

INPLASY202370080

doi: 10.37766/inplasy2023.7.0080

Received: 20 July 2023

Published: 20 July 2023

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Taipei Medical University.Lin, S¹; Chen, C²; Kang, Y³.**ADMINISTRATIVE INFORMATION****Support** - Non-applicable.**Review Stage at time of this submission** - Preliminary searches.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202370080**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 20 July 2023 and was last updated on 20 July 2023.**INTRODUCTION**

Review question / Objective Perioperative complications continue to pose significant challenges in healthcare settings. Adequate collection of patient data through perioperative assessment and consultation (PAC) has been shown to assist in reducing postoperative complications. Patient information gathered through PAC aids in framing discussions about risks and benefits, enabling shared decision-making. However, challenges exist in data collection and shared decision-making during the preoperative period, including a knowledge gap between patients and physicians. Time constraints and manpower deficits in perioperative care can hinder effective consultations and deliberation. Another difficulty in traditional perioperative care communication is the tendency for concealment when involving sensitive and private information. Potential tools to solve this include electronic devices, such as chatbots and other messaging systems. They can offer advantages over traditional methods by providing higher feasibility, response rates, preferred modalities, visualized results, and improved patient-clinician communication. Expanding non-face-to-face communication channels allows patients to

express information freely, ensuring privacy and facilitating timely education. This thus promotes shared decision-making, patients' rights, and reduces complications.

Overall, the use of chatbots in the perioperative period has grown rapidly. However, there is limited literature assessing the overall benefits of chatbots from patients' perspectives. This is the first systematic review and meta-analysis aiming to fill this gap. The aim of this systematic review is to examine the impact of chatbot interventions on patient outcomes and experiences to provide more valuable insights for healthcare providers, policymakers, and researchers to enhance perioperative care delivery.

Rationale The use of chatbots in healthcare has gained increasing interest. They have been employed in various areas such as cancer monitoring, type 2 diabetes risk reduction, sleep quality improvement, asthma knowledge acquisition, neck/shoulder pain relief, and depression relief. Moreover, chatbots have been developed to support patients in the perioperative period in a variety of ways, including pain management after orthopedic surgeries, follow-up of orthopedic patients, enhancing adherence after primary total knee replacement, and other perioperative situations.

In the perioperative setting, insufficient communication, low satisfaction, and poor knowledge can result in patients feeling uninformed, unprepared, and experiencing regret after surgical procedures. Unfavorable outcomes resulting from which may lead to decision regret. Chatbots address these challenges by bridging communication gaps and providing accessible, personalized, and timely information throughout the perioperative journey. By leveraging chatbot technology, healthcare providers aim to enhance patient communication, knowledge, and satisfaction, ultimately reducing the likelihood of postoperative regret.

The soaring usage of ChatGPT calls for a comprehensive evaluation of the perioperative application of chatbots, synthesizing the available evidence to guide future implementation and development efforts. However, there is limited literature assessing the overall benefits of chatbots from patients' perspectives. This is the first systematic review and meta-analysis aiming to fill this gap by examining the impact of chatbot interventions on patient outcomes and experiences. The findings will provide valuable insights for healthcare providers, policymakers, and researchers to enhance perioperative care delivery.

Condition being studied Participants will include adult patients(over 18) who were scheduled for surgery and were already in the preoperative, intraoperative, or postoperative phases. Surgical interventions will encompass both elective and emergency surgeries across various specialties such as vascular surgery, urology, orthopedics, anesthesiology, and radiology. Analysis of patients' satisfaction and knowledge acquisition with chatbot application will be addressed by the systematic review.

METHODS

Search strategy Search strategies will include free text and search strings related to the two groups of following core concepts: The first group will encompass keywords related to bi-directional chatbots. The second group will include keywords related to perioperative period. Boolean operators used to combine the search terms will include: (1)keywords within one group were combined using the OR operator; and (2)keywords across different groups were linked using the AND operator.

The articles meeting inclusion criteria will be searched from inception to May 2023 on MEDLINE, EMBASE, and the Cochrane Library.

Participant or population Both eligible articles will be conducted in adult patients who had undergone any surgical intervention targeting physical rather than mental health and who were in advance or subsequently followed up using a conversational agent (a chatbot) at any point before or after an intervention will be eligible for inclusion. Participants included patients who were scheduled for surgery and were already in the preoperative, intraoperative, or postoperative phases. Among the selected articles, patients underwent physical interventions such as ureteroscopy for kidney stones, primary total hip replacement for osteoarthritis, breast biopsy, hip arthroscopy for femoroacetabular impingement (FAI) syndrome, anesthesia before elective orthopedic surgeries, and treatment for lower extremity (LE) superficial venous reflux disease.

Intervention The intervention in this study will involve the implementation of a chatbot application for perioperative care. A chatbot will be defined as a computer software application that permits two-way conversation (via text, speech or a combination of both) between a human user and a computer program. Chatbot platforms or interfaces won't be limited. The chatbot is developed and designed to provide support, information, and communication to patients before, during, and after their surgical procedures.

Comparator For the included comparative articles, comparators will include other non-automated communicating systems, including routine procedures such as traditional preoperative assessment, consultation, and postoperative follow-up delivered via face-to-face outpatient clinics by physicians.

Study designs to be included All studies reporting original data will be eligible for inclusion, including randomized trials, comparative and non-comparative observational studies.

Eligibility criteria To ensure the relevance and quality of the studies, we will apply the following conclusion criteria: (1) treatment focusing on surgeries or anesthesia; (2) studies using any form of bi-directional chatbots (eg. messenger, SMS text message or websites); (3) studies reporting original data of randomized trials, clinical trials, and observational studies; (4) studies reporting qualitative or quantitative results on interventions(chatbots); (5) English articles published from 2019 to 2023 (as of June 28, 2023), and (6) intervention focus on the perioperative period. Additionally, reviews and meta-analyses will also be screened for potentially eligible

articles. Articles will be excluded if they were (1) not studies but protocols; (2) treatment based on non-surgical interventions, such as physiological monitoring, chemical therapy, routine clinical procedures, without a specific perioperative component; (3) studies that only focus on single-directional SMS message, or (4) studies that focused only on mental health, health behaviors or physiological data instead of perioperative care outcomes.

Information sources The articles meeting inclusion criteria will be searched from inception to May 2023 on MEDLINE, EMBASE, and the Cochrane Library.

Main outcome(s) The primary and secondary outcome assessed will be the satisfaction (defined as the proportion of patients who rated 'satisfied' or 'very satisfied') and knowledge acquisition (defined as the proportion of patients who rated 'agree' or 'very agree' with the assistance of chatbot in education of perioperative information) after implementing chatbots as a method of perioperative communication. Untransformed proportional data of patients' satisfaction and knowledge acquisition in the four relevant studies will be meta-analyzed. The forest plot will display the effect sizes and confidence intervals of each included study, as well as the overall pooled effect estimate.

Additional outcome(s) Additional outcomes assessed will include patient demographics, design features such as platforms used, intervention time and place, measures of patient satisfaction and knowledge acquisition.

Other outcome measures reported by studies will include patient's adherence, patients' usage of chatbot, patient feedback, patient experience and technical details related to chatbot performance.

Data management Data searched will be managed by the tool EndNote. Utilize EndNote to store all references selected for the systematic review, to maintain a searchable database of references related to the systematic review, and to remove duplicate citations. Data from the selected studies will be extracted using a standardized data extraction form. The following information will be collected: study characteristics, participant characteristics, chatbot intervention features, and the perioperative outcomes. These extracted data will be collated, cross-checked by other authors and compared.

In patients' self-reported tests or questionnaires, chatbot's assistance in patients' understanding of the procedure will be defined by authors as

enhancement in knowledge acquisition. If variable measures do not have a consistent grading system across the studies, the authors will convert the data to a standardized form. Additionally, the proportion will also be extracted for further analysis of untransformed proportion (PR).

Quality assessment / Risk of bias analysis The revised Methodological Index for Non-Randomized Studies (MINORS) tool will be used to assess methodological quality of comparative and non-comparative studies separately. As for the two included RCTs, a Cochrane risk-of-bias tool RoB 2 will be used to evaluate their limitations.

Strategy of data synthesis A meta-analysis will be conducted using a random-effects model, and the overall effect size will be calculated using the mean untransformed proportion (PR) with a 95% confidence interval (CI).

Due to heterogeneous outcome reporting and differences in other study designs, a narrative synthesis and descriptive analysis will also be used. The meta-analysis will be performed using Review Manager software (Version 5.4) and OpenMeta[Analyst]. The effect size will be calculated using untransformed proportion (PR) for proportional and continuous data. The heterogeneity among studies will be assessed using the I^2 statistic. A random-effects model will be used to estimate the overall effect size if there is significant heterogeneity between studies.

Subgroup analysis Non-applicable.

Sensitivity analysis Non-applicable.

Language restriction Only articles published in English will be considered for inclusion.

Country(ies) involved Taiwan (Taipei Medical University).

Keywords chatbot; conversational agent; conversational system; perioperative; perioperative care; perioperative period; surgery; shared decision-making.

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