Perioperative Medicine

REVIEW

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Global research trends in perioperative care for diabetic patients: a bibliometric and visualized study

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Abstract

Perioperative management in diabetic patients is important since their postoperative mortality and morbidity are higher than that of non-diabetic patients, which will exacerbate the burden on public health. We selected relevant publications from the WoSCC-SCIE between 2007 and 2024, utilizing VOSviewer and CiteSpace to analyze the collected information and generate knowledge maps. A total of 3167 articles from 792 journals and 83 countries/regions were included for analysis. Overall, there has been a continuous increase in publication volume. From the result of academic collaboration between different countries/regions and institutions, the USA occupies a central position in research strength. A total of 18,101 authors participated in research on "perioperative management in diabetic patients" with Dr. Guillermo E. Umpierrez from Emory University School of Medicine being the most productive author. We conclude that perioperative adverse clinical outcomes in diabetic patients and perioperative blood glucose management have consistently been research hotspots in this field. Additionally, continuous glucose monitoring and insulin administration under computer guidance, as well as the use of merging medications are likely to be frontier directions for future research. Research on perioperative care for diabetic patients has been further deepened worldwide, which will be crucial in further improving perioperative care for diabetic patients and enhancing postoperative recovery.

Keywords Bibliometric analysis, Visualized analysis, Diabetes, Perioperative care

Introduction

With the increased living standards and the advent of global population aging, diabetes has emerged as an increasingly serious global public health challenge. According to the International Diabetes Federation (IDF), it is estimated that by 2030, the global number of people with diabetes will rise to approximately 643 million, and by 2045, it will rise to 783 million (International Diabetes Federation 2021), placing significant strain on healthcare resources and economies. In addition, diabetic individuals account for a significant proportion of the surgical population, and related studies have shown that up to 50% of diabetic patients require surgical procedures during their lifetime (Drayton et al. 2022). Due to the chronic and multi-system damage caused by diabetes, surgical patients may present with a variety of comorbidities preoperatively, including cardiovascular diseases, diabetic nephropathy, and peripheral vascular and neurological disorders. Undoubtedly, this poses a challenge to anesthesiologists in the perioperative management of diabetic patients. In addition to the inherent glucose regulation disorders in diabetic patients, surgical and anesthesia stress may cause abnormal fluctuations in blood glucose, increasing the risk of adverse clinical outcomes. A large

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body of literature (Drayton et al. 2022; Frisch et al. 2010; Martin et al. 2016; Noordzij et al. 2007; Shang et al. 2024) has shown that diabetes is a risk factor for perioperative adverse outcomes in surgical patients. Over the past few decades, numerous clinical studies have been conducted to improve the management of surgical diabetic patients.

To the best of our knowledge, nothing has been published in the field of perioperative care for diabetic patients to reflect the global state of the field over the past two decades. This study selected articles published between 2007 and 2024, providing a retrospective and systematic overview that will help researchers further understand research trends in this area and guide future studies.

Methods

Data source and search strategy

In the Web of Science Core Collection (WoSCC) -Science Citation Index Expanded (SCI-EXPANDED; 2007-present) database, a search strategy with the terms TS = ("diabetes" or "diabetes mellitus" or "DM") AND TS = ("perioperative") was employed for subject retrieval. The time range selected was from 2007 to the present. To avoid biases caused by database updates, literature retrieval and data downloading were performed on the same day, March 14, 2025.

Inclusion and exclusion criteria

Inclusion criteria: Articles or reviews included in the WoSCC- SCIE.

Exclusion criteria: (1) Publications in 2025, (2) non-English, (3) proceeding paper or early access or meeting abstract or editorial material or letter or book chapters or correction or news item or reprint or retracted publication, and (4) duplicate literature.

Software for bibliometric analysis

Bibliometric analysis is a research methodology that employs mathematical and statistical theories and methods to mine and analyze data from literature databases, including publication timelines, authors, institutions, cited references, and other metadata. Through software visualization, it generates knowledge maps to assist researchers in rapidly understanding the current landscape and developmental trends of a specific field. Bibliometric analysis was conducted using two software tools: VOSviewer (1.6.20) and CiteSpace (5.7.R5). Firstly, the downloaded data were preprocessed and deduplicated using CiteSpace before analysis. Microsoft Excel 2021 was used to analyze and present the publication counts from 2007 to 2024.

VOSviewer is a literature analysis and knowledge visualization tool based on network data. It can illustrate relationships such as structure, evolution, and collaboration in the field (Jan and van Eck and Ludo Waltman. VOSviewer manual.31, 2023). In our study, it was primarily used for analyzing co-authorship between countries/regions, institutions, journals and authors, co-citation analysis between journals and authors, and co-occurrence analysis of keywords.

CiteSpace is a bibliometric analysis and visualization software developed by Professor Chaomei Chen based on Kuhn's theory of scientific revolutions. In our study, CiteSpace was mainly used for burst detection analysis of keywords and literature, as well as co-citation analysis of literature.

Parameters settings for VOSviewer: counting method as full counting; ignoring articles with many co-authored countries, with a maximum of 25 countries per article; threshold settings were adjusted differently based on the analysis content and considerations for a clean and tidy graph. Parameters settings for CiteSpace: time span: 2007.01–2024.12; time slice: 1 year; node threshold filtering: g-index25 ($k = 25$), LRF = 3.0, LBY = 8, $e = 2.0$; label content extraction selected from titles, with final label determination adjusted and modified based on the results of three algorithms.

Results

A total of 3740 publications were retrieved from the WoSCC-SCIE database. Among them, 573 were excluded for newly published in 2025, non-English, and proceeding papers or early access or meeting abstracts or editorial material or letter or book chapters or correction or news items or reprint or retracted publication. There were no duplicate records, resulting in 3167 were identified, including 2767 (87.4%) research articles and 400 (12.6%) reviews (Fig. 1). The collected literature information includes authors, titles, publications, languages, types of literature, keywords, abstracts, author affiliations, countries, DOI numbers, and cited references.

Overview of publication status

The number of annual publications and the changing trends in the field can reflect the developmental stages and predict future trends. Overall, the annual publication output showed steady growth from 2007 to 2022, peaking in 2022 with 309 relevant articles published. However, there was a significant decrease in 2023, with a decrease of 18.7%. Notably, publication numbers rebounded in 2024, returning to 307 articles. Linear fitting was performed based on the cumulative number of annual publications ($R^2 = 0.9592$) (Fig. 2).

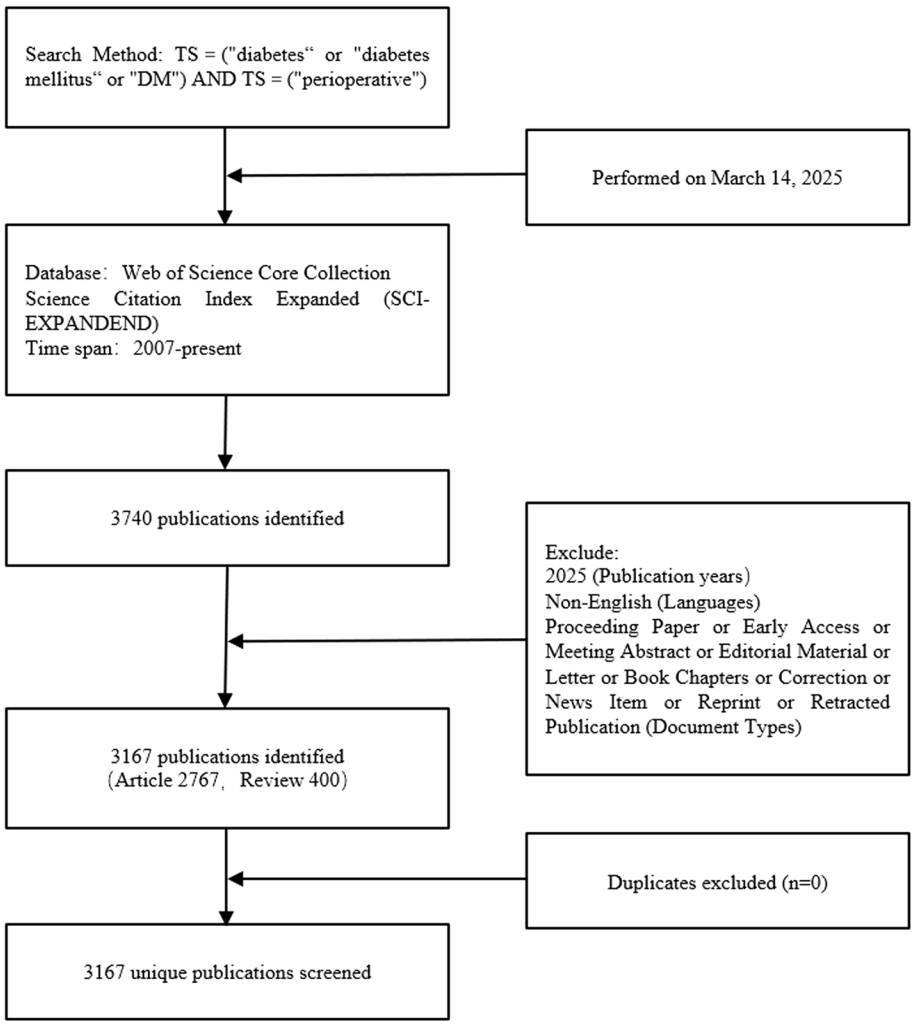

Fig. 1 Publication screening flow chart

Co-authorship between countries/regions and institutions

From 2007 to 2024, 3167 articles were screened, originating from 83 countries/regions and 3478 institutions. In Fig. 3A, it can be observed that the countries/regions with the most published articles are the USA, China, Japan, Germany, England, and Canada. Although its average publication time is later compared to other countries, with a trend of catching up around 2020, China ranks second globally in the number of publications (Table 1). Moreover, based on the number and thickness of connections, it can also be observed that the USA and several major publishing countries have actively close cooperation.

A selection and visualization were made based on 103 institutions publishing ≥ 11 articles, and a co-authorship network map was constructed (Fig. 3B). Combining with Table 2, the top 10 institutions with the most published articles are all from the USA. Among them, the Mayo Clinic, Cleveland Clinic, and Harvard Medical School are the top three academic institutions with the most published articles, and Harvard Medical School has the closest cooperation with other institutions (total link strength = 114).

Co-authorship and co-citation between journals

According to statistics, these articles were published in a total of 792 journals, with the top 10 most productive journals specializing in cardiovascular, joint, and metabolic surgery (Supplementary Table 1). A co-authorship network of 42 active journals revealed strong collaborations between related journals like *Annals of Vascular Surgery with The Journal of Vascular Surgery*, *Journal of Arthroplasty* with *Journal of Bone and Joint Surgery*, *Spine* with *World Neurosurgery*, and *Obesity Surgery*

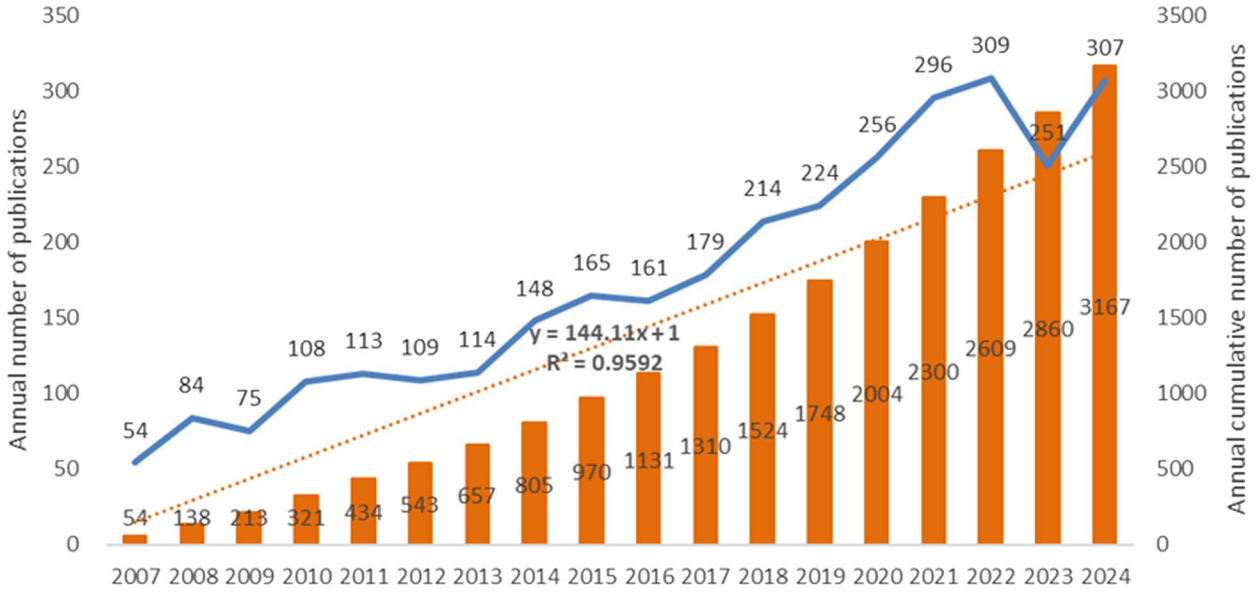

Fig. 2 Graphics of annual number (blue line) and cumulative number of publications (orange bar) between 2007 and 2024. The orange line indicates the trend line based on the cumulative number of annual publications

with *Surgery for Obesity and Related Diseases* (Fig. 3C). Co-citation analysis of 9089 journals identified *NEJM*, *Diabetes Care*, and *Annals of Surgery* as the most influential (Supplementary Table 2), with particularly strong relationships between anesthesia and metabolic surgery journals.

Co-authorship and co-citation between authors

A total of 18,101 authors participated in research in the field, with Dr. Guillermo E. Umpierrez being the most published (16 articles, 1194 citations) (Supplementary Table 3). Co-citation authors refer to authors who are jointly cited in a series of publications. Among the 58,448 co-cited authors, it is clear to see the authors with the highest citation frequencies, including Dr. Greet Van den Berghe from Gaithersburg University Hospital's Intensive Care Medicine Department, whose article on *Intensive insulin therapy in critically ill patients* has received widespread attention, followed by Dr. Guillermo E. Umpierrez from Emory University and Dr. Anthony P. Furnary from the Cardiothoracic Surgery Department at Providence Saint Vincent Medical Center (Supplementary Table 4). The author networks demonstrated distinct collaborative clusters through color coding (Fig. 3D and F).

Co-occurrence and burst analysis of keywords

Firstly, using VOS viewer, we conducted a co-occurrence analysis of keywords based on author keywords, retrieving a total of 4963 keywords. With a threshold frequency set at fifteen, 83 keywords met the criteria (Supplementary Table 5), leading to the cluster view (Fig. 4A). The four clusters represented by different colors in the cluster view can be summarized as follows: (1) red: perioperative complications and risk factors in diabetic patients; (2) green: perioperative management of diabetic patients; (3) blue: metabolic surgery in diabetic patients; and (4) yellow: total joint arthroplasty in diabetic patients.

Next, using CiteSpace, we conducted a burst analysis of keywords, selecting the top 25 keywords with the strongest burst from 2007 to 2024 (Fig. 4B). Among them, "intensive insulin therapy, glucose control, critically ill, coronary artery bypass, cardiopulmonary bypass, long-term survival" were keywords with burst strengths exceeding 5 during specific time periods, reflecting strong research interests and focal points over the past decade. The latest emergent keywords include "prediction, readmission, delirium" which can help predict future research directions.

Co-citation and burst analysis of references

Co-citation analysis examines documents cited together within a series of publications. Among 3167 articles, there were 83,902 cited references. After visualization, valuable information such as highly cited, highly intermediate, and highly burst articles can be directly identified, facilitating an understanding of the overall research landscape and trends in perioperative management of diabetic patients from 2007 to 2024.

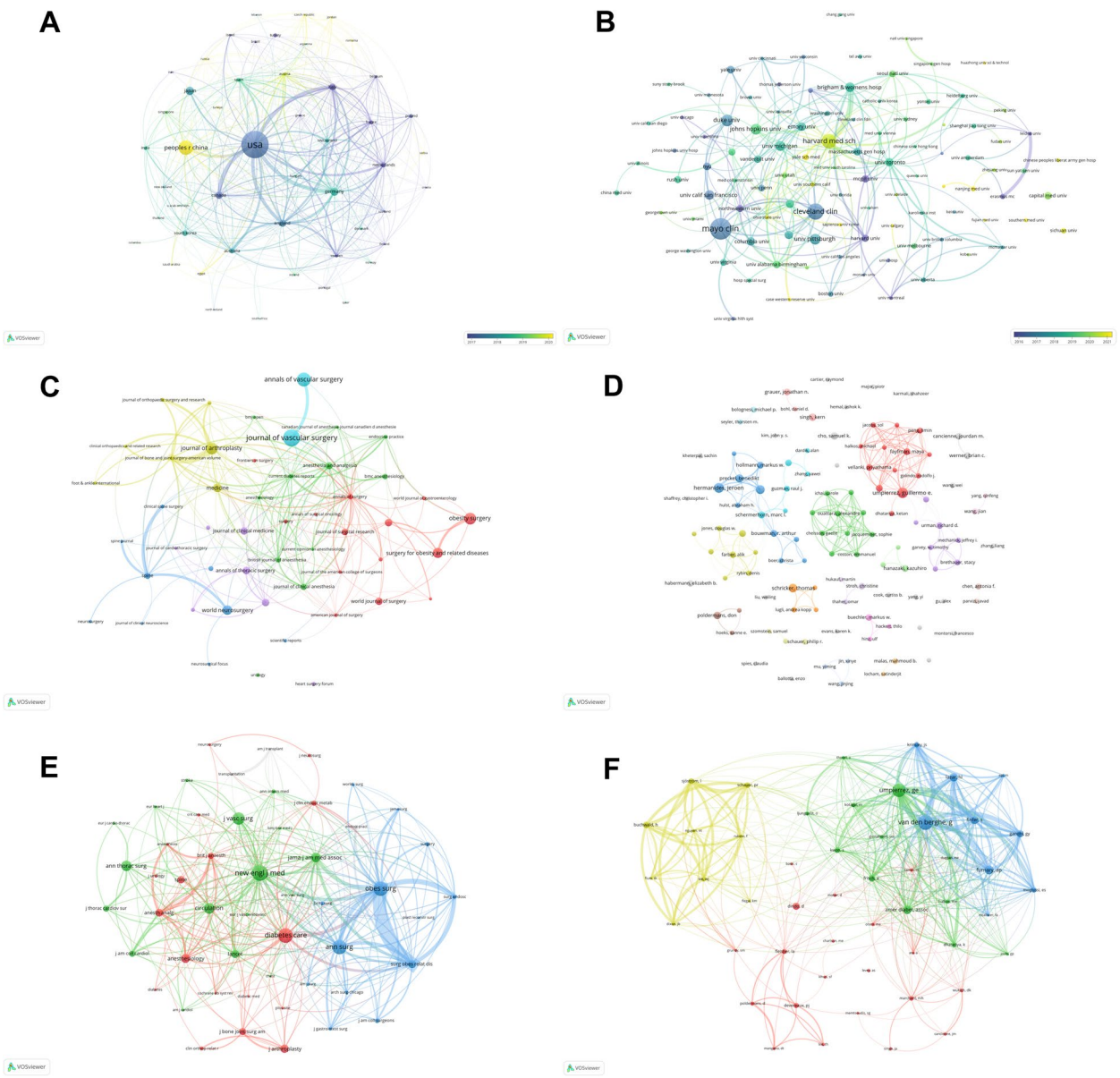

Fig. 3 Visual maps of academic collaboration between countries/regions, institutions, journals, and authors by VOSviewer. **A** Co-authorship between countries/regions (threshold = 5). **B** Co-authorship between institutions (threshold = 11). **C** Co-authorship between journals (threshold = 15). **D** Co-authorship between authors (threshold = 5). **E** Co-citation between journals (threshold = 416). **F** Co-citation between authors (threshold = 62)

According to preset filtering criteria, 984 nodes representing 984 articles were presented in Fig. 5A. These articles were roughly categorized into different colored regions based on the year. Larger nodes indicate higher citation frequencies. Table 3 lists the top 10 most cited articles, including 8 clinical research articles and 2 reviews, focusing on issues related to "erioperative hyperglycemia and adverse outcomes in diabetic patients," "perioperative glucose management," and "intensive insulin therapy in critically ill patients." Notably, articles with high intermediacy, such as those authored by Underwood P (2014), Rubino F (2016), Wiener RS (2008), and Adams TD (2012), are surrounded by purple circles, as well as articles with red circles indicating high burst (Fig. 6).

Burst analysis of cited references explores articles frequently cited and closely followed by scholars in a specific field over a period of time (Fig. 6). The most intense

Table 1 The top 10 productive countries/regions

Rank	Country	Documents	Citations	Total link strength
1	USA	1335	40,909	368
2	China	468	5656	95
3	Japan	189	3051	39
4	Germany	174	4303	198
5	England	149	6858	228
6	Canada	143	4058	146
7	Italy	129	4123	172
8	South Korea	101	1825	47
9	Netherlands	92	3648	121
10	Australia	92	3319	110

citation burst (strength = 22.33) was triggered by the paper titled *Intensive insulin therapy in critically ill patients*, which lasted for 2 years. Currently, seven articles are still experiencing citation bursts (Supplementary Table 6). Among them, Chrastil et al. (2015) and van den Boom et al. (2018) examined the correlation between glycated hemoglobin (HbA1c) levels and postoperative outcomes in diabetic patients; Berríos-Torres et al. (2017) published clinical guidelines for surgical site infection (SSI) prevention in *JAMA Surgery*; Martin et al. (2016) conducted a systematic review and meta-analysis establishing diabetes as an independent risk factor for SSI; Duggan et al. (2017) comprehensively reviewed perioperative hyperglycemia management in surgical patients with diabetes; a 2015 cohort study in *Annals of Surgery* investigated associations between diabetes, perioperative hyperglycemia and adverse events; and 2015 clinical guidelines addressed optimal perioperative management protocols for diabetic surgical patients.

Cluster analysis was performed on the co-cited references to reveal common themes in similar articles. As shown in Fig. 5B, the references were divided into 14 clusters, represented by different colors in the graph. With a Modularity Q of 0.7463 and a Mean Silhouette S of 0.8011, it can be inferred that the clustering results are reasonable and efficient. These clusters include "tight perioperative glycemic control, perioperative blood glucose management, total knee arthroplasty, bariatric surgery, surgical-site infection, sodium-glucose cotransporter-2 inhibitor, clinical endocrinologist, liver surgery, cardiovascular risk assessment, Canadian Cardiovascular Society guidelines, end-stage renal disease, American Society, early perioperative outcome, following preoperative fasting, complicating laminectomy and spinal procedure." These clusters of co-cited references align with the themes summarized by the co-occurrence clustering of keywords and are used together to describe the research hotspots in this field.

The timeline analysis reveals the evolving research hotspots in the field of "perioperative management in diabetic patients" (Fig. 7). Initially, perioperative glucose management strategies (particularly intensive glycemic control protocols) dominated the research focus. Subsequently, we observe a clear expansion from studies primarily focused on cardiovascular surgeries to metabolic/bariatric procedures and eventually non-cardiovascular operations. Furthermore, with the advent of novel antidiabetic agents (SGLT-2 inhibitors and GLP-1 receptor agonists), significant research efforts have shifted toward exploring their perioperative applications and associated risks.

New publications

Due to the limited citation opportunities for literature published in recent years, to avoid the loss of information contained in this part of the literature and to ensure an accurate analysis of the frontier field, we will conduct

Table 2 The top 10 productive organizations

Rank	Organization	Country	Documents	Citations	Total link strength
1	Mayo Clinic	USA	86	4734	74
2	Cleveland Clinic	USA	64	3178	64
3	Harvard Medical School	USA	57	1435	114
4	Duke University	USA	45	1595	44
5	Johns Hopkins University	USA	41	1367	39
6	University of Pittsburgh	USA	41	1991	38
7	University of Michigan	USA	38	1505	57
8	Brigham and Women's Hospital	USA	37	1095	68
9	University of California, San Francisco	USA	37	1477	43
10	Emory University	USA	33	2031	44

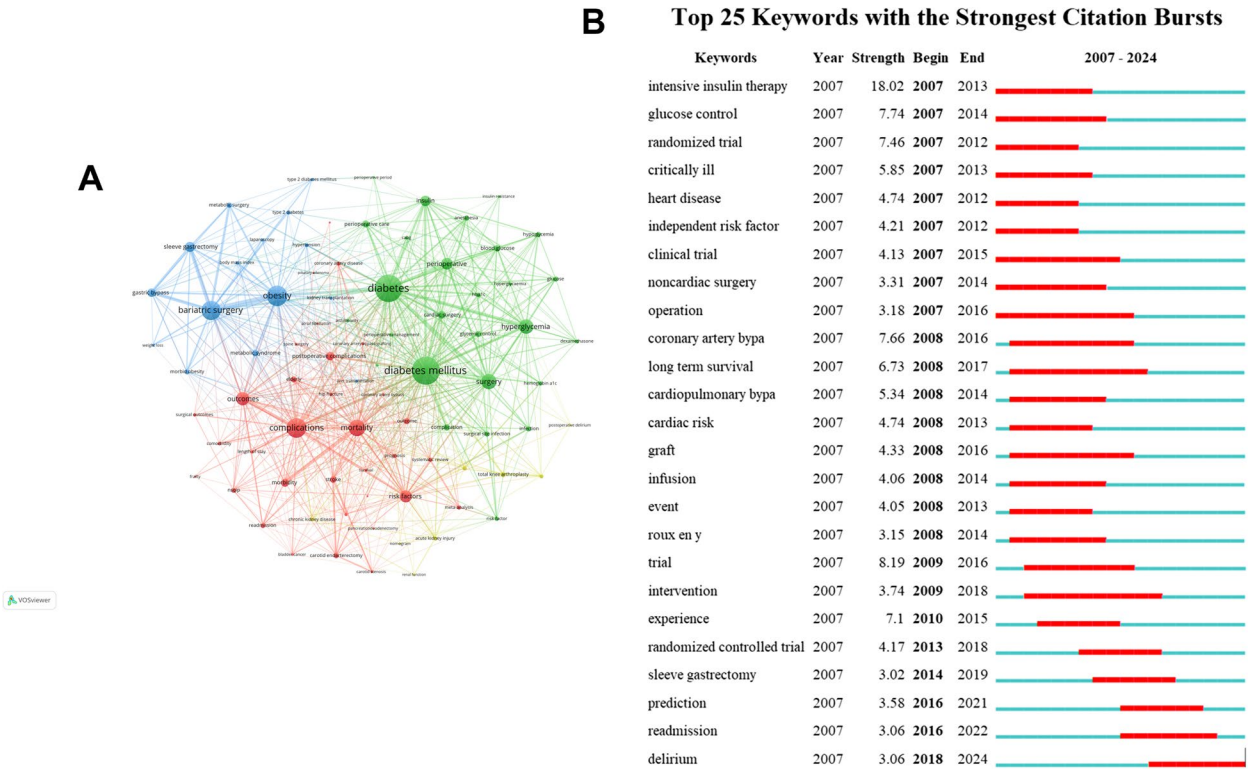

Fig. 4 Visual maps of co-occurrence keywords by VOSviewer (**A**) and burst analysis by Citespace (**B**)

a separate analysis of the literature from the past 3 years (2022–2024). Therefore, we selected 21 relevant articles with relatively high impact factors from 2022 to 2024, as presented in Supplementary Table 7.

Inclusion criteria: Published between 2022 and 2024; high-quality journals related to anesthesia and surgery with a 2023 impact factor (IF) of at least 5, identified through the Journal Citation Reports (JCR); and articles selected by two individuals, excluding those not fully aligned with the theme.

These articles not only focused on the significant correlation between diabetic patients and postoperative complications but also included new directions such as the application and optimization of continuous glucose monitoring (CGM) and closed-loop insulin infusion for better blood glucose management; the use and risks of new hypoglycemic drugs in the perioperative period: GLP-1 receptor agonists (such as semaglutide) may delay gastric emptying, increasing the risk of anesthetic aspiration, necessitating an extended preoperative drug withdrawal period; SGLT2 inhibitors are associated with postoperative ketoacidosis.

Discussion

This bibliometric analysis provides a comprehensive overview of research evolution in perioperative management of diabetic patients from 2007 to 2024, summarizing research hotspots, development trends, and predicting future research frontiers.

Basic knowledge

Within the selected time span, the annual publication volume is currently exhibiting a fluctuating but overall increasing trend, with a significant decrease in the number of articles published in 2023. Based on the linear fitting of the cumulative annual publication volume, it is predicted that the publication volume will continue to increase in the coming years. However, due to the narrow time span selected, the overall development trend in the field cannot be fully determined at present.

In terms of countries, the USA leads in the number of published articles and has the closest collaborative ties with other countries, with contributions from institutions such as the Mayo Clinic, the Cleveland Clinic, and Harvard Medical School, playing a significant role.

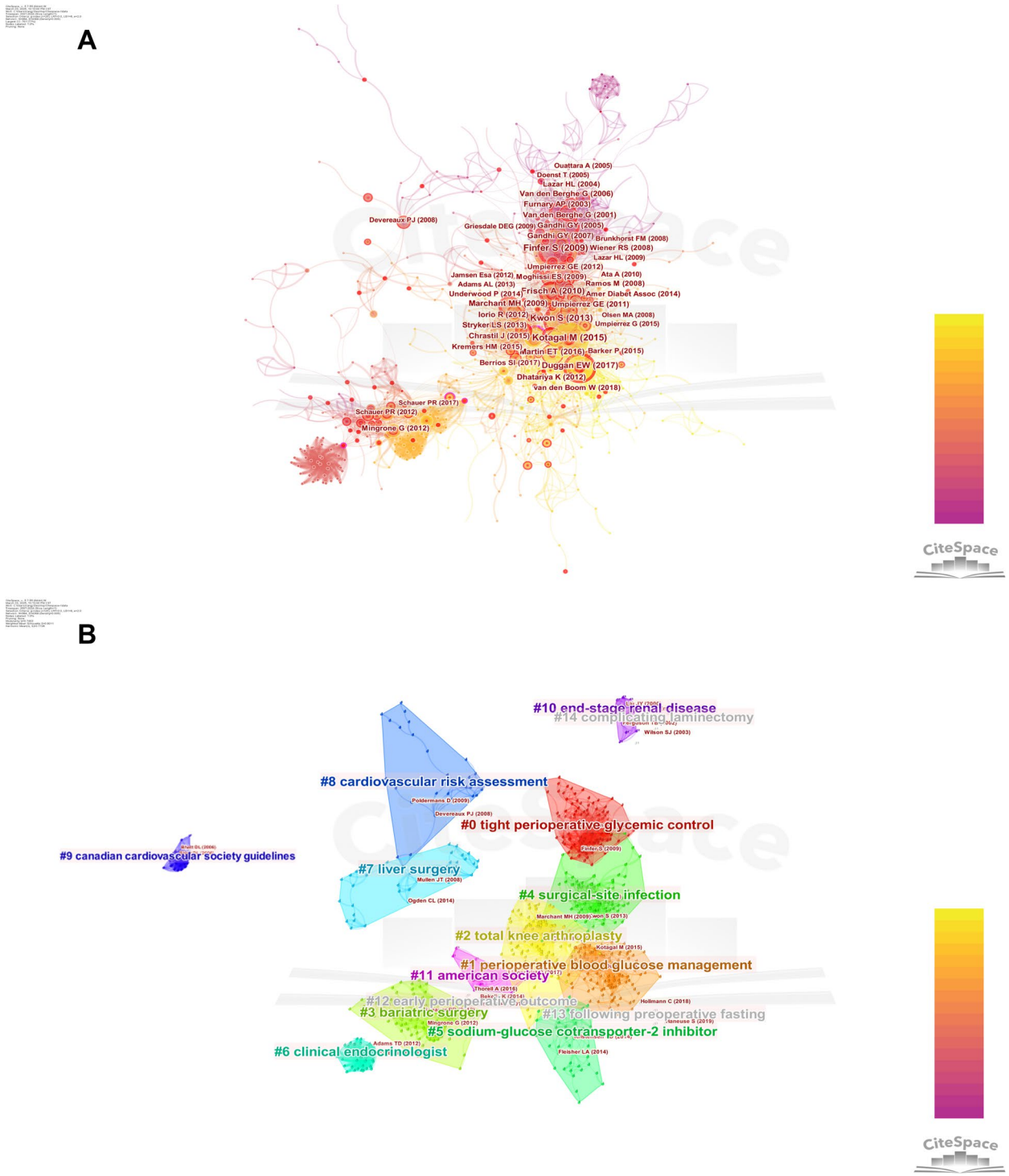

Fig. 5 Visual maps of co-cited references analysis by Citespace. **A** The overall display diagram of the co-cited references. **B** Cluster diagram of co-cited references

China's research in this field, while emerging more recently, is poised to make substantial contributions in the near future as the country's scientific ecosystem and healthcare capabilities continue to advance rapidly.

From the distribution of influential authors and journals in the field, it is evident that they span various specialties, including critical care medicine, cardiovascular, and endocrinology, not limited to anesthesiology.

Table 3 The top 10 cited references

Rank	Count	Type	Co-cited references	Title
1	79	Article	Kotagal M, 2015, ANN SURG, V261, P97, DOI https://doi.org/10.1097/SLA.0000000000000688	Perioperative hyperglycemia and risk of adverse events among patients with and without diabetes
2	78	Article	Finfer S, 2009, NEW ENGL J MED, V360, P1283, DOI https://doi.org/10.1056/NEJMoa0810625	Intensive versus conventional glucose control in critically ill patients
3	71	Article	Kwon S, 2013, ANN SURG, V257, P8, DOI https://doi.org/10.1097/SLA.0b013e31827b6bbc	Importance of perioperative glycemic control in general surgery: a report from the Surgical Care and Outcomes Assessment Program
4	55	Article	Frisch A, 2010, DIABETES CARE, V33, P1783, DOI https://doi.org/10.2337/dc10-0304	Prevalence and clinical outcome of hyperglycemia in the perioperative period in noncardiac surgery
5	52	Review	Duggan EW, 2017, ANESTHESIOLOGY, V126, P547, DOI https://doi.org/10.1097/ALN.0000000000001515	Perioperative Hyperglycemia Management: An Update
6	45	Article	Marchant MH, 2009, J BONE JOINT SURG AM, V91 A, P1621, DOI https://doi.org/10.2106/JBJS.H.00116	The impact of glycemic control and diabetes mellitus on perioperative outcomes after total joint arthroplasty
7	38	Review	Martin ET, 2016, INFECT CONT HOSP EP, V37, P88, DOI https://doi.org/10.1017/ice.2015.249	Diabetes and Risk of Surgical Site Infection: A Systematic Review and Meta-analysis
8	37	Article	Gandhi GY, 2005, MAYO CLIN PROC, V80, P862, DOI https://doi.org/10.4065/80.7.862	Intraoperative hyperglycemia and perioperative outcomes in cardiac surgery patients
9	37	Article	Van den Berghe G, 2001, NEW ENGL J MED, V345, P1359, DOI https://doi.org/10.1056/NEJMoa011300	Intensive insulin therapy in critically ill patients
10	37	Article	Chrastil J, 2015, J ARTHROPLASTY, V30, P1197, DOI https://doi.org/10.1016/j.arth.2015.01.040	Is Hemoglobin A1c or Perioperative Hyperglycemia Predictive of Periprosthetic Joint Infection or Death Following Primary Total Joint Arthroplasty?

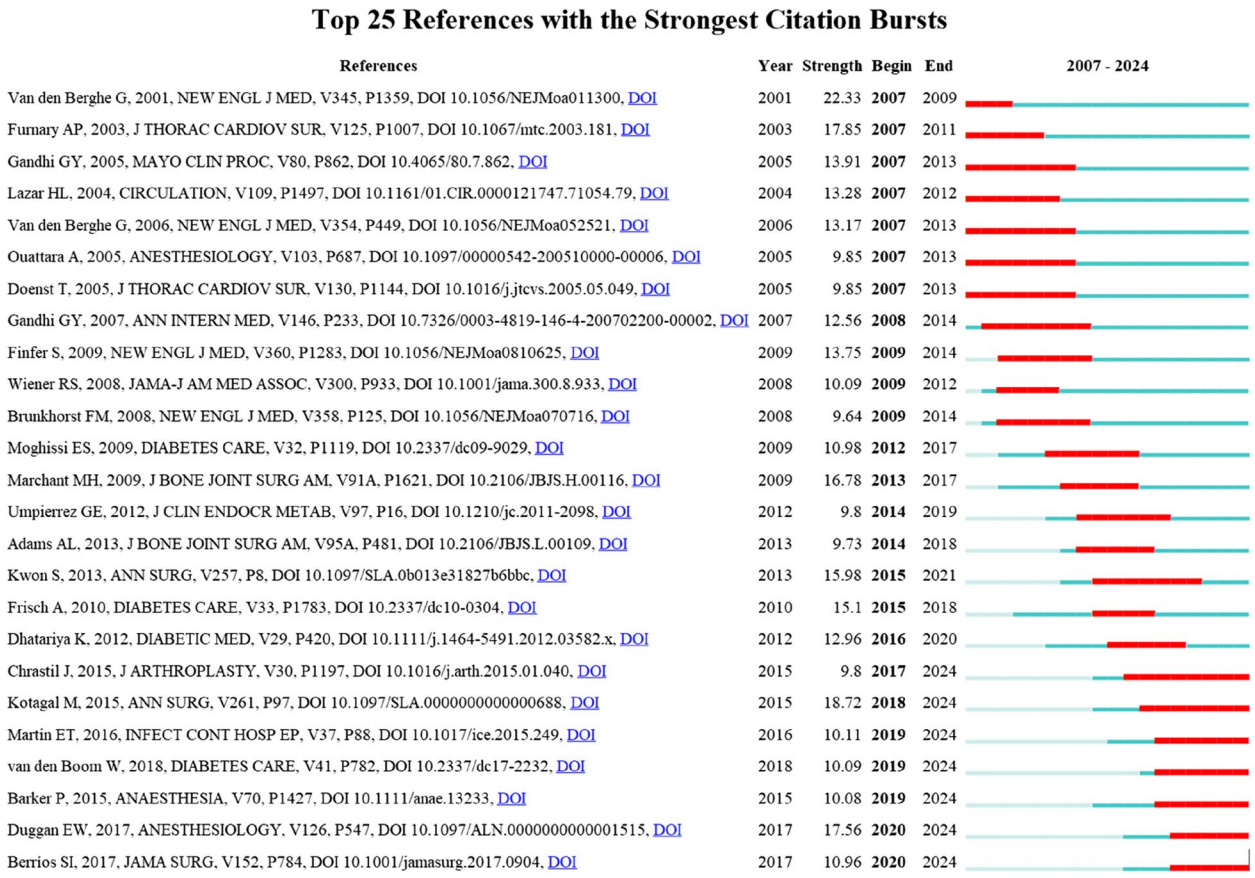

Fig. 6 Burst analysis of co-cited references by Citespace

Fig. 7 Timeline view of co-cited references by Citespace

Therefore, it can be inferred that perioperative management of diabetic patients is not only a topic of concern for anesthesiologists that requires the joint participation of surgeons, anesthesiologists, and nursing staff.

Research hotspots

Based on the analysis of keyword co-occurrence and reference co-citation, it can be observed that the higher the frequency of occurrence or citation of keywords and articles, the more they represent the hot topics in the field of research. We can see that over the past 17 years, The research primarily focuses on the correlation between diabetes patients and postoperative complications, as well as perioperative blood glucose management.

Adverse perioperative outcomes

Research has clearly indicated that diabetic patients face a higher risk during the perioperative period, a risk that extends beyond cardiovascular surgery or critically ill surgical patients (Furnary et al. 2003). Suboptimal preoperative glycemic control exhibits a strong correlation with adverse perioperative outcomes. Clinical evidence demonstrates that patients with poorly regulated diabetes mellitus incur elevated risks of postoperative complications (e.g., surgical site infections, cardiovascular events), increased mortality rates, and prolonged hospitalization compared to counterparts with optimal glycemic management (Marchant et al. 2009). Specifically, glycated hemoglobin (HbA1c) levels, reflecting average glycemic control over the preceding 2–3 months, have emerged as a significant predictor of extended hospital stays during surgical care episodes (Underwood et al. 2014).

Perioperative hyperglycemia has been identified as an independent risk factor for predicting postoperative complications and mortality (Gandhi et al. 2005). It is noteworthy that in non-diabetic patients, the risk of perioperative hyperglycemia-induced complications may even exceed that in diabetic patients (Kotagal et al. 2015). Although the exact mechanisms behind this phenomenon have not been fully elucidated, possible factors include undiagnosed diabetes before surgery, dysregulation of blood glucose control in non-diabetic individuals, and the long-term adaptation of diabetic patients to high blood glucose levels.

In conclusion, controlling blood glucose levels during the perioperative period has a positive impact on decreasing postoperative complications and mortality rates (Kwon et al. 2013), regardless of whether the patient has diabetes.

Blood glucose management

Controversy continues to exist regarding the ideal blood glucose levels and strategies for blood glucose control during the perioperative period for diabetic patients. Existing clinical guidelines are mostly based on expert opinions or consensus derived from certain clinical practices, with many areas remaining ambiguous and lacking high-quality research evidence support.

Early research by Dr. Greet Van den Berghe's team demonstrated that intensive insulin therapy significantly reduced mortality and complications in surgical inpatients (Berghe et al. 2001). However, subsequent studies did not yield the same results in 2006 (Berghe et al. 2006) and revealed that strict glycemic control markedly increased the incidence of hypoglycemia (NICE-SUGAR Study Investigators; Finfer et al. 2009; Wiener et al. 2008). Notably, a recent NEJM study suggests that inadequate perioperative glucose monitoring and improper insulin regulation may underlie these contradictory findings and that advances in monitoring and delivery technologies could potentially resolve this issue (Gunst et al. 2023).

Novel hypoglycemic drugs

The application of traditional hypoglycemic drugs in surgical patients has certain limitations. The emergence of novel hypoglycemic drugs provides new options for blood glucose management in diabetic patients. SGLT-2 inhibitors (sodium-glucose cotransporter-2 inhibitors) reduce blood glucose concentration by blocking the reabsorption of glucose in the renal tubules, leading to the excretion of excess glucose in the urine. They have certain advantages in areas such as cardiovascular protection and delaying the progression of kidney disease (Palmer et al. 2001). However, SGLT-2 inhibitors may cause ketoacidosis, and guidelines recommend discontinuing such drugs 3 days before surgery (Halvorsen et al. 2022).

GLP-1 receptor agonists (glucagon-like peptide-1 receptor agonists) not only promote insulin secretion and reduce glucagon secretion but also act on the central nervous system to suppress appetite and control weight (Palmer et al. 2001). In studies comparing them with glucose-insulin-potassium infusion and intravenous insulin infusion schemes, administering a certain dose of GLP-1 receptor agonist the day before surgery, both in cardiac and non-cardiac surgeries, reduced the perioperative insulin requirement and stabilized blood glucose levels without increasing the risk of hypoglycemia (Polderman et al. 2018). However, recent research has focused strongly on the delayed gastric emptying and aspiration risk associated with GLP-1 receptor agonists (GLP-1 RAs), prompting calls for extended fasting or drug cessation (Sen et al. 2024 ; van Zuylen et al. 2024). Further research is needed to determine their optimal use, safety, and long-term effects to achieve a balance between benefits and risks.

Metabolic surgery and total joint arthroplasty surgery

There is a close relationship between obesity and diabetes. Bariatric surgery not only helps patients manage their weight but also decreases a range of complications caused by obesity (Adams et al. 2012). A study with 10 years of follow-up found that metabolic surgery was more effective in the long-term control of type 2 diabetes than traditional drug therapy (Mingrone et al. 2021). The effect of blood glucose control in type 2 diabetic patients by bariatric surgery has been widely recognized.

Diabetic patients undergoing total joint arthroplasty surgery constitute a special high-risk group. Elevated blood glucose levels can delay wound healing and increase the risk of surgical site infections and even periprosthetic joint infections (Chrastil et al. 2015), significantly affecting patients' postoperative recovery. A study found that there was a certain correlation between average postoperative blood glucose >200 mg/dL (11.1 mmol/L) or preoperative hemoglobin A1c >6.7% and postoperative wound complications in patients undergoing elective total joint arthroplasty surgery (Stryker et al. 2013). Therefore, optimal blood glucose control is crucially important to postoperative recovery, helping to reduce the occurrence of complications and improve patients' quality of life.

Research frontiers and prospects

Research published in high-impact factor journals from 2021 to 2024 has the potential to become highly cited literature. Analysis of keywords, references, and timelines provides clues to reveal the research frontier trends in the field.

Continuous glucose monitoring and automated insulin delivery systems

Blood glucose management during surgery is crucial for the perioperative safety and postoperative recovery of diabetic patients. The development and application of new technologies provide more convenient and accurate tools for monitoring and regulating blood glucose levels.

Continuous glucose monitoring (CGM) is a monitoring method that utilizes electrochemical sensors in subcutaneous tissue to provide minimally invasive, real-time blood glucose levels (Carlsson et al. 2023). Products combining CGM with mobile applications are currently on the market, primarily used in the daily blood glucose management of diabetes patients, especially those with type 1 diabetes. The application of CGM in surgical patients is currently in the clinical research stage

(Carlsson et al. 2023; Perez-Guzman et al. 2021; Polderman et al. 2017), but the superiority of CGM in perioperative blood glucose monitoring is foreseeable. It not only helps us promptly identify abnormal blood glucose values that single-point glucose monitoring may overlook but also reflects the trend of blood glucose fluctuations during the perioperative period.

Furthermore, the combination of CGM and computer algorithm-controlled insulin infusion, such as the closed-loop insulin infusion system during the perioperative period, allows autonomous adjustment of insulin dosage based on real-time blood glucose levels monitored by sensors. In relevant studies, compared to traditional standard insulin therapy, closed-loop insulin infusion systems can achieve blood glucose targets without increasing the risk of hypoglycemia (Herzig et al. 2022). With the support of such precise control and monitoring technologies, it also provides safety assurances for future research aimed at establishing an ideal perioperative blood glucose therapy strategy (Gunst et al. 2023).

Risk assessment and prediction models

Neither preoperative glycosylated hemoglobin nor blood glucose levels alone can comprehensively reflect the overall condition of patients. Perioperative blood glucose abnormalities are associated with various factors, including the patient's own glycemic control, discontinuation and adjustment of preoperative hypoglycemic agents, preoperative fasting time, operation duration, and the magnitude of surgical stress. To facilitate anesthesiologists in rapidly assessing the patient's overall condition and predicting the occurrence of perioperative blood glucose abnormalities and the risk of adverse perioperative outcomes, it is helpful to construct risk assessment and prediction models. This will assist anesthesiologists to identify and treat high-risk patients promptly.

Appropriate fasting times

Recent literature suggests that diabetic patients may suffer autonomic dysfunction, potentially leading to delayed gastric emptying compared to non-diabetic individuals (Xiao et al. 2021). However, whether delayed gastric emptying in diabetic patients further increases the risk of gastric retention and reflux aspiration remains to be fully elucidated, as clinical data on this aspect are currently limited. On the other hand, considering the challenges posed by preoperative fasting and adjustments or discontinuation of hypoglycemic agents during the perioperative period for diabetic patients' own glucose regulation, most guidelines recommend minimizing preoperative fasting time for diabetic patients, scheduling surgeries as the first cases in the morning (Simha and Shah 2019). However, these guidelines did not specify fasting durations. Given the combined impact of these factors on the preoperative fasting duration for diabetic patients, future efforts should focus on gathering more clinical data, integrating methods such as ultrasound assessment of gastric contents and continuous blood glucose monitoring during the perioperative period with emerging technologies to address these issues.

In summary, research on perioperative management of diabetes is continuously deepening and expanding. It is believed that through further research, guidelines and strategies for perioperative management can be gradually improved to enhance the safety and clinical outcomes of surgical diabetic patients.

Limitations

This study has several limitations. Firstly, the database used was limited to the WoSCC-SCIE. This was chosen because CiteSpace is particularly compatible with the WOS database, requiring no data conversion and reducing data loss to a certain extent, ensuring data accuracy. Secondly, we did not exclude irrelevant articles based on titles and abstracts. This decision was made because, within the context of bibliometric analysis, irrelevant literature is unlikely to significantly impact the visualization of the main results. Additionally, recent studies (2022–2024) are underrepresented in citation networks, necessitating ongoing updates. Finally, the narrow time range of this study fails to fully capture the development of the field.

Conclusion

Reviewing the relevant studies on "perioperative management in diabetic patients" from 2007 to 2024, it can be observed that the focus and hotspots of research have consistently revolved around the relationship between perioperative hyperglycemia in diabetic patients and adverse outcomes, as well as the precise control of blood glucose levels. Future research directions may include the application of continuous blood glucose monitoring and computer-guided insulin administration during the perioperative period, the application of merging medications in the perioperative period and appropriate fasting times for diabetic patients, and the development of various prediction models. This will advance personalized, precise, and comprehensive care for diabetic patients during the perioperative period, thereby reducing the risk of postoperative complications, enhancing patient recovery after surgery, and minimizing the consumption of healthcare resources.

Furthermore, in the era of big data, the application of bibliometric analysis tools in scientific research offers significant assistance to researchers, holding promising prospects for future applications.

Abbreviations

IDF	International Diabetes Federation
WoSCC-SCIE	Web of Science Core Collection (WoSCC) -Science Citation Index Expanded (SCI-EXPANDED; 2007-present)
HbA1c	Glycated hemoglobinA1c
SSI	Surgical site infections
SGLT-2 inhibitors	Sodium-glucose cotransporter-2 inhibitors
GLP-1 receptor agonists	Glucagon-like peptide-1 receptor agonists
CGM	Continuous glucose monitoring

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13741-025-00532-w.

Additional file 1: Table S1 The top 10 productive journals. Table S2 The top 10 Co-cited Journals. Table S3 The top 10 authors. Table S4 The top 10 Co-authors. Table S5 Clusters of the top 83 keywords. Table S6 The references still experiencing high burst in 2024. Table S7 The 21 articles published in journals with high impact factor from 2022 to 2024.

Acknowledgements
Not applicable.

Authors' contributions
Conceptualization, Huang Nie, Xin Chai and Jiangru Kang; methodology, Xin Chai and Jiangru Kang; software, data curation and visualization, Jiangru Kang and Jia Tao; validation, Jia Tao, Rong Fu and Huiru Hu; formal analysis, Jiangru Kang; investigation, Huiru Hu; writing—original draft preparation, Xin Chai and Jiangru Kang; writing—review and editing, Huang Nie; supervision, Huang Nie. All authors have read and agreed to the published version of the manuscript.

Funding
Not applicable.

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 4 January 2025 Accepted: 19 April 2025
Published online: 30 April 2025

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