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Summary of Evidence for Tumor-free Techniques in Malignant Tumor Surgery

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Abstract: *Objective*: To systematically retrieve, evaluate, and summarize the evidence regarding tumor-free techniques, thereby providing a foundation for standardizing nursing practices in malignant tumor surgery. *Methods*: According to the evidence-based "6S" model, a comprehensive search of literature pertaining to tumor-free technology was conducted using both Chinese and English databases. The time frame for this search extended from the inception of the database up until December 2025. *Results*: A total of 21 articles were included in this review. Among these, there was 1 clinical decision, 7 guidelines, 3 expert consensus documents, 6 systematic reviews, 1 randomized controlled trial, and 3 quasi-experiments. The topics covered encompassed preoperative personnel preparation, establishment of isolation areas, incision protection, body cavity exploration, management of carbon dioxide pneumoperitoneum, puncture needle management, tumor resection techniques, irrigation fluid management practices, surgical instrument handling protocols, and tumor specimen management. In total, there were 10 distinct topics with an aggregate of 27 items addressed. *Conclusion*: The evidence presented in this study serves as a valuable reference for the standardization of tumor-free techniques. It aims to enhance operating room nurses' awareness of these techniques and mitigate the risk of iatrogenic tumor implantation and metastasis during surgical procedures.

Keywords: Malignant tumor; Tumor-free techniques; Evidence summary; Evidence-based nursing

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1. Introduction

According to the International Agency for Research on Cancer (IARC), there will be nearly 20 million new cancer cases worldwide in 2022, while 9.7 million people will die of cancer, about one in five men or women will develop cancer in their lifetime, and about one in nine men or one in 12 women will die of cancer [1]. At present, surgery remains the most direct and effective approach to addressing malignant tumors, with tumor-free technology playing a pivotal role in the surgical process [2]. In 1954, Cole introduced the concept of tumor-free technology, which encompasses a series of measures implemented during the manipulation of malignant tumor surgeries aimed at preventing or minimizing the shedding, implantation, and dissemination of malignant tumor cells [3]. This includes efforts to inhibit their circulation, lymphatic metastasis, and local implantation. Given the inherent characteristics of local invasion and distant metastasis associated with malignant tumors, any inappropriate surgical maneuvers can significantly elevate the risk of releasing malignant tumor cells into surrounding tissues. These cells possess robust proliferative capabilities and have the potential to disseminate throughout various tissues and organs within the body, ultimately leading to the formation of secondary tumors that closely resemble the primary malignancy [4]. This not only heightens the risk of disease progression but also directly diminishes patient survival rates, thereby exacerbating the economic burden on patients. Consequently, standardized tumor-free techniques are crucial for ensuring the safety of malignant tumor surgeries. A study showed that currently 42.17% of the operating theatre departments have no specifications for anaplastic techniques and the correct operation rate of healthcare professionals in performing anaplastic techniques was only 56.80%, which showed a significant lack of awareness and knowledge related to anaplastic techniques for malignant tumours among the operating theatre healthcare professionals [5]. This highlights significant deficiencies in both awareness and knowledge regarding cancer-free technology among operating room personnel. On another note, while there has been a certain volume of research related to tumor-free techniques, there remains a scarcity of evidence-based summaries pertinent to this field. This gap hinders nursing staff from efficiently screening relevant evidence and applying it effectively in clinical practice. Therefore, this study aims to systematically and comprehensively retrieve pertinent evidence on tumor-free techniques both domestically and internationally. The goal is to provide robust support for medical professionals as well as an evidence-based foundation for nursing managers when formulating preventive measures related to tumor-free practices—ultimately reducing the risk of surgical-induced tumor metastasis. This study has been registered with the Evidence-Based Nursing Center at Fudan University (ES20256970).

2. Methods

2.1. Question identification

The PIPOST analysis method was used to formulate evidence-based nursing questions concerning tumor-free techniques in malignant tumor surgery [6]. Population (P): Patients aged 18 years and older undergoing surgery for malignant tumors. Intervention (I): Tumor-free surgical techniques. Professional (P): Operating room personnel. Outcome (O): Incidence of tumor implantation metastasis; patient prognosis. Setting (S) for evidence application: Operating room environment. Type of evidence (T): Guidelines, expert consensus, systematic reviews, meta-analyses, evidence summaries, and original research studies.

2.2. Retrieval strategy

According to the evidence "6S" pyramid model [7], utilize the keywords "tumor seed*/ no-touch isolation technique/ no tumor/ tumor-free techniques." The search will encompass resources such as The Guidelines Network, relevant professional association websites including UpToDate, Guidelines International Network (GIN), Chinese Medicine Pulse Guide network, and the American Association of Perioperative Registered Nurses (AORN). The search strategy involved combining subject headings with free-text terms. The English search terms included: "neoplasm Seed*/ tumor Seed*/ tumor spread*/ port-site metastasis," "no-touch isolation technique/ no tumor/ tumor-free techniques," and "guideline/ consensus/ recommendation/ statement." For systematic reviews/meta-analyses/evidence-based practices in Chinese, the search terms were "tumor-free technique/non-contact isolation technique/surgical isolation technique" along with "guidelines/consensus/standards/management/evidence summary/systematic review/meta-analysis”. Databases searched included PubMed, Cochrane Library, Web of Science, CINAHL, China National Knowledge Infrastructure (CNKI), Wanfang Database, VIP database, and China Biology Medicine Disc. Taking PubMed as an example for English databases, please refer to **Figure 1** for the specific search formula.

```
#1 ("no tumor"[Title/Abstract]) OR ("no touch isolation
   technique"[Title/Abstract]) OR ("tumor free
   techniques"[Title/Abstract])
#2 (("prevention and control"[Mesh Subheading]) OR ("preventive
   therapy"[Title/Abstract]) OR ("preventive measures"[Title/Abstract])
   OR ("prevention"[Title/Abstract]) OR ("control"[Title/Abstract]))
   AND (("neoplasm seeding"[Mesh Terms]) OR ("neoplasm
   seed*"[Title/Abstract]) OR ("tumor seed*"[Title/Abstract]) OR
   ("tumor spread*"[Title/Abstract]) OR ("port-site metastasis
   "[ Title/Abstract]) OR ("neoplasm metastasis"[Mesh Terms]))
#3 ("guideline"[Title/Abstract]) OR ("consensus"[Title/Abstract]) OR
   ("recommendation"[Title/Abstract]) OR ("statement"[Title/Abstract])
   OR ("systematic review"[Title/Abstract]) OR ("Meta-
   analysis"[Title/Abstract])
#4 (#1 OR #2) AND #3
```

Figure 1. PubMed search strategy.

2.3. Literature inclusion and exclusion criteria

2.3.1. Inclusion criteria

(1) The study subjects were patients who underwent resection of malignant tumors; (2) The research content encompassed management related to tumor resection, among other aspects;(3) Types of research included guidelines, expert consensus, clinical decisions, best clinical practices, evidence summaries, systematic reviews, and various original studies closely associated with the topic of this investigation.

2.3.2. Exclusion criteria

(1) Duplicate publications; (2) Non-English and non-Chinese literature; (3) Literature lacking full text availability; (4) Incomplete guidelines or brief guides that contain only introductions, tables of contents, abstracts, etc.;(5) Literature that has been updated; (6) Unpublished papers.

2.3.3. Literature quality evaluation criteria

The Appraisal of Guidelines for Research and Evaluation II (AGREE II) (2017 edition) was employed to assess the quality of guidelines [8].

The quality of systematic reviews, expert consensus, randomized controlled trials (RCTs), and quasi-experimental studies was evaluated using the relevant criteria established by the Australian JBI Evidence-based Health Care Center (2016 edition) [9].

The evidence summary was traced back to the original literature, with corresponding evaluation criteria selected based on the type of original study.

Quality evaluations of the guidelines were conducted independently by four researchers. Systematic reviews, meta-analyses, evidence summaries, and original research were assessed independently by three researchers; in cases where evaluation opinions differed, discrepancies were resolved through consultation and discussion.

2.3.4. Evidence extraction and integration

A self-designed evidence data extraction table was utilized to systematically extract evidence content based on specific research topics. During the extraction process, each piece of included literature was reviewed individually, summarized, and synthesized.

(1) When the sources of evidence differed, but the contents were similar, preference was given to evidence that exhibited strong professionalism, comprehensive content, and concise phrasing. For instance, "1.5 liter rectal irrigation is recommended to reduce the risk of local recurrence in patients with resectable tumors using normal saline only" is favored over "it may be reasonable to recommend intraoperative rectal irrigation to prevent local recurrence after rectal cancer surgery."

(2) In cases where the evidence complemented one another, these pieces of evidence were integrated based on their logical relationships in language expression. For example, statements such as "The instruments can be contaminated by soaking in 55℃ distilled water for 60 seconds; tumor cells can be completely inactivated [10]," and "heparin saline combined with absolute ethanol for washing ensures optimal tumor-free effects on surgical instruments [11]," were merged. The 2014 version of the JBI Evidence Pre-Grading System was employed to assess the quality of included evidence. The evidences were categorized into grades ranging from 1a to 5c according to varying study designs [12].

3. Results

3.1. Literature search results and general information

A total of 1378 literatures were retrieved. EndNote software was used to remove duplicate literatures, and the title, abstract and full text were read to complete the primary and secondary screening. Among them, there were 1 clinical decision [13], 7 guidelines [2,14–19], 3 expert consensus [20–22], 6 systematic reviews [23–28], 1 randomized controlled trial [29], and 3 quasi-experiments [10,30,31]. See **Figure 2** for the literature screening process, and Table 1 for the general information of the included literature.

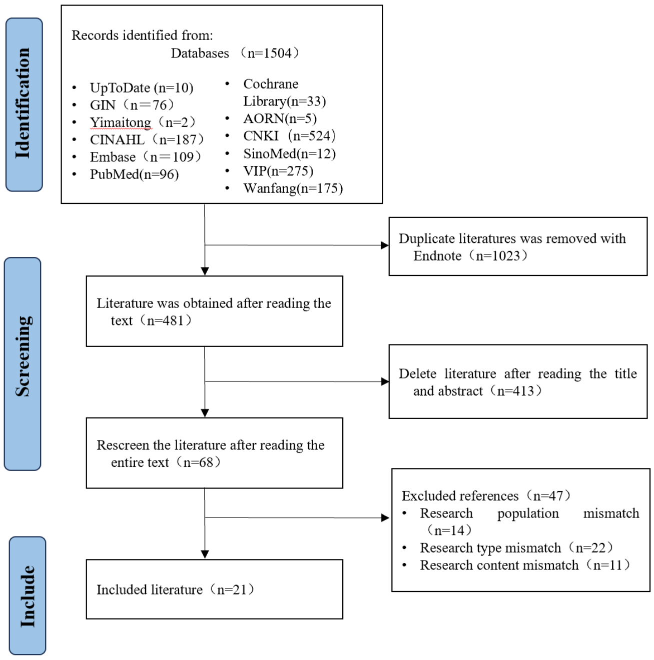

Figure 2. Screening flow chart for literature.

Table 1. Evidence source and content

Included literature	Year of publication (year)	Type of literature	Literature reference	The literature theme
Aurora et al. [13]	2023	Clinical decision-making	UpToDate	Complications of laparoscopic surgery: port-site metastasis
Rey et al. [19]	2010	Guideline	PubMed	Guidelines for the use of electrosurgical equipment in endoscopic surgery
Chinese Nursing Association, Operating Room Nursing Committee [2]	2024	Guideline	CNKI	Clinical Nursing Practice Guidelines for the Operating Room
Speth et al. [15]	2024	Guideline	AORN	Guidelines for Aseptic Techniques in the Operating Room
Zerey et al. [16]	2013	Guideline	PubMed	Evidence-based guidelines for laparoscopic resection for colon and rectal cancer
Kyle et al. [17]	2023	Guideline	AORN	Guidelines for Aseptic Techniques in Operating Room Nursing
Roberts et al. [18]	2010	Guideline	PubMed	Guidelines for the management of malignant pleural effusions
AORN [14]	2021	Guideline	AORN	Guidelines for specimen management in the operating room
Colorectal Oncology Group of the Chinese Medical Association Society of Oncology [22]	2024	Expert consensus	CNKI	Recommendations for surgical margins in rectal cancer
Wang et al. [20]	2023	Expert consensus	CNKI	Recommendations for preventive measures against laparoscopic perforation port-site metastasis in gynecologic malignancies
Wei et al. [21]	2020	Expert consensus	CNKI	Recommendations for surgical isolation techniques for malignant tumors of the lungs
Pop-Vicas et al. [24]	2020	Systematic review	PubMed	Interventions to reduce surgical site infections
Zhou et al. [25]	2014	Systematic review	PubMed	Relationship between flushing solution, flushing volume and risk of local recurrence in anterior rectal cancer resection
Rondelli et al. [26]	2012	Systematic review	PubMed	Intraoperative irrigation fluid flushing and tumor recurrence
Matsuda et al. [27]	2013	Systematic review	PubMed	Intraoperative irrigation fluid flushing and tumor recurrence
Coccolini et al. [28]	2016	Systematic review	PubMed	Effect of intraperitoneal chemotherapy and intraperitoneal lavage on peritoneal cells
Zhou et al. [23]	2015	Systematic review	PubMed	The effect of suturing technique on the prognosis of cancer surgery
Yuen-Chun et al. [29]	2024	Randomized controlled trial	PubMed	Comparison of total tumor resection with standard resection
Zhang et al. [31]	2014	quasi-experiments	CNKI	Comparison of rapid methods for handling intraoperative contaminated surgical instruments
Yu et al. [10]	2013	quasi-experiments	CNKI	Comparison of rapid methods for handling intraoperative contaminated surgical instruments
Kuhar et al. [30]	2021	quasi-experiments	PubMed	Cytopathologic evaluation of postoperative gloves and instruments

3.2. Literature quality-evaluation results

3.2.1. Clinical decision

One clinical decision [13], from UpToDate, was included directly.

3.2.2. Guidelines quality evaluation

7 guide for quality evaluation [2,14–19], including 4 levels that guide recommended [2,14,15,17]. For a grade 3 guide, recommended levels [16,18,19] for class B, meet eligibility criteria, were included. The results of the quality evaluation are shown in **Table 2**.

Table 2. Guidelines quality evaluation results (*n* = 7)

Inclusion guidelines	Normalized percentage of scores (%)						≥ 60% of fields	≥ 30% of fields	Recom-mendation level
	Scope and Purpose	Involved personnel	Preciseness of guideline development	Clarity of presentation	Applicability	Independence of writing			
Rey et al. [19]	74.3	79.5	65.5	76.5	59.5	100	5	6	B
Speth et al. [15]	85.5	81.8	79.5	85.5	61.8%	77.3	6	6	A
Zerey et al. [16]	83.5	76.8	84.5	65.3	59.8	83.5	5	6	B
Kyle et al. [17]	85.3	84.5	81.0	83.3	62.8	77.5	6	6	A
Roberts et al. [18]	74.3	79.5	65.7	78.2	52.5	96.3	5	6	B
AORN [14]	85.8	82.3	80.8	85.5	63.3	77.5	6	6	A
Chinese Nursing Association, Operating Room Nursing Committee [2]	93.8	80.5	63.3	81.0	65.3	100	6	6	A

3.2.3. System evaluation and expert consensus on the quality of the evaluation results

The quality of the included 6 systematic reviews was evaluated [23–28], and all items were rated as "yes", with high quality, and were included. Two expert consensus articles were included, and all items in the expert [20,21] consensus were rated as "yes" and of high quality, so they were included.

3.2.4. Quality evaluation results of relevant original studies

A total of 1 randomized controlled trial was included in this study [29], and the results of item 5 were "no", and the results of the other items were "yes". The overall quality was high, so it was included. Three quasi-experimental studies were included [10,30,31], except for one study [10] with item 5 and item 6 "not applicable" and two studies [30,31] with item 6 "not applicable"; the rest of the items were "yes" and were of high quality, so they were included.

3.3. Evidence summary and description

Researchers summarized the evidence from 10 aspects, including preoperative personnel preparation, establishment of isolation area, incision protection, body cavity exploration, carbon dioxide pneumoperitoneum management, puncture needle management, tumor resection, irrigation fluid management, surgical instruments management and tumor specimen management, and formed 27 pieces of evidence. See **Table 3** for evidence.

Table 3. Summary of evidence for tumor-free techniques in malignant tumor surgery

Evidence topic	Evidence description	Level
Preoperative evaluation and staff preparation	1. Operative nurses are skilled in relevant tumor-free techniques [2]	5b
Establishment of a quarantine zone	2. Setting up "tumor isolation area" and "tumor-free area" respectively on the instrument table, the instruments in the two areas are used separately to avoid cross-over [2,15].	1b
	3. Prepare clearly marked "isolation trays" for tumor specimens and surgical instruments in contact with the tumor [2,21].	5b
c Incision protection	4. Use of incision protectors to protect surgical incisions during the removal of tumors [13,16,17].	1a
body cavity search	5. It is recommended that the examination be performed gently to minimize the number of probes [2,20,21].	1b
	6. Timely change of sterile gloves at the end of body cavity exploration before performing surgery or suturing wounds [21,24].	1b
	7. In the presence of pleural fluid/ascites, the surgeon's suction device should be provided for timely suction to avoid spreading and planting of tumor cells in the pleural fluid/ascites [18,21].	1b
Carbon dioxide pneumoperitoneum management	8. Use an appropriately sized perforator and minimize the gap between the perforator and the abdominal wall to avoid CO_2 leakage [20,24].	1b
	9. During laparoscopic surgery for malignant tumors, heated, humidified CO2 insufflation (37°C, 95% relative humidity) is recommended when resources permit, with a view to reducing the incidence of PSM [20].	1b
	10. Intraoperatively, regulate the pneumoperitoneum pressure ≤ 14 mmHg, maintain the flow rate < 5 Lmin, warm the gas to 37°C, and keep the CO2 pneumoperitoneum pressure steady, avoiding sudden pressure increase, sudden decrease, and repeated inflation and deflation [2].	5b
Management of pierced pipes	11. Secure the perforator to prevent displacement and dislodgement, reduce the frequency of repeated entry and exit of the perforator, and avoid "submarine insertion" during perforator placement to avoid wider fascial injury [20].	5b
	12. Place a drain to remove intra-abdominal fluid before releasing the pneumoperitoneum. The abdominal wall wound can be adequately flushed with sterilized water for injection, and instruments, trocars, and port sites can be flushed with 5% povidone-iodine solution and water [13,20].	1a
	13. Remove the puncture device without pneumoperitoneum to avoid sudden reduction of the abdominal pressure [20].	1b
lumpectomy	14. During tumor resection, it is recommended that the tumor be resected in its entirety and dissected sharply, avoiding direct cuts and rupture of the tumor, while ensuring adequate negative margins [20,29].	1b
	15. Use non-contact isolation techniques during tumor resection and maximize the use of electrosurgical equipment to isolate tissues, reduce bleeding and cut off hematogenous metastatic pathways [2,19].	1a
	16. If the tumor is found to be ruptured, the area of the tumor should be protected, either by covering it with a gauze pad or by applying TH adhesive to the surface of the tumor to isolate it from normal tissue and other traumatic areas [2,21].	5b
	17. Place the tumor in an extraction bag as soon as possible after ex vivo and use the bag to remove the tumor tissue [13,20].	1a
Flushing Solution Management	18. Intraoperative irrigation with large volumes of saline (1500-2000 mL) significantly reduces the risk of local tumor recurrence [25,27].	1a
	19. Intraperitoneal chemotherapy combined with peritoneal lavage can further reduce tumor recurrence in the peritoneum [28].	1a
Surgical Instrument Management	20. If a cutting anastomosis is used in the removal of a tumor, the instrumentation nurse should not have direct contact with the hands when removing or replacing the staple compartment or cartridge, nor with the anastomosis after it has been used [21,23].	1a
	21. Contaminated instruments should be replaced promptly, and all contaminated instruments, gloves, etc. should be replaced prior to other operations after removal of the tumor specimen and prior to closure of the body cavity. When counting the items, they should be counted with the help of instruments that have not touched the tumor/are not contaminated, and the contaminated instruments should not be touched directly by hand, and the replaced instruments should be placed in the tumor-bearing area [14,21].	1a
	22. In the presence of multiple lesions to be examined during the procedure, instruments, blades, and dressings used to remove specimens should not be mixed, and the used instruments should be placed in the tumor-bearing area [14,21].	1a
	23. When conditions are limited, contaminated instruments can be soaked in distilled water at 55°C for 60 seconds or rinsed in heparinized saline for 5 seconds and then rinsed in anhydrous ethanol for 5 seconds to rapidly inactivate tumor cells carried by the instruments, which can be reused after the treatment is completed [10,11].	2b
	24. The operating room nurse should prepare enough surgical instruments to ensure that contaminated instruments are replaced in a timely manner during lymph node dissection, and that contaminated instruments are placed in an isolated area and not reused [2,21].	5b
	25. When taking tumor margins, it is recommended that the margin tissue be treated as malignant tissue, and that the surgical instruments that come into contact with the margin specimen be replaced and placed in a quarantine area after the margin specimen has been taken [2,22].	5b

Evidence topic	Evidence description	Level
Tumor Specimen Management	26. It is recommended that instrument nurses use special specimen trays and curved forceps when picking up specimens and lymph nodes, and that health care workers do not touch the tumor directly with their hands [2,21].	5b
	27. When retaining rapid pathology specimens, incise the specimen in the tumor-bearing area, place the incised specimen in a specimen bag and label it. Change gloves and instruments after the procedure. The instruments should not be reused [2,30].	5b

4. Discussion

4.1. Enhance the understanding and training of medical personnel regarding tumor-free techniques in malignant tumor surgery

Strengthening the awareness of disease-free practices is essential. Operating room staff should regularly receive education on disease-free technological knowledge to fully understand the significance of these technologies for the safety and prognosis of malignant tumors. A study examined the implementation of tumor-free technology among operating room nurses in 16 hospitals, revealing a lack of systematic theoretical understanding and practical skill training related to tumor-free technology [32]. Furthermore, surgeons, nurses, and managers demonstrated insufficient awareness regarding the safety implications associated with tumor-free practices. On one hand, while some surgical nurses recognize the importance of disease-free technology, their comprehension tends to be limited primarily to interactions with tumor-related equipment post-surgery. They often overlook factors that may indirectly contribute to tumor cell growth or metastasis, such as the use of puncture kits and CO2 pneumoperitoneum [33]. Currently, training in tumor-free techniques predominantly relies on experiential learning rather than structured methodologies; there are no specific training methods or assessment standards in place. Consequently, there remains a significant gap in unified, standardized, and detailed training programs. In future endeavors, it is crucial to establish comprehensive and standardized training programs for tumor-free techniques along with relevant textbooks based on empirical evidence. This initiative aims to enhance medical personnel's understanding and safety awareness concerning tumor-free practices during malignant tumor surgeries.

4.2. Formulate a multidisciplinary team to enhance the technical specifications for tumor-free outcomes

Disease-free technology plays a crucial role in the implementation of tumor resection, encompassing various complex processes such as the management of touch tumor specimens and other intricate steps. Effective collaboration among multidisciplinary teams, including operating room nurses, surgeons, anesthesiologists, and pathologists, is essential; relying solely on individual medical staff makes it challenging to address all details comprehensively. Establishing a multidisciplinary cooperative team can facilitate efficient communication and collaboration for the successful application of cancer-free technology. Currently, existing guidelines regarding the manipulation of disease-free technology require further enhancement. Clinical medical personnel often lack systematic and scientifically grounded protocols to guide their clinical practices. A survey indicated that only 40 percent of healthcare workers changed surgical instruments to mitigate the risk of tumor implantation [34]. Furthermore, motivations for altering items that come into contact with tumors were primarily based on subjective experiences, such as intuition, rather than being informed by scientific evidence or established manipulation standards.

4.3. Further enhance the specifics of tumor-free technology to minimize its economic costs

The primary objective of tumor-free technology is to minimize the risk of iatrogenic tumor implantation and metastasis, thereby enhancing surgical outcomes for patients and reducing the economic burden on both individuals and society. However, achieving tumor-free status often necessitates an increased utilization of certain items in clinical practice, such as incision protectors and replacements for instruments that may come into contact with tumors. This requirement inevitably leads to higher financial expenditures associated with malignant tumor surgeries. Currently, replacing items that are not conducive to a tumor-free environment stands as a fundamental principle within this technology. Nonetheless, if all such items are substituted indiscriminately, it could result in multiple replacements of high-value instruments like ultrasonic scalpels. Such practices would undoubtedly escalate the overall costs associated with malignant tumor surgery, further increasing the economic strain on patients and society at large while potentially diminishing patients' willingness to undergo surgical procedures. Recent studies have indicated that various contact materials exhibit differing probabilities of harboring malignant cells; consequently, the risks associated with iatrogenic metastasis also vary accordingly [11,31,35]. Rapid processing methods for certain contact articles can allow their reuse without significantly elevating the risk of iatrogenic metastasis. Therefore, future advancements in tumor-free technology should focus on refining procedural details while striving to minimize economic costs without compromising safety regarding potential tumor implantation or metastasis risks.

5. Limitations

This study summarizes the relevant evidence regarding tumor-free techniques in surgery for malignant tumors, but there are some limitations: (1) there are a wide variety of malignant tumors, and the evidence in this study comes from studies related to common solid tumors, while there is a lack of evidence related to non-solid tumors, so the applicability of the tumor-free technique when using it in surgery for non-solid tumors is unclear; (2) some of the evidence in this study comes from expert consensus, and the level of evidence is low, so readers should choose the most reliable evidence judiciously in the context of clinical practice; (3) this study included only Chinese and English literature, which may have overlooked high-quality research results in other languages.

6. Conclusion

This study consolidates the pertinent evidence regarding the tumor-free technique in malignant tumor surgery, aiming to provide a reference for future clinical applications of this approach. The study incorporates numerous expert consensus statements, and it is recommended that evidence developers periodically review emerging data or design foundational research to validate these findings. Given the variations in medical environments and clinical support conditions across different regions and grading hospitals in China, it is advised that practitioners thoroughly assess their specific circumstances prior to implementing any evidence-based practices. A scientific and rational selection of currently applicable and feasible evidence should be made to formulate a practice management plan for oncology-free surgical nursing tailored to align with actual clinical situations. This approach aims to minimize the risk of implantation and metastasis associated with iatrogenic tumors during surgical procedures.

Disclosure statement

The authors declare no conflict of interest.

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