Data from these articles were synthesized descriptively to identify common perioperative assessment domains and practices in cancer patients. Below is the flowchart diagram illustrating the study selection process:

Table 1.
Evidance Based Practice

No	Title of the Scientific Paper	Authors	Method	Result
1.	*Prehabilitation programs for cancer patients: a systematic review of randomized controlled trials (protocol)*	Meneses-Echávez et al., 2020	Design: Systematic review protocol Sample: RCTs related to prehabilitation programs Variable: Effectiveness of prehabilitation programs Instrument: RCT studies Analysis: Meta-analysis	Prehabilitation programs before surgery in cancer patients have the potential to improve patients' physical and psychological conditions, thereby reducing postoperative complications and accelerating recovery. It is important to develop effective preoperative intervention programs as part of preoperative assessment to improve clinical outcomes and reduce the risk of postoperative complications in cancer patients.
2.	*Impact of Nutritional Status on Postoperative Outcomes in Cancer Patients following Elective Pancreatic Surgery*	Menozzi, R., et al. 2023	Design: Observational cohort Sample: 200 elective pancreatic cancer patients Variables: Nutritional status, postoperative outcomes Instruments: Nutritional assessment, clinical records Analysis: Descriptive statistics and regression	Poor preoperative nutritional status is significantly associated with increased postoperative complications and longer hospital stays in patients with pancreatic cancer. This highlights the importance of proper nutritional assessment during preoperative evaluation to reduce the risk of complications and improve clinical outcomes in cancer patients.
3.	*The Influence of the Perioperative Nutritional Status on the Survival Outcomes for Esophageal Cancer Patients with Neoadjuvant Chemotherapy*	Nakatani,M et al., 2022	Design: Retrospective cohort Sample: 150 esophageal cancer patients Variables: Perioperative nutritional status, survival outcomes Instruments: Nutritional assessment, medical records Analysis: Survival analysis	Patients with good perioperative nutritional status have higher survival rates compared to those who are malnourished. This underscores the need for close monitoring of nutritional status during preoperative assessment to improve long-term outcomes in cancer patients.
4.	*Relationship Between Nutritional Status and Clinical Outcome in Patients With Gastrointestinal Stromal Tumor After Surgical Resection*	Ding, L et al., 2022	Design: Retrospective observational Sample: 413 GIST patients Variables: Nutritional status (NRS2002, PG-SGA), clinical outcomes Instruments: Nutrition scores, clinical data	Patients at risk of malnutrition or who are malnourished experience higher rates of postoperative complications and a decline in nutritional laboratory parameters at discharge compared to admission. This indicates that preoperative nutritional status is a critical predictor of complications.
5.	*Evaluation of preoperative cardiopulmonary reserve and surgical risk of patients undergoing lung cancer resection*	Petrella, F et al., 2024	Design: Prospective observational Sample: Lung cancer patients scheduled for resection Variables: Cardiopulmonary reserve, surgical risk Instruments: Spirometry, exercise tests, cardiac evaluation Analysis: Correlation and risk stratification	Assessment of cardiopulmonary reserve (lung function and exercise capacity) provides important information for determining postoperative cardiopulmonary risk. This demonstrates that specific organ function domains (lung/cardiopulmonary) should be included in preoperative cancer assessment tools to more accurately evaluate surgical risk.
6.	*An augmented reality mHealth prototype for surgical decision-*	Najafi, N *et al.,* 2023	Design: Technology/prototype development study Sample: AR system for	The AR prototype enables integrated visualization of medical data in surgical decision-making for breast cancer, enhancing clinical insights. This demonstrates the

No	Title of the Scientific Paper	Authors	Method	Result
	making in breast cancer		surgical decision-making Variables: Application usage, surgical decisions Instruments: AR prototype, usability test Analysis: (not specified)	potential for integrating technology (e.g., preoperative data visualization) into PRECANT so that the instrument is not only static but also interactive and supportive of decision-making.
7.	*Cancer-associated cachexia: the anorexia-cachexia syndrome in cancer*	Barber et al, 2019	Design: Narrative review Sample: Literature on cancer cachexia Variables: Mechanisms, clinical effects Instruments: Literature review Analysis: (not specified)	Cachexia is a complex metabolic syndrome that affects nutritional status, muscle function, and tolerance to medical procedures in cancer patients. This underlines that preoperative cancer patients may already be in a cachectic state and that preoperative instruments should include indicators of cachexia/metabolic status.
8.	*ESPEN expert group recommendations for action against cancer-related malnutrition*	Arends et al, 2017	Design: Expert consensus/recommendations Variables: Cancer-related malnutrition Instruments: Clinical guidelines Analysis: Delphi method / literature synthesis	It is recommended that early identification of cancer-related malnutrition and nutritional interventions be an integral part of comprehensive cancer patient management. This provides a basis for developing cancer-specific preoperative instruments aligned with internationally accepted oncology nutrition guidelines.
9.	*Infection risks in cancer patients: An overview*	Malhotra et al, 2020	Design: Literature review Sample: Cancer population Variables: Infection risk factors, infection outcomes Instruments: Literature review Analysis: (not specified)	Cancer patients have a higher risk of infection due to immunosuppression (medication/therapy), which affects clinical outcomes during and after surgery. This emphasizes that the immune and infection domains should be integrated into preoperative instruments (e.g., neutropenia status, infection history) to predict the risk of complications.
10.	*Frailty predicts increased hospital and six-month healthcare cost following colorectal surgery in older adults*	Robinson et al, 2019	Design: Retrospective cohort Sample: Elderly patients undergoing colorectal surgery Variables: Frailty, cost, and outcomes Instruments: Frailty score Analysis: Regression analysis	Patients identified as "frail" prior to surgery exhibit higher healthcare costs and complication rates in the short term, extending up to six months postoperatively. This underscores the importance of incorporating the frailty domain (physical reserve) into preoperative assessment tools for cancer patients, in order to better anticipate healthcare expenditures and the risk of complications.
11.	*Risk assessment in cancer surgery: Preoperative evaluation and risk stratification*	Bilimoria et al, 2021	Design: Systematic review and multi-institutional study Variables: Preoperative risk factors, cancer surgery outcomes Instruments: Risk prediction models Analysis: Meta-analysis / statistical modeling	Preoperative risk evaluation and stratification based on the clinical characteristics of cancer patients are essential for guiding surgical decisions and interventions. This provides a theoretical foundation that the cancer preoperative instrument (PRECANT) should include risk stratification elements capable of predicting postoperative complications.
12.	*Anxiety and depression after cancer diagnosis: prevalence rates by cancer type, gender, and age*	Linden et al, 2017	Design: Cross-sectional Sample: Cancer patients Variables: Levels of anxiety and depression Instruments: Psychological questionnaires (e.g., HADS, PHQ, GAD) Analysis: Descriptive statistics / correlation	Depression and anxiety are fairly common following a cancer diagnosis, with variations depending on cancer type, age, and gender. This highlights that the psychological domain should be included in the cancer preoperative instrument (PRECANT) to detect mental burden that may affect recovery and clinical decision-making.

DISCUSSION

This systematic review highlights multiple critical domains and practices in the perioperative assessment of cancer patients, emphasizing the importance of a comprehensive, multidisciplinary approach to optimize surgical outcomes and patient recovery. Nutritional status emerges as a paramount factor influencing postoperative outcomes. Several studies underscore the impact of preoperative nutrition on complication rates, hospital stay length, and survival. Menozzi et al. (2023) demonstrated that poor nutritional status in pancreatic cancer patients significantly increases postoperative complications, supporting the need for thorough nutritional evaluations during preoperative assessments. Similarly, Nakatani et al. (2022) reported that esophageal cancer patients with better perioperative nutritional status had improved survival outcomes, suggesting that nutritional optimization can directly affect long-term prognosis. These findings align with Ding et al. (2022), who identified malnutrition as a predictor of postoperative complications, reinforcing the integration of standardized nutritional screening tools such as NRS2002 or PG-SGA in perioperative protocols (Menozzi et al., 2023; Nakatani et al., 2022; Ding et al., 2022).

Beyond nutrition, the assessment of cardiopulmonary reserve is essential, particularly in lung cancer surgery. Petrella et al. (2024) showed that evaluating lung function and exercise capacity provides critical data for risk stratification, indicating that perioperative tools should incorporate organ-specific functional assessments to predict surgical risks more accurately. This reflects the clinical imperative to tailor perioperative evaluation to the unique physiological challenges posed by different cancer types and surgical interventions (Petrella et al., 2024). The integration of technology into perioperative assessment is an emerging area of interest. Najafi et al. (2023) demonstrated the potential of augmented reality (AR) prototypes to enhance surgical decision-making by allowing dynamic visualization of patient data, suggesting that interactive digital tools could support precision medicine approaches in perioperative care (Najafi et al., 2023). This innovative direction aligns with broader trends in personalized healthcare and highlights the future potential of digital integration into assessment protocols.

Cancer-associated cachexia, a multifactorial metabolic syndrome characterized by severe weight and muscle loss, profoundly affects patients' nutritional and functional status. Barber et al. (2019) emphasized that cachexia complicates tolerance to surgery and treatment, signaling that perioperative assessment tools must include metabolic and cachexia-related parameters to better identify high-risk patients (Barber et al., 2019). This notion is supported by expert recommendations from ESPEN, advocating early detection and intervention against cancer-related malnutrition as a standard of care to improve clinical outcomes (Arends et al., 2017). Immunological and infection risk factors are also critical considerations. Malhotra et al. (2020) highlighted the immunosuppressive effects of cancer therapies that increase susceptibility to infections, which can significantly impact perioperative morbidity. Therefore, incorporating immune status indicators and infection history into preoperative assessments can aid in predicting and mitigating postoperative complications (Malhotra et al., 2020).

Frailty assessment has gained attention as a predictor of postoperative outcomes and healthcare resource utilization. Robinson et al. (2019) found that frail cancer patients experienced increased complications and healthcare costs, underscoring the need for frailty scoring in preoperative evaluations to improve risk stratification and inform care planning (Robinson et al., 2019). This expands the perioperative assessment beyond traditional physiological metrics to include broader evaluations of physical reserve and vulnerability. Risk stratification models, as highlighted by Bilimoria et al. (2021), provide a framework for integrating multiple patient and disease variables to predict surgical outcomes and guide clinical decisions. The use of validated prediction tools within perioperative protocols can improve patient selection, surgical planning, and postoperative management, ultimately enhancing patient safety and outcomes (Bilimoria et al., 2021).

Lastly, psychological assessment is a crucial yet often overlooked domain. Linden et al. (2017) found significant prevalence of anxiety and depression among cancer patients, which can adversely affect recovery and quality of life. Incorporating mental health screening into perioperative assessments allows for early identification of psychological distress, enabling timely interventions that support holistic patient care (Linden et al., 2017). Overall, this review demonstrates that perioperative assessment in cancer patients must be multidimensional, encompassing nutritional status, organ-specific function, immunological health, frailty, psychological well-being, and technological support systems. Current evidence advocates for standardized, cancer-specific assessment tools such as PRECANT that integrate these domains to improve preoperative risk evaluation, patient stratification, and tailored intervention planning. Future research should focus on validating such comprehensive instruments and exploring digital and interactive technologies to enhance clinical decision-making and patient outcomes.

CONCLUSION

Perioperative assessment in cancer patients plays a crucial role in reducing postoperative complications, enhancing recovery, and improving overall clinical outcomes. This review indicates that several key domains such as nutritional status, cardiopulmonary reserve, frailty, immune function, psychological health, and infection risk are consistently evaluated and have significant implications for surgical outcomes and recovery trajectories. Nutritional status and frailty, in particular, are major factors influencing both short- and long-term recovery, while psychological health affects recovery time and overall patient well-being. Despite the existence of various assessment tools, there is considerable variability in which domains are evaluated and how assessments are conducted across different institutions. These findings highlight the need for a comprehensive and standardized perioperative assessment approach that integrates multiple domains, allowing for personalized risk stratification and prehabilitation planning. Overall, understanding the current practices and domains in perioperative assessment provides a foundation for developing evidence-based, multidomain tools to improve surgical safety and optimize clinical outcomes in cancer patients.

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