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An artificial intelligence chatbot as a substitute for physician-patient counselling on perioperative anaesthesia in knee-related surgeries

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ABSTRACT

Aims: The aim of this study was to evaluate the potential of Bard AI to provide patients with accurate and comprehensive information about spinal and general anaesthesia for knee-related surgeries, while also emphasizing the importance of physician oversight in interpreting AI-generated content.

Methods: Bard AI was asked to generate responses to questions on spinal and general anaesthesia and evaluated their accuracy based on current guidelines and physician experience. The questions were designed to emulate a real conversation. Two authors evaluated the responses for accuracy and comprehensiveness at the patient level.

Results: Some of the answers include a note emphasizing that the approach to each patient may differ. Generally, no major errors or misdirection were observed but specific questions, such as those on migraine, received answers deemed incomplete.

Conclusion: Bard Google AI can be utilized as a complementary tool in doctor-patient consultations for preoperative education. However, the role of doctors remains indispensable, and it is important for patients to consult their doctors to have their questions addressed and alleviate their concerns.

Keywords: Anaesthesia, artificial intelligence, bard, ChatGPT, arthroplasty

INTRODUCTION

Knee-related surgeries are among the most common orthopaedic procedures performed globally, addressing a wide array of conditions, from sports injuries to degenerative diseases [1]. In the context of these surgeries, the choice of anaesthesia is a critical decision that significantly influences patient experience and outcomes [2]. Spinal and general anaesthesia have emerged as the preferred modalities for knee-related surgeries due to their advantages, including effective pain control and faster postoperative recovery [3]. However, ensuring that patients have a thorough understanding of the potential benefits and complications associated with these anaesthesia techniques is vital for informed decision-making and patient satisfaction.

Traditionally, this information is delivered through preoperative counselling sessions conducted by medical doctors. These sessions serve a dual purpose: they foster trust between patients and their attending physicians while affording patients the opportunity to pose tailored follow-up questions that pertain to their unique circumstances and overall health [4]. Undoubtedly, this face-to-face interaction is invaluable in terms of the constructive rapport it builds. However, it is essential to

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acknowledge that, in today's landscape where efficiency and cost-effectiveness are paramount, the time allocated to patient counselling during the preoperative planning phase can often fall short of its true importance [5,6]. This shortfall has the potential to translate into postoperative surprises, manifesting as unexpected minor or major complications that may not have been adequately addressed during counselling sessions.

Bard, driven by Google AI (artificial intelligence), among others, has emerged as a transformational tool in the era of quick advances in natural language processing (NLP). It holds out the possibility of simplifying complex information into simple ones [7]. The use of Bard by patients could potentially result in significant time savings for medical professionals, in addition to its value in delivering clear explanations across a variety of disciplines [7,8]. With its ability to comprehend and produce writing that is human-like, Bard's main goals are to improve human-machine interactions and ease the spread of knowledge [9]. There is, however, growing interest in looking into its indirect effects. The aim of this study, therefore, is to investigate whether Bard can not only save time for medical professionals but also provide patients with accurate and comprehensive information about spinal and general anaesthesia for knee-related surgeries.

METHODS

Two authors (a senior anesthesiologist and an orthopaedic surgeon) independently evaluated Bard's responses for accuracy, relevance to the question, and comprehensiveness at the patient level. These assessments were made according to generally accepted guidelines from their respective disciplines.

Patient/Interviewer (1): I am a patient about to undergo a knee joint-related procedure soon. I have some questions related to the kinds of anaesthesia proposed by my doctor. What are the advantages of spinal anaesthesia over general anaesthesia?

Response: Spinal anaesthesia is a type of regional anaesthesia that numbs the lower half of your body by injecting a local anaesthetic medication into the spinal canal. General anaesthesia, on the other hand, puts you into a deep sleep during surgery.

There are several advantages of spinal anaesthesia over general anaesthesia for knee joint procedures, including:

- Reduced risk of complications: Spinal anaesthesia is generally considered to be safer than general anaesthesia, with a lower risk of serious complications such as heart attack, stroke, and pneumonia.
- Less blood loss: Spinal anaesthesia can help to reduce blood loss during surgery.
- Faster recovery: Patients who receive spinal anaesthesia typically recover more quickly after surgery and are able to go home sooner.
- Less pain: Spinal anaesthesia can provide excellent pain control during and after surgery.
- More awareness: Patients who receive spinal anaesthesia are typically awake and aware during surgery, although they may be sedated to help them relax.

One potential disadvantage of spinal anaesthesia is that it can cause low blood pressure. However, this is usually temporary and can be easily managed by the anaesthesia team.

Overall, spinal anaesthesia is a good option for many patients undergoing knee joint procedures. It has a number of advantages over general anaesthesia, including a lower risk of complications, less blood loss, faster recovery, less pain, and more awareness.

It is important to talk to your doctor about the risks and benefits of spinal anaesthesia to determine if it is the right choice for you.

Patient/Interviewer (2): OK, and what are the advantages of general anaesthesia over spinal anaesthesia?

Response: General anaesthesia has the following advantages over spinal anaesthesia for knee joint procedures:

It can be used for longer surgeries or when surgery may cause much blood loss. General anaesthesia can provide complete muscle relaxation and pain control for longer periods of time than spinal anaesthesia. This is important for complex or lengthy surgeries, such as total knee replacement.

Used if the patient is not a candidate for spinal anaesthesia. Some patients may not be candidates for spinal anaesthesia due to certain medical conditions, such as coagulopathy (bleeding disorder), infection at the injection site, or neurological disorders.

It can provide complete unconsciousness. General anaesthesia can put you into a deep sleep so that you are not aware of the surgery or any pain or discomfort. This may be beneficial for patients who are anxious or claustrophobic.

However, general anaesthesia also has some potential disadvantages, including:

- Higher risk of complications. General anaesthesia has a higher risk of complications than spinal anaesthesia, such as heart attack, stroke, pneumonia, and nausea and vomiting.
- Longer recovery time. Patients who receive general anaesthesia typically take longer to recover than patients who receive spinal anaesthesia.
- Less awareness. Patients who receive general anaesthesia are not conscious during surgery and have no memory of the procedure.

Overall, the best type of anaesthesia for you will depend on your individual medical needs and preferences. Talk to your doctor about the risks and benefits of both spinal anaesthesia and general anaesthesia to determine which option is right for you.

In addition to the above, I would like to add that general anaesthesia may be a better option for patients who are undergoing a knee joint procedure that requires them to be placed in a prone position (lying on their stomach). This is because spinal anaesthesia can sometimes cause hypotension (low blood pressure), which can be more difficult to manage in the prone position. It is also important to note that the type of anaesthesia used for a knee joint procedure may vary depending on the surgeon's preference.

Patient/Interviewer (3): Will an injection into my back for spinal anaesthesia give me back pain?

Response: Spinal anaesthesia is a type of regional anaesthesia that numbs the lower half of your body by injecting a local anaesthetic medication into the spinal canal. The injection site is typically in the lower back. The needle used for a spinal anaesthesia injection is very thin and sharp, and the injection is usually painless. However, some people may experience some discomfort or pain during or after the injection. This is usually temporary and can be managed with medication.

Here are some of the possible causes of back pain after a spinal anaesthesia injection:

- Irritation of the spinal nerves: The needle used for the injection may irritate the spinal nerves, which can cause pain.
- Headache: A spinal anaesthesia injection can sometimes cause a headache, which may be accompanied by back pain.
- Muscle soreness: The muscles in the back may become sore after the injection.
- Infection: Rarely, an infection may develop at the injection site, which can cause pain.

If you experience back pain after a spinal anaesthesia injection, be sure to tell your doctor. They can help to determine the cause of your pain and recommend appropriate treatment.

In most cases, back pain after a spinal anaesthesia injection is mild and resolves on its own within a few days. However, if your pain is severe or does not improve after a few days, be sure to see your doctor.

Patient/Interviewer (4): I see. Will I then have a headache after spinal anaesthesia?

Response: Yes, there is a risk of headache after spinal anaesthesia. This is known as a post-dural puncture headache (PDPH). PDPH occurs when cerebrospinal fluid (CSF) leaks out of the spinal canal through the puncture hole made for the spinal anaesthesia injection.

PDPH is most common in young women and people who have had a previous spinal anaesthesia injection. It typically develops within 1-7 days after the injection and can last for several days or even weeks.

Symptoms of PDPH include:

- Headache that is worse when sitting or standing and improves when lying down
- Neck pain
- Nausea and vomiting
- Sensitivity to light and noise

If you experience PDPH, there are a number of treatments that can help, including:

- Bed rest with fluids
- Lying flat on your back with your head elevated
- Caffeine
- Pain medication
- Epidural blood patch: This is a procedure where blood is injected into the space around the spinal cord, which can help to seal the puncture hole and stop the CSF leak.

In most cases, PDPH resolves with treatment within a few days. However, if your PDPH is severe or does not improve with treatment, you may need to be hospitalised. It is important to talk to your doctor about the risks and benefits of spinal anaesthesia before your surgery. They can help you to decide if spinal anaesthesia is the right choice for you and can discuss ways to reduce your risk of developing PDPH.

Patient/Interviewer (5): But I have a migraine, can I

still undergo spinal anaesthesia?

Response: Yes, people with migraine can still undergo spinal anaesthesia. However, it is important to talk to your doctor about your migraine history and any other medical conditions you have before surgery.

Your doctor may take some precautions to reduce your risk of developing a migraine after spinal anaesthesia, such as:

- Giving you preventive migraine medication before surgery
- Keeping you well-hydrated
- Using smaller doses of local anaesthetic medication
- Avoiding certain triggers that may trigger a migraine, such as bright lights and loud noises

If you do develop a migraine after spinal anaesthesia, your doctor can treat you with medication.

It is also important to note that spinal anaesthesia may actually help to reduce the frequency and severity of migraines in some people. This is because the spinal anaesthesia can block the pain signals from the trigeminal nerve, which is the nerve that is involved in migraines.

Overall, spinal anaesthesia is a safe and effective option for people with migraine. However, it is important to talk to your doctor about your individual medical needs and preferences to determine if spinal anaesthesia is the right choice for you.

Here are some additional tips for people with migraine who are undergoing spinal anaesthesia:

- Get enough sleep before surgery.
- Avoid caffeine and alcohol before surgery.
- Eat a light meal on the morning of surgery.
- Bring a list of your medications to the hospital and let your doctor know which ones you are taking.

Tell your doctor if you have any concerns or questions about spinal anaesthesia.

Patient/Interviewer (6): How long will the numbness last after spinal anaesthesia?

Response: The numbness caused by spinal anaesthesia typically lasts for 2-4 hours. However, the exact duration of numbness can vary depending on a number of factors, including:

- The type of local anaesthetic medication used
- The dose of local anaesthetic medication used
- The patient's age and weight
- The patient's overall health

In some cases, numbness may last for up to 6 hours or longer. However, this is relatively uncommon.

As the spinal anaesthesia wears off, patients may experience tingling or numbness in the areas that were previously numb. This is normal and should go away within a few hours.

If you have any concerns about the duration of numbness after spinal anaesthesia, be sure to talk to your doctor.

Here are some tips for managing numbness after spinal anaesthesia:

- Avoid getting out of bed until your numbness has worn off.
- If you need to get out of bed, ask for help from a nurse or therapist.
- Be careful not to trip or fall.
- Avoid using any sharp objects or operating any machinery until your numbness has worn off.

If you experience any pain or discomfort, be sure to tell your doctor.

Patient/Interviewer (7): Will I be able to feel pain during spinal anaesthesia? What if I happen to feel pain?

Response: Spinal anaesthesia is a type of regional anaesthesia that numbs the lower half of your body by injecting a local anaesthetic medication into the spinal canal. This means that you should not feel any pain during surgery. However, some people may experience some discomfort or pressure during the injection or as the spinal anaesthesia wears off.

If you do happen to feel pain during spinal anaesthesia, be sure to tell your doctor or anesthesiologist right away. They can adjust your medication or take other steps to make sure that you are comfortable.

Here are some of the reasons why you might feel pain during spinal anaesthesia:

- The spinal anaesthesia may not be working properly.
- The surgery may be affecting a nerve that was not blocked by the spinal anaesthesia.
- You may be experiencing breakthrough pain, which is pain that occurs despite being under anaesthesia.

If you experience breakthrough pain, your doctor or anesthesiologist may give you additional pain medication or use a different type of anaesthesia.

It is important to note that spinal anaesthesia is a very safe and effective form of anaesthesia. However, it is important to be aware of the potential for pain and to communicate with your doctor or anesthesiologist if you experience any discomfort.

Patient/Interviewer (8): I understand. Will pain come back after the effect of spinal anaesthesia disappears?

Response: Yes, pain may come back after the effect of spinal anaesthesia disappears. This is because the surgery itself can cause tissue damage and inflammation, which can lead to pain.

The severity of post-operative pain can vary depending on the type of surgery you had and your individual pain tolerance. However, most people experience some degree of pain after surgery.

There are a number of things that can be done to manage post-operative pain, including:

- Medication: Your doctor may prescribe pain medication, such as over-the-counter pain relievers or prescription opioids.
- Nerve blocks: Nerve blocks are injections of local anaesthetic medication that can be used to numb the area of pain.
- Physical therapy: Physical therapy can help to strengthen the muscles around the surgical site and improve range of motion, which can help to reduce pain.

It is important to talk to your doctor about your pain management plan before surgery. They can help you to develop a plan that is right for you and your individual needs.

Here are some tips for managing post-operative pain at home:

- Take your pain medication as prescribed by your doctor.
- Apply ice or heat to the surgical site, as recommended by your doctor.
- Rest and elevate the surgical site.
- Avoid activities that put stress on the surgical site.
- Eat a healthy diet and get enough sleep.

If your pain is severe or does not improve with medication, be sure to contact your doctor.

Patient/Interviewer (9): OK. I am still afraid of hearing noises and the talks during surgery. Is there anything that can be done about it?

Response: Yes, there are a few things that can be done to help you cope with hearing noises and talks during surgery:

- Talk to your doctor or anesthesiologist about your concerns. They can help you to understand what to expect during surgery and can take steps to make you as comfortable as possible.
- Ask for music or headphones. Some hospitals and surgical centres allow patients to listen to music or wear headphones during surgery. This can help to block out noise and distractions.
- Bring a comfort object. Bringing a comfort object, such as a stuffed animal or blanket, can help you feel more relaxed and secure during surgery.
- Try relaxation techniques. Relaxation techniques, such as deep breathing or meditation, can help to reduce anxiety and stress.

It is also important to remember that the surgical team is there to take care of you. They are professionals who are trained to perform surgery safely and effectively. If you do need to communicate with the surgical team during surgery, simply let them know. They will be happy to answer your questions or address any concerns you may have.

Here are some additional tips for coping with hearing noises and talking during surgery:

- Focus on your breathing. Take deep, slow breaths through your nose and out through your mouth.
- Repeat positive affirmations to yourself. For example, you can say "I am safe" or "I am in good hands."
- Visualise a relaxing place. Imagine yourself in a place where you feel safe and relaxed, such as a beach or a forest.
- If you start to feel anxious or stressed, talk to your anesthesiologist. They can give you additional medication or help you relax.

Remember, you are not alone. Many people are afraid of surgery, hearing noises, and talking during surgery. However, there are things that you can do to cope with your fear and make the experience as comfortable as possible.

Patient/Interviewer (10): Is there any risk of being paralysed after spinal anaesthesia?

Response: Yes, there is a small risk of paralysis after spinal anaesthesia. This is because the spinal anaesthesia injection can damage the spinal cord or nerves around the spinal cord. However, this is a very rare complication, occurring in less than 1 in 100,000 cases.

The risk of paralysis after spinal anaesthesia is slightly higher in people who have certain medical conditions, such as:

- Congenital spinal stenosis (narrowing of the spinal canal)
- Degenerative spine disease
- Infection of the spine
- Injury to the spine
- Tumours of the spine
- Vascular malformations of the spine

If you have any of these medical conditions, be sure to talk to your doctor about the risks and benefits of spinal anaesthesia before surgery.

There are a number of things that can be done to reduce the risk of paralysis after spinal anaesthesia, including:

- Using a thin needle for the injection
- Carefully positioning the patient during the injection
- Using ultrasound guidance to help direct the needle
- Injecting the local anaesthetic medication slowly and carefully

If you do experience any numbness or weakness in your legs or feet after spinal anaesthesia, be sure to tell your doctor or anesthesiologist right away. They will assess your condition and take steps to protect your spinal cord.

Overall, spinal anaesthesia is a very safe and effective form of anaesthesia. However, it is important to be aware of the potential risks, including the risk of paralysis. If you have any concerns about spinal anaesthesia, be sure to talk to your doctor.

Patient/Interviewer (11): Well, if I choose to undergo general anaesthesia instead, will there be pain immediately after the surgery?

Response: Yes, there is a risk of pain immediately after surgery, even if you choose to undergo general anaesthesia. This is because the surgery itself can cause tissue damage and inflammation, which can lead to pain.

The severity of post-operative pain can vary depending on the type of surgery you had and your individual pain tolerance. However, most people experience some degree of pain after surgery.

There are a number of things that can be done to manage post-operative pain, including:

- Medication: Your doctor may prescribe pain medication, such as over-the-counter pain relievers or prescription opioids.
- Nerve blocks: Nerve blocks are injections of local anaesthetic medication that can be used to numb the area of pain.
- Physical therapy: Physical therapy can help to strengthen the muscles around the surgical site and improve range of motion, which can help to reduce pain.

It is important to talk to your doctor about your pain management plan before surgery. They can help you to develop a plan that is right for you and your individual needs.

Here are some tips for managing post-operative pain at home:

- Take your pain medication as prescribed by your doctor.
- Apply ice or heat to the surgical site, as recommended by your doctor.
- Rest and elevate the surgical site.
- Avoid activities that put stress on the surgical site.
- Eat a healthy diet and get enough sleep.

If your pain is severe or does not improve with medication, be sure to contact your doctor.

It is also important to note that general anaesthesia does have some risks of its own, such as nausea, vomiting, and headache. However, these risks are typically mild and temporary.

Overall, both spinal anaesthesia and general anaesthesia are safe and effective forms of anaesthesia. The best type of anaesthesia for you will depend on your individual medical needs and preferences. Talk to your doctor about the risks and benefits of both types of anaesthesia to determine which option is right for you.

Patient/Interviewer (12): I understand. I have panic attacks, which anaesthesia types from the above would be more suitable for me?

Response: Spinal anaesthesia is generally considered to be a better option for people with panic attacks than general anaesthesia. This is because spinal anaesthesia allows you to be awake and aware during surgery, but you should not feel any pain. This can be helpful for people with panic attacks, as it can help to reduce anxiety and fear.

General anaesthesia, on the other hand, puts you into a deep sleep during surgery. This can be helpful for people who are very anxious about surgery, but it can also be disorienting and frightening for people who are prone to panic attacks.

Of course, the best way to decide which type of anaesthesia is right for you is to talk to your doctor. They can assess your individual medical needs and preferences and help you to choose the safest and most comfortable option for you.

Here are some additional tips for people with panic attacks who are undergoing spinal anaesthesia:

Talk to your doctor about your panic attacks and any concerns you have about anaesthesia.

Ask your doctor to prescribe medication to help reduce your anxiety before surgery.

Bring a comfort object, such as a stuffed animal or blanket, to surgery.

Practice relaxation techniques, such as deep breathing or meditation, before and during surgery.

If you start to feel anxious or stressed during surgery, let your anesthesiologist know. They can give you additional medication or help you relax.

Remember, you are not alone. Many people have panic attacks, and there are things you can do to manage them. By talking to your doctor and planning ahead, you can help to ensure that your surgery is a positive experience.

Patient/Interviewer (13): I see. Lastly, I have undergone an aortic valve replacement and use Coumadin. Can I still undergo spinal anaesthesia?

Response: Whether or not you can undergo spinal anaesthesia if you have undergone an aortic valve replacement and use Coumadin depends on a number of factors, including your INR (international normalised ratio), the specific type of aortic valve replacement you had, and any other medical conditions you have.

Coumadin is a blood thinner that is used to prevent blood clots. However, it can also increase the risk of bleeding. This is because Coumadin works by interfering with the blood's ability to clot.

Spinal anaesthesia is a type of regional anaesthesia that numbs the lower half of the body by injecting a local anaesthetic medication into the spinal canal. However, there is a small risk of bleeding after a spinal anaesthesia injection, especially in people who are taking blood thinners.

Your doctor will need to weigh the risks and benefits of spinal anaesthesia before making a decision. If your INR is well controlled and you do not have any other medical conditions that increase your risk of bleeding, your doctor may be able to clear you for spinal anaesthesia. However, if your INR is high or you have other medical conditions that increase your risk of bleeding, your doctor may recommend general anaesthesia instead.

It is important to talk to your doctor about your individual medical history and concerns before surgery. They can help you to choose the safest and most comfortable type of anaesthesia for you.

Here are some additional things to keep in mind:

You may need to stop taking Coumadin for a few days before surgery.

Your doctor may monitor your INR closely before and after surgery.

You may need to receive blood transfusions or other treatments to stop bleeding if it occurs.

If you have any questions or concerns about spinal anaesthesia or Coumadin, be sure to talk to your doctor. They can help you to understand the risks and benefits and make the best decision for your individual health.

RESULTS

The responses were evaluated independently by a senior anesthesiologist and an orthopaedic surgeon using criteria based on current anaesthesia guidelines and clinical expertise. These assessments were made according to generally accepted guidelines from their respective disciplines.

Overall, Bard AI provided generally accurate and relevant information for the majority of the questions. Most responses included disclaimers emphasising individualised patient care, which was positively noted by the reviewers. The answers regarding fundamental topics, such as the difference between spinal and general anaesthesia, preoperative fasting, and potential side effects, were considered satisfactory and sufficiently informative for patient understanding.

However, certain questions—particularly those involving comorbid conditions (e.g., migraine, anticoagulant use)—revealed notable deficiencies. These responses lacked the necessary clinical nuance or failed to reflect guideline-based recommendations. While no overt misinformation or dangerous advice was found, some responses were deemed incomplete or overly simplified, potentially leading to misinterpretation if used without physician oversight.

DISCUSSION

The most important finding of this study is that it shows that a chatbot (Bard Google AI) can be utilised as a complementary tool in doctor-patient consultations for preoperative education regarding types of perioperative anaesthesia in patients about to undergo knee-related surgery.

Artificial intelligence-based programs are trained on various text materials, including books, articles, and web pages, enabling them to respond to a wide range of topics and discussions [8]. AI-based programs like ChatGPT and Bard can be used as language models for chatbots and question-and-answer platforms [10]. Their ability to produce responses that are superior and human-like in text conversations has gained recognition and adoption in the medical field as well [11,12]. Several studies have tested them to determine whether AI-based chatbots can assist in routine medical tasks [13]. Bard and ChatGPT can provide assistance to patients with less human involvement at any desired time during the day. This technology can handle many challenging activities related to managing complex medical and clinical data.

Total knee arthroplasty is a commonly performed and notoriously painful procedure [2,14]. The operation is typically conducted under either spinal anaesthesia or general anaesthesia. The advantages of these two anaesthesia methods are still a subject of debate, making it a complex and challenging decision for patients [15]. Patients prepare for surgery by relying on information they have gathered from previously operated relatives, from the attending physician, and also on information obtained from anaesthesia specialists during pre-anaesthetic assessments. Several orthopaedic and anaesthesia departments attempt to assist patients with their inquiries by preparing brochures on this topic, but sometimes this approach proves to be insufficient. In this study, when selecting questions to be posed to the AI program, we based our choices on the questions asked to anaesthesia specialists during preoperative assessments and the frequently asked questions on the websites of anaesthesia or orthopaedic departments. We directed 15 questions to the artificial intelligence application and obtained responses. The evaluation of the questions relied on guidelines as well as the experience and knowledge of experienced anaesthesia specialists. Upon evaluating the responses, it was observed that general statements were provided instead of specific answers. This approach is considered acceptable and accurate [8]. From the perspective of language usage and clarity, it is evident that the provided information is conveyed to patients in understandable and simple language. This is of utmost importance in patient education because patients desire to hear the most satisfying and comprehensible responses. Some of the answers include a note emphasising that the approach to each patient may differ, and the most accurate decision will be made based on the patient's existing conditions and the evaluation of the administering physician. We believe that this approach also serves as a guiding and accurate means of information transmission to the patient.

When we examine the responses on a question-specific basis, it is observed that the answer to the 5th question, while generally correct, contains some inaccuracies or omissions. The information provided about spinal anaesthesia reducing pain signals from the trigeminal nerve is incorrect or incomplete. Studies have not shown a difference between spinal and general anaesthesia in the development of migraines [16]. When we consider the mechanism of migraine formation, both anaesthesia choices may contain factors that could trigger migraines [17]. One of the most critical criticisms of these programs is their failure to provide sources. This is because they retrieve information from a vast database, evaluate it, and present it as an answer [10]. We cannot assess which source provided the incomplete information.

Upon examining the responses to other questions, no errors or misdirection were observed. In general, it was noticed that patients received accurate guidance and advice. Providing advice to reduce anxiety related to the operation can be considered a prominent feature of artificial intelligence. It can assist in defining and standardising experimental techniques for measuring human-AI interactions. Sometimes, patients trying to find answers to their questions about the surgery by searching on internet search engines can be time-consuming and may lead to misinformation [9]. By using these artificial intelligence-based programs in a question-answer format, patients can achieve more satisfying information acquisition.

Bard is a black box, which means that it's not always clear how Bard makes its decisions [10]. This can make it challenging to trust Bard's outcomes. It's important for scientists to understand how Bard works so they can make informed decisions and evaluate the validity of its results. Bard is only as good as the data it's trained on. If the data is biased, Bard will be biased as well. This is a problem because it can lead to incorrect results. Scientists must carefully assess the data on which Bard is trained to ensure the accuracy of the results because Bard cannot, yet, replace human intelligence. We advise the usage of Bard as a tool to assist in research, but we

should still rely on our own judgment to evaluate outcomes. Bard can be a powerful tool for accelerating scientific research [18]. However, it's important to be aware of its limitations. Another important concern is the potential for inappropriate or stigmatising responses, especially in sensitive health contexts. Moore et al. emphasised that such limitations prevent large language models (LLMs) from safely replacing health professionals in clinical counselling environments [19].

The results of our study demonstrate that Bard Google AI can serve as a supplementary tool in doctor-patient consultations for preoperative education. Bard Google AI can provide patients with accurate and up-to-date information about the risks and benefits of surgery, answer their questions, and offer guidance on how to prepare for the surgery. It is important to emphasise that Bard Google AI cannot completely replace doctor-patient consultations in preoperative education. Doctors can assess patients, provide personalised recommendations, and help alleviate preoperative concerns.

CONCLUSION

Bard Google AI can be utilised as a complementary tool in doctor-patient consultations for preoperative education. However, the role of doctors remains indispensable, and it is important for patients to consult their doctors to have their questions addressed and alleviate their concerns.

ETHICAL DECLARATIONS

Ethics Committee Approval

Real patients were not used in this study. The questions directed to the artificial intelligence robot were evaluated by experts. Therefore, ethics committee approval was not obtained.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Financial Disclosure

The authors declared that this study has received no financial support.

Informed Consent

All patients signed a free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

REFERENCES

1. Erivan R, Tardieu A, Villatte G, et al. Knee surgery trends and projections in France from 2008 to 2070. Orthop Traumatol Surg Res. 2020;106(5):893-902. doi:10.1016/j.otsr.2020.02.018
2. Khusid E, Lui B, Weber M, Kelleher DC, White RS. Enhanced recovery after hip/knee arthroplasty: Gaps in outcomes by race, ethnicity, and other social determinants of health. J Clin Anesth. 2023;89:111157. doi:10.1016/j.jclinane.2023.111157
3. Montes FR, Zarate E, Grueso R, et al. Comparison of spinal anaesthesia with combined sciatic-femoral nerve block for outpatient knee arthroscopy. J Clin Anesth. 2008;20(6):415-420. doi:10.1016/j.jclinane.2008.04.003
4. De Jong A, Penne C, Kapandji N, et al. Determinants of information provided by anaesthesiologists to relatives of patients during surgical procedures. BJA Open. 2023;7:100205. doi:10.1016/j.bjao.2023.100205
5. Urquhart AC, Antoniotti NM, Berg RL. Telemedicine--an efficient and cost-effective approach in parathyroid surgery. Laryngoscope. 2011;121(7):1422-1425. doi:10.1002/lary.21812
6. Şahin E, Yavuz Veizi BG, Naharci MI. Telemedicine interventions for older adults: A systematic review. J Telemed Telecare. 2024;30(2):305-319. doi:10.1177/1357633X211058340
7. Ram B, Pratima Verma PV. Artificial intelligence AI-based chatbot study of ChatGPT, Google AI Bard, and Baidu AI. World J Adv Eng Technol. Sci. 2023;8(1):258-261. doi.org/10.30574/wjaets.2023.8.1.0045
8. Totlis T, Natsis K, Filos D, et al. The potential role of ChatGPT and artificial intelligence in anatomy education: a conversation with ChatGPT. Surg Radiol Anat. 2023;45(10):1321-1329. doi:10.1007/s00276-023-03229-1
9. Kaarre J, Feldt R, Keeling LE, et al. Exploring the potential of ChatGPT as a supplementary tool for providing orthopaedic information. Knee Surg Sports Traumatol Arthrosc. 2023;31(11):5190-5198. doi:10.1007/s00167-023-07529-2
10. Giannakopoulos K, Kavadella A, Aaqel Salim A, Stamatopoulos V, Kaklamanos EG. Evaluation of the Performance of Generative AI Large Language Models ChatGPT, Google Bard, and Microsoft Bing Chat in Supporting Evidence-Based Dentistry: Comparative Mixed Methods Study. J Med Internet Res. 2023;25:e51580. doi:10.2196/51580
11. Javaid M, Haleem A, Singh RP. ChatGPT for healthcare services: an emerging stage for an innovative perspective. BenchCouncil Trans Benchmarks Stand Eval. 2023;3(1):100105. doi:10.1016/j.tbench.2023.100105
12. Goldstein JC, Goldstein HV. Artificial intelligence in anesthesiology: What are the missing pieces?. J Clin Anesth. 2021;71:110219. doi:10.1016/j.jclinane.2021.110219
13. Kanjee Z, Crowe B, Rodman A. Accuracy of a Generative Artificial Intelligence Model in a Complex Diagnostic Challenge. JAMA. 2023;330(1):78-80. doi:10.1001/jama.2023.8288
14. Albrecht E, Wegrzyn J, Dabetic A, El-Boghdadly K. The analgesic efficacy of iPACK after knee surgery: A systematic review and meta-

analysis with trial sequential analysis. J Clin Anesth. 2021;72:110305. doi:10.1016/j.jclinane.2021.110305

15. Baratta JL, Schwenk ES. Regional versus general anaesthesia for ambulatory total hip and knee arthroplasty. Curr Opin Anaesthesiol. 2022;35(5):621-625. doi:10.1097/ACO.0000000000001170
16. Liao CY, Li CC, Liu HY, et al. Migraine Headaches after Major Surgery with General or Neuraxial Anaesthesia: A Nationwide Propensity-Score Matched Study. Int J Environ Res Public Health. 2021;19(1):362. doi:10.3390/ijerph19010362
17. Radkowski P, Fadrowska-Szleper M, Podhorodecka K, Mieszkowski M. Neurological Complications of Regional Anaesthesia: An Updated Review with Clinical Guidelines. Med Sci Monit. 2023;29:e940399. doi:10.12659/MSM.940399
18. Chervenak J, Lieman H, Blanco-Breindel M, Jindal S. The promise and peril of using a large language model to obtain clinical information: ChatGPT performs strongly as a fertility counseling tool with limitations. Fertil Steril. 2023;120(3 Pt 2):575-583. doi:10.1016/j.fertnstert.2023.05.151
19. Moore J, Grabb D, Agnew W, et al. Expressing stigma and inappropriate responses prevents LLMs from safely replacing mental health providers. FAccT. 2025;599–627. doi:10.1145/3715275.3732039.