MEDIA KEPERAWATAN INDONESIA
Jl. Kedungmundu Raya No. 18 Semarang Gedung NRC Universitas Muhammadiyah Semarang Phone: 02476740287, Fax: 02476740287 Email: mki@unimus.ac.id



Review Article

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Real-time perioperative communication technologies for reducing family anxiety: a systematic review

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Article Info

Article History:
Submitted: May 19th, 2026
Accepted: Sept 5th, 2026
Published: Sept 28th, 2026

Keywords:
anxiety; caregiver; family; perioperative; surgical tracking

Abstract

Family members often experience anxiety during the intraoperative period because of uncertainty regarding surgical progress and the patient's condition. Real-time perioperative communication technologies, including mobile applications, automated short message service updates, and digital tracking systems, may help reduce anxiety and improve family experiences. This systematic review aimed to synthesise evidence on the effectiveness of real-time perioperative communication technologies in reducing family anxiety. The review followed PRISMA 2020 guidelines. Searches were conducted in Scopus, PubMed, ScienceDirect, Wiley Online Library, and SAGE Journals using terms related to perioperative communication, surgical tracking, family, caregivers, and anxiety. Eligible studies included randomised controlled trials, quasi-experimental, observational, cohort, and cross-sectional studies evaluating digital communication interventions for families of surgical patients. Methodological quality was assessed using the Joanna Briggs Institute Critical Appraisal Tools. Owing to heterogeneity in study designs, interventions, populations, and outcome measures, findings were synthesised narratively. Ten studies were included: five randomised controlled trials, one quasi-experimental study, two observational studies, and two cross-sectional studies. Most studies reported that real-time communication through SMS updates, mobile applications, or digital dashboards was associated with lower family anxiety and greater satisfaction than standard communication. However, substantial heterogeneity limited direct comparisons across studies. Real-time perioperative communication technologies appear promising for reducing family anxiety and supporting family-centred perioperative care. Further multicentre studies using standardised interventions and outcome measures are needed.

INTRODUCTION

The perioperative period is a phase that may cause anxiety not only for patients but also for family members waiting during surgical procedures. Uncertainty regarding the patient's condition, surgical progress, and possible complications may increase emotional distress among family members during the waiting period. Previous studies

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Media Keperawatan Indonesia, Vol 9 No 3, Sept 2026
e-ISSN: 2615-1669
ISSN: 2722-2802
DOI: 10.26714/mki.9.3.2026.301-311

have shown that inadequate communication during surgery is associated with higher anxiety levels, negative perceptions of healthcare services, and lower family satisfaction with perioperative care [1,2]. Family anxiety may also affect the ability to receive postoperative information and reduce trust in healthcare providers.

Advances in digital health technology have led to the development of various real-time perioperative communication technologies. In this review, real-time perioperative communication technologies are defined as digital or technology-supported communication systems that provide family members or caregivers with timely and structured updates regarding the patient's surgical or perioperative progress during the procedure or immediate perioperative period. These technologies include automated or technology-facilitated short message service (SMS) updates, mobile applications, digital dashboards, surgical tracking systems, and other digital platforms that provide structured perioperative information. Both automated updates and messages facilitated by healthcare staff were considered eligible when delivered through a technology-supported system. Conventional telephone calls or face-to-face briefings without a digital communication or tracking component were excluded from this definition. Technology-supported video updates were considered eligible when they provided structured and timely information regarding perioperative progress.

These technologies enable family members to receive timely and structured updates regarding the patient's surgical progress without unnecessarily interrupting the surgical workflow. From the perspective of stress and coping theory, clear and timely information may improve perceived control and reduce uncertainty, which are major contributors to anxiety among family members [3,4]. In addition, digital communication systems have been reported to improve family experiences and communication processes in healthcare settings [5].

Several previous studies have suggested that perioperative digital communication interventions may reduce family anxiety. Randomized controlled trials have reported that intraoperative updates delivered through SMS or other digital information systems were associated with lower anxiety scores and higher family satisfaction compared with standard communication approaches [6–8]. Other studies have also reported improvements in waiting experiences, perceived communication, and family involvement during surgical procedures [9,10].

The present review includes studies involving family members or caregivers of both adult and pediatric surgical patients. The review was not restricted to a specific surgical specialty or age group because anxiety related to uncertainty and waiting may occur across different perioperative contexts. However, differences between adult and pediatric surgical settings, as well as variations in surgical populations, were considered potential sources of heterogeneity when interpreting the findings.

Despite these promising findings, the available evidence on real-time digital perioperative communication remains heterogeneous. Variations in intervention design, communication platforms, timing and frequency of updates, study populations, and outcome measurements make direct comparisons between studies difficult. In addition, many studies have focused on specific surgical populations or single clinical settings, which may limit the generalizability of the findings. To date, systematic reviews specifically synthesizing evidence on real-time perioperative communication technologies and family anxiety remain limited.

Therefore, this systematic review aimed to synthesize current evidence on real-time perioperative communication technologies for reducing family anxiety during surgical procedures and to evaluate the methodological quality of the available studies using the Joanna Briggs Institute (JBI) Critical Appraisal Tools.

METHODS

This study was conducted as a systematic review to synthesize evidence on real-time digital perioperative communication interventions and their potential effects on family anxiety during surgical procedures. The review process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.

Search Strategy

Literature searches were conducted in Scopus, PubMed, ScienceDirect, Wiley Online Library, and SAGE Journals. The final literature search was conducted on 30 June 2026. The search combined terms related to perioperative or surgical care, real-time communication or surgical updates, family or caregivers, and anxiety. The search strategy was adapted to the specific requirements of each database, and the complete search strings are provided in the Supplementary Material. Reference lists of relevant articles were also manually screened. All records were managed and duplicate records removed using Mendeley Reference Manager.

Eligibility Criteria

The eligibility criteria were structured according to the Population, Intervention, Comparison, and Outcome (PICO) framework. The Population included family members or caregivers of adult or pediatric patients undergoing surgical procedures. The Intervention included real-time perioperative communication technologies, such as SMS updates, mobile applications, digital dashboards, and surgical tracking systems that provided timely information regarding the patient's perioperative progress. The Comparison, where applicable, included standard communication practices, limited updates, or usual care. The Outcomes included family anxiety as the primary outcome, as well as family satisfaction, perceived waiting experience, and other relevant psychosocial outcomes.

Randomized controlled trials, quasi-experimental, observational, cohort, and cross-sectional studies were eligible for inclusion. Studies were excluded if they focused solely on patients without involving family members or caregivers, evaluated communication without a real-time or technology-supported component, were review articles, editorials, commentaries, or case reports, or did not report relevant family-related outcomes. Only articles published in English or Indonesian were included.

Inclusion and Exclusion Criteria

Studies were eligible for inclusion if they employed randomized controlled trial, quasi-experimental, observational, cohort, or cross-sectional study designs and involved family members or caregivers of adult or pediatric patients undergoing surgical procedures. Eligible interventions included real-time or technology-supported perioperative communication, such as mobile applications, SMS updates, digital dashboards, or real-time tracking systems.

The primary outcome of interest was family anxiety. Additional outcomes included family satisfaction, perceived waiting experience, information needs, and other relevant psychosocial responses during the perioperative period. Where applicable, randomized controlled and quasi-experimental studies were used to assess the potential effects of the interventions, whereas observational and cross-sectional

studies were used to describe family experiences, perceptions, and associations related to perioperative communication.

Only articles published in English or Indonesian were included. Studies were excluded if they focused solely on patients without involving family members or caregivers, consisted of review articles, editorials, commentaries, or case reports, or did not report relevant family-related outcomes.

Study Selection and Data Extraction

Two reviewers independently screened titles and abstracts based on the eligibility criteria, followed by full-text assessment of potentially relevant studies. Disagreements during the selection process were resolved through discussion until consensus was reached. Data extraction was also conducted independently by two reviewers using a predefined data extraction form. Extracted data included study characteristics, population, intervention type, anxiety measurement tools, sample size, and main findings. Any discrepancies in the extracted data were resolved through discussion and consensus between the two reviewers.

An additional limitation is that the review protocol was not registered. The absence of prospective protocol registration may reduce methodological transparency and increase the potential risk of deviations from the originally planned review methods.

Quality Assessment

Methodological quality was assessed independently by two reviewers using the Joanna Briggs Institute (JBI) Critical Appraisal Tools appropriate to each study design. The assessment evaluated key methodological domains, including participant selection, randomization and allocation procedures, comparability of study groups, measurement of exposure or intervention and outcomes, identification and management of confounding factors, completeness of follow-up, and appropriateness of statistical analysis, as applicable to each study design.

Each item was assessed according to the JBI criteria and recorded as yes, no, unclear, or not applicable. Disagreements between the two reviewers were resolved through discussion until consensus was reached. The results of the methodological quality assessment were summarized according to study design and are presented in Table 2.

Data Synthesis

Due to methodological heterogeneity among studies, including variations in study design, intervention type, and outcome measurements, a narrative synthesis approach was used to summarize and compare the findings across studies.

Figure 1. PRISMA 2020 Flow Diagram

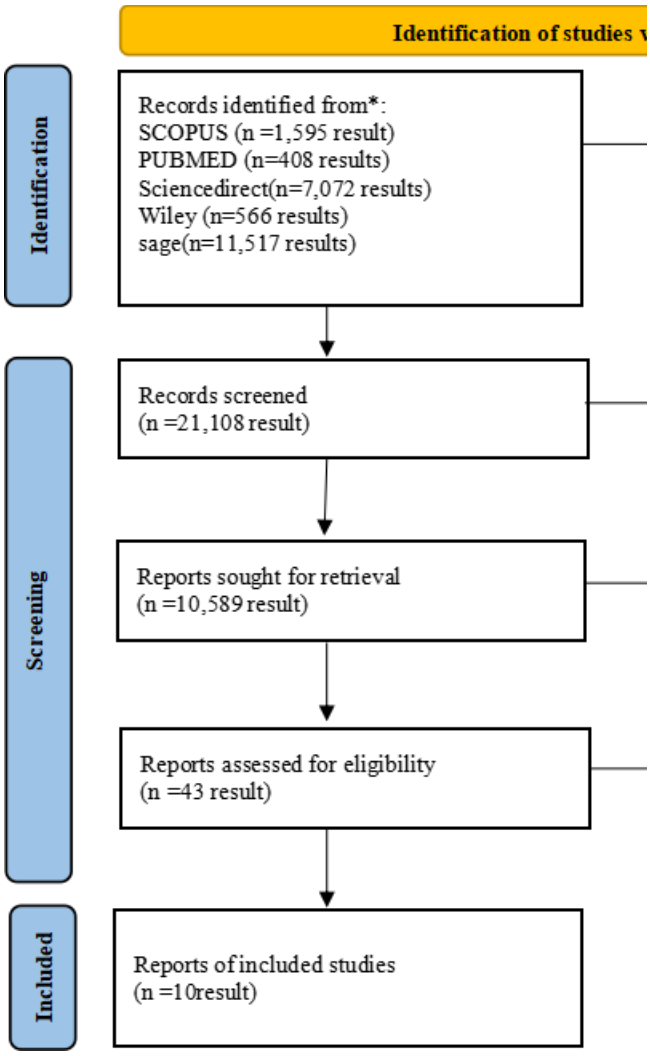


Table 1. Characteristics of Included Studies

Author	Design	Population	Intervention	Outcome	Main Findings
Linjun et al. (2025)	RCT	Families of elective surgery patients	Digital real-time updates	GAD-7 anxiety score	Significant reduction in family anxiety
Howe et al. (2021)	RCT	Orthopedic surgery families	Real-time dashboard	Anxiety and satisfaction	Reduced anxiety and improved satisfaction
Şişman & Diğin (2024)	RCT	Major surgery families	Structured SMS updates	STAI	Lower postoperative anxiety
Yun et al. (2024)	RCT	Families of pediatric elective surgery patients	Digital real-time perioperative updates	Family anxiety	Reduced perioperative
Poudel et al. (2020)	RCT	Elective surgery families	Scheduled intraoperative SMS		
Mignault et al. (2022)	Observational	Elective surgery families	Automated SMS system		
Bagheri et al. (2022)	Quasi-experimental	Major surgery families	Structured electronic updates		
Lundberg et al. (2024)	Observational	Elective and emergency surgery families	Digital dashboard/SS		
Sawicki et al. (2024)	Cross-sectional	Elective surgery families	Surgical notification system		
Machado et al. (2024)	Cross-sectional	Major surgery families	Digital communication application		

Table 2. Methodological Quality of Included Studies

Author	Design	JBI Score
Poudel et al. (2020)	RCT	8/13
Linjun et al. (2025)	RCT	11/1
Howe et al. (2021)	RCT	8/13
Yun et al. (2024)	RCT	8/13
Şişman & Diğin (2024)	RCT	7/13
Mignault et al. (2022)	Observational	4/9
Bagheri et al. (2022)	Quasi-experimental	6/9
Lundberg et al. (2024)	Observational	7/9
Sawicki et al. (2024)	Cross-sectional	4/8
Machado et al. (2024)	Cross-sectional	6/8

RESULTS

Study Selection

The literature search identified 21,158 records from five electronic databases. After removing 50 duplicate records, 21,108 articles were screened by title and abstract. A total of 43 full-text articles were assessed for eligibility, and 10 studies met the inclusion criteria for the final review. The study selection process is presented in Figure 1.

Characteristics of Included Studies

The review included 10 studies published between 2020 and 2025, comprising five randomized controlled trials (RCTs), one quasi-experimental study, two observational studies, and two cross-sectional studies. The studies were conducted in various perioperative settings, including general surgery, orthopedic surgery, cardiovascular surgery, and elective surgical procedures.

The digital communication interventions evaluated in the studies included automated short message service (SMS) updates, mobile applications, digital dashboards, and real-time perioperative tracking systems. Anxiety outcomes were measured using validated instruments such as the Generalized Anxiety Disorder-7 (GAD-7), State-Trait Anxiety Inventory (STAI), Hospital Anxiety and Depression Scale-Anxiety (HADS-A), and Visual Analog Scale for Anxiety (VAS-A). Sample sizes ranged from 30 to 200 family members or caregivers.

Methodological Quality

Methodological quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools according to study design. Overall, the methodological quality of the included studies ranged from moderate to high. Most RCTs demonstrated adequate randomization and comparable baseline characteristics between groups. However, blinding and allocation concealment were frequently limited because of the nature of digital communication interventions.

The quasi-experimental and observational studies showed moderate methodological quality, with common limitations related to the absence of randomization and limited control of confounding variables. Cross-sectional studies provided useful descriptive evidence regarding family experiences and perceptions but were limited in establishing causal relationships.

Effects of Digital Perioperative Communication on Family Anxiety

Most included studies reported lower family anxiety or more favorable perioperative experiences among families exposed to real-time communication approaches compared with standard or limited communication approaches. Interventions using automated SMS updates, mobile applications, and digital dashboards consistently improved family satisfaction and reduced uncertainty during the intraoperative period.

RCTs provided the strongest evidence for potential effects of digital communication interventions. Studies by Poudel et al. [6], Howe et al. [1], and Linjun et al. [10] reported significant reductions in anxiety scores among family members receiving structured perioperative updates. Quasi-experimental and observational studies also reported improvements in family experience, perceived waiting time, and communication satisfaction [11].

Overall, interventions providing structured and timely updates during surgery were generally associated with lower reported anxiety than standard or limited communication approaches.

DISCUSSION

This systematic review synthesized evidence on real-time perioperative communication technologies, including SMS updates, real-time information-sharing systems, and other digital communication approaches, for reducing anxiety among family members of surgical patients. Overall, the included studies suggest that these interventions may reduce family anxiety and improve satisfaction and perioperative experiences. Evidence from randomized controlled trials provides stronger support for a potential intervention effect, particularly in studies evaluating structured perioperative updates and real-time information sharing [1,6–8,10]. However, the findings should be interpreted cautiously because the included studies varied in intervention characteristics, study populations, outcome measures, and methodological quality. Observational and cross-sectional studies provide additional information regarding family experiences, perceptions, and information needs but cannot establish causal effectiveness [4,9,12].

The potential benefit of real-time perioperative communication may be explained by its ability to reduce uncertainty. Family members waiting during surgical procedures may experience anxiety because of limited information regarding the patient's condition and surgical progress. Timely and structured information may improve perceived control and provide emotional reassurance, which is consistent with stress and coping theory [3]. In addition, studies of perioperative information needs suggest that family members may require clear and relevant information during the surgical process [4]. Therefore, the potential benefits of communication may depend not only on the availability of updates but also on whether the information is timely, understandable, and relevant to family needs.

The findings also suggest that different communication modalities may have different practical advantages. SMS-based communication has been evaluated in several included studies and may provide a relatively simple method for delivering structured updates directly to family members [6,8,9,12]. Real-time information-sharing systems may provide more detailed information regarding the progress of surgery [7,10]. However, the available evidence does not allow a definitive conclusion regarding whether SMS is more effective than mobile applications or other digital communication systems. Differences in intervention content, timing, frequency of updates, outcome measures, and study populations limit direct comparisons between communication modalities.

Similarly, the optimal frequency of perioperative updates remains unclear. Although timely communication may reduce uncertainty, the included studies used different schedules and approaches for providing information [6–12]. The current evidence is therefore insufficient to determine the ideal number or timing of updates. More frequent updates may provide reassurance, but excessive communication may also create unnecessary expectations or increase the information burden for families and healthcare providers. Future studies should directly compare different communication frequencies and evaluate the timing and content of updates that best meet family needs.

Differences between adult and pediatric surgical populations should also be considered. Most of the included intervention studies involved family members of adult surgical patients, whereas Yun et al. evaluated real-time information sharing among families of children undergoing elective surgery [7]. In addition, Sawicki et al. highlighted the specific perioperative information needs of parents of children with special health care needs

[4]. Parents or caregivers of pediatric patients may have different levels of emotional involvement and information needs compared with family members of adult patients. However, the limited and heterogeneous evidence does not allow firm conclusions regarding whether particular communication technologies are more beneficial in pediatric or adult perioperative populations.

Implementation considerations are also important when introducing real-time perioperative communication technologies into clinical practice. Digital literacy among patients and family members may influence their ability to access, understand, and use digital communication systems. Although SMS-based systems may be relatively accessible, more advanced applications or digital platforms may require smartphones, internet access, technical support, and familiarity with digital technology [5,9,12]. Therefore, the choice of communication technology should consider the characteristics and technological capacity of both families and healthcare facilities.

Privacy and confidentiality should also be carefully considered. Perioperative updates may contain sensitive information regarding the patient's condition or surgical progress. Healthcare institutions should therefore establish procedures to verify the identity of authorized recipients and determine what type of information can be communicated through digital systems. Consent for receiving digital updates should also be obtained according to institutional policies and applicable ethical and regulatory requirements. In addition, message content should be standardized to ensure that information is clear, consistent, and appropriate while avoiding unnecessary disclosure of sensitive clinical information.

Staff workload represents another important implementation issue. Automated communication systems may reduce the need for repeated manual updates and potentially improve communication efficiency [5,9,12]. However, implementation may also require staff training, message development, system monitoring, technical support, and procedures for responding to questions from family members. Therefore, digital communication systems should be integrated into existing clinical workflows rather than creating additional unnecessary burdens. Evidence on implementation strategies also highlights the importance of considering organizational context and feasibility when introducing healthcare interventions [15].

Infrastructure requirements and cost-effectiveness should also be considered. SMS-based interventions may be relatively feasible in settings with limited technological resources, whereas mobile applications, digital dashboards, and integrated information systems may require greater investment in infrastructure, software, maintenance, cybersecurity, and staff training. Although these technologies may improve communication and family experiences, the current evidence is insufficient to determine their cost-effectiveness. Broader reviews of communication practices and digital health interventions have also highlighted the need to evaluate implementation and resource-related outcomes [13,14]. Future research should therefore include economic evaluations and implementation outcomes in addition to anxiety and satisfaction measures.

Several limitations of this review should be acknowledged. Considerable heterogeneity was observed in intervention modalities, communication schedules, surgical populations, and outcome measurements, limiting direct comparison between studies and precluding quantitative meta-analysis. In addition, some included studies had relatively small sample sizes, single-center designs, or methodological limitations

related to blinding and confounding control. The inclusion of observational and cross-sectional studies also requires cautious interpretation because these designs cannot establish causal relationships or determine intervention effectiveness. Furthermore, the review protocol was not registered, which may reduce methodological transparency and increase the potential risk of deviations from the originally planned review methods.

Despite these limitations, this review has several strengths. The review followed PRISMA 2020 guidelines, included studies from multiple international databases, and assessed methodological quality using study-design-specific JBI Critical Appraisal Tools. The inclusion of different study designs also provided a broader understanding of both the potential effects of real-time perioperative communication interventions and family experiences associated with perioperative information and communication.

Future research should prioritize adequately powered, multicenter randomized controlled trials using clearly defined and standardized intervention protocols. Studies should report the content, timing, and frequency of communication updates and directly compare different communication modalities, including SMS, mobile applications, and other real-time information-sharing systems. Further research should also examine differences between adult and pediatric surgical populations and evaluate implementation outcomes, including digital literacy, acceptability, privacy and confidentiality, staff workload, infrastructure requirements, and cost-effectiveness [13–15].

Overall, the findings of this review suggest that real-time perioperative communication technologies may help reduce family anxiety and improve satisfaction and perioperative experiences. However, the magnitude and consistency of these potential benefits may depend on the communication modality, content, timing and frequency of updates, study population, and implementation context. Therefore, these technologies may be considered supportive components of family-centered perioperative care, while further high-quality research is needed to determine the most appropriate communication strategies.

Strengths and Limitations

This systematic review has several strengths. First, the review followed the PRISMA 2020 guidelines to support a transparent and systematic review process. Second, the literature search was conducted across multiple international databases, including Scopus, PubMed, ScienceDirect, Wiley Online Library, and SAGE Journals, which increased the comprehensiveness of the evidence identified. Third, methodological quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools according to study design, allowing a structured evaluation of the included studies. In addition, the inclusion of randomized controlled trials, quasi-experimental, observational, and cross-sectional studies provided a broader understanding of both the potential effects of the interventions and family experiences and perceptions related to perioperative communication.

However, several limitations should be considered. The included studies demonstrated substantial heterogeneity in intervention types, communication platforms, frequency of updates, outcome measurements, and perioperative settings, limiting direct comparison between studies. Variations in anxiety assessment instruments and study populations also prevented quantitative meta-analysis. Several studies had relatively small sample sizes and were conducted in single-center

settings, which may limit the generalizability of the findings. Furthermore, methodological limitations, including limited blinding, lack of allocation concealment, and potential confounding bias, were identified in some studies.

The review was also limited to articles published in English or Indonesian, which may have resulted in language bias and the exclusion of relevant studies published in other languages. In addition, only published literature identified through the selected databases and manual reference screening was included; grey literature, such as unpublished studies, conference proceedings, dissertations, and reports, was not systematically searched. Therefore, the possibility of publication bias cannot be excluded, as studies with positive findings may be more likely to be published and identified. Finally, the review protocol was not registered, which may reduce methodological transparency and increase the potential risk of deviations from the originally planned review methods.

CONCLUSION

This systematic review suggests that real-time perioperative communication technologies, including SMS updates, mobile applications, digital dashboards, and other digital communication systems, may reduce family anxiety during surgical procedures. Overall, the included studies generally reported lower anxiety or improved family satisfaction and perioperative experiences; however, these findings should be interpreted cautiously because of heterogeneity in study designs, interventions, outcome measurements, and study populations.

Structured and timely perioperative communication may help reduce uncertainty and improve perceived emotional support among family members during the surgical process. These technologies may therefore serve as supportive components of family-centered perioperative care and may improve communication processes within healthcare settings.

Further well-designed, multicenter randomized controlled trials with standardized intervention protocols, consistent outcome measures, larger sample sizes, and long-term follow-up are needed to strengthen the evidence and determine the most appropriate communication modalities, timing, and frequency of updates for different surgical populations.

ETHICAL CONSIDERATION

Ethical approval was not required because this study used data from previously published literature.

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