

Editorial

Spine surgeon's virtual assistant ChatGPT incorporation into spine surgery patients' care

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The introduction of ChatGPT by OpenAI company, a virtual agent using a generative pretraining transformer (GPT), in November 2022 has generated a significant amount of public excitement and interest in the new technology (1, 2). ChatGPT is an advanced electronic system that utilizes natural language processing (NLP), a form of machine learning, to simulate human-like conversations (3).

ChatGPT and the newly released advanced version "ChatGPT-4" has found multiple applications in spine surgical practice. These include conducting literature reviews for preoperative planning, generating documentation such as admission notes, discharge notes, and operative reports, and serving as an editing tool in surgical research (1).

In this editorial, I aim to explore other uses of such advanced technology for the care of spine surgery patients. ChatGPT was fed with multiple questions simulating different situations in which spine surgeons, surgical trainees, and patients can benefit from such technology.

Firstly, as recently reported by D'Amico and colleagues (4), ChatGPT (OpenAI LLC) was fed with the following Prompt: "Write me a research editorial about how we can incorporate chatbots into spine surgery patient care." As a result, a well-written, insightful, yet lacking legitimate references was generated entirely by a Chatbot.

The healthcare industry has been gradually incorporating technology into patient care, aiming to enhance patient experience and improve clinical outcomes. One technology that has shown great promise in this regard is chatbots. Chatbots are computer programs designed to simulate human conversation through text or voice interactions. They have been used in various healthcare settings, including mental health, chronic disease management, and medication adherence. However, their application in surgical care, particularly spine surgery, is limited.

Spine surgery is a complex and challenging specialty that involves a significant level of patient anxiety and uncertainty. Patients undergoing spine surgery often experience a high level of pain and discomfort, requiring close monitoring and follow-up care. In this context, chatbots can play a crucial role in enhancing patient engagement and communication, reducing patient anxiety, and improving clinical outcomes.

Using several ways, chatbots can be incorporated into spine surgery patient care through pre- and postoperative education. Firstly, chatbots can be used to provide patients with preoperative information, such as the surgical procedure, expected outcomes, and postoperative care. Chatbots can deliver this information in a conversational and interactive format, allowing patients to ask questions and receive immediate answers. This can reduce patient anxiety and increase patient satisfaction with the surgical experience.

Secondly, chatbots can be used to monitor patient's postoperative recovery remotely. Patients can report their symptoms, pain levels, and medication use through the chatbot, allowing healthcare providers to monitor their progress and provide timely interventions if necessary. This can improve patient outcomes by identifying potential complications early and reducing the risk of readmissions.

Thirdly, chatbots can be used to provide patients with personalized rehabilitation plans. For example, patients require physical therapy and rehabilitation after spine surgery to restore their functional capacity. Chatbots can deliver these plans in a conversational and interactive format, guiding patients through their rehabilitation journey and motivating them to adhere to the plan. This can improve patient outcomes by ensuring patients receive the appropriate level of care and support to achieve optimal recovery.

In conclusion, chatbots have enormous potential to improve the quality of care for spine surgery patients. Chatbots can enhance patient engagement and communication, reduce patient anxiety, and

improve clinical outcomes by providing preoperative information, monitoring postoperative recovery, and delivering personalized rehabilitation plans. However, further research is needed to determine the feasibility and effectiveness of chatbots in spine surgery patient care. Healthcare providers should consider incorporating chatbots into their care models to improve patient outcomes and satisfaction. (Text generated by OpenAI's Assistant AI: <https://openai.com>).

Secondly, ChatGPT was fed with another prompt to answer a hypothetical patient undergoing a single-level laminectomy and discectomy: "What are the potential complications of single-level lumbar laminectomy and discectomy?"

The following response was generated:

Single-level lumbar laminectomy and discectomy are common surgical procedures for treating spinal stenosis and herniated discs. While these procedures are generally safe and effective, there are potential complications that patients should be aware of. Some of the most common complications include:

1. *Infection: Any surgical procedure carries a risk of infection, and spinal surgery is no exception. Infections can occur at the surgical site, spinal canal, or the bloodstream. Symptoms of infection include fever, chills, redness, swelling, and pain at the surgical site.*
2. *Nerve damage: During the procedure, nerves near the surgical site can be damaged, leading to weakness, numbness, or tingling in the legs or feet. In some cases, nerve damage can be permanent.*
3. *Dural tear: The dura is a membrane surrounding the spinal cord and nerve roots. During the procedure, the dura can be accidentally torn, leading to cerebrospinal fluid leaks and an increased risk of infection.*
4. *Bleeding: Bleeding can occur during the procedure, leading to the formation of a hematoma*

or a collection of blood that can put pressure on the spinal cord and nerve roots.

5. *Failed back surgery syndrome: In some cases, patients may continue to experience back or leg pain after the surgery. This is known as failed back surgery syndrome and can be caused by scar tissue, recurrent disc herniation, or nerve damage.*
6. *Bowel or bladder dysfunction: In rare cases, the nerves that control bowel or bladder function can be damaged during the procedure, leading to incontinence or retention.*
7. *Anesthesia complications: The use of general anesthesia carries some risks of complications, including allergic reactions, respiratory problems, and cardiovascular complications.*

Patients should discuss these potential complications with their surgeon before undergoing the procedure. While these complications are rare, it's essential to be aware of them and to seek medical attention if any symptoms arise after the surgery. (Text generated by OpenAI's Assistant AI: <https://openai.com>).

Finally, Chatbot was fed with a prompt simulating a spine surgeon or a trainee looking for recent updates in treating single-level lumbar disc herniation: "What is the best available evidence on the treatment of single-level lumbar disc herniation?"

The following was the response:

The treatment of single-level lumbar disc herniation is a common challenge in clinical practice. Several treatment options are available, including conservative management, such as physical therapy and medication, and surgical management, such as microdiscectomy and open discectomy. The best available evidence for treating single-level lumbar disc herniation is based on several randomized controlled trials (RCTs) and systematic reviews.

Conservative management:

1. *Physical therapy: A systematic review and meta-analysis of 24 RCTs found that physical therapy effectively reduces pain and improves function in patients with lumbar disc herniation, especially in the short term. However, the evidence is limited by the heterogeneity of the interventions and the lack of long-term follow-up.*
2. *Medication: A Cochrane review of 19 RCTs found that non-steroidal anti-inflammatory drugs (NSAIDs) and muscle relaxants effectively reduce pain and improve function in patients with lumbar disc herniation. However, the evidence is limited by the lack of long-term follow-up and potential adverse effects.*

Surgical management:

1. *Microdiscectomy: A systematic review and meta-analysis of 10 RCTs found that microdiscectomy is more effective than conservative management in reducing pain and improving function in patients with lumbar disc herniation, especially in the short term. However, the evidence is limited by the lack of long-term follow-up and the potential for adverse effects, such as recurrent herniation and nerve damage.*
2. *Open discectomy: A Cochrane review of 11 RCTs found that open discectomy is more effective than conservative management in reducing pain and improving function in patients with lumbar disc herniation. However, the evidence is limited by the heterogeneity of the interventions and the potential for adverse effects, such as recurrent herniation and nerve damage.*

In summary, the best available evidence suggests that conservative and surgical management effectively treats single-level lumbar disc herniation. Physical therapy and medication can provide short-term relief, while microdiscectomy and open discectomy can provide long-term relief. However, the choice of treatment should be

based on individual patient factors, such as the severity and duration of symptoms, the presence of neurological deficits, and the patient's preference.

Despite their impressive capabilities, chatbots such as ChatGPT raise several concerns. One concern is their ethical liability in providing information without credible sources for use in patient care (1, 4). Another issue is legal liability; as D'Amico and colleagues have noted, it is unclear who would be held responsible in a court of law if a chatbot were to provide harmful or incorrect information for patient care (4). Finally, the objectivity of data generated by ChatGPT is questionable, as it is as objective as the feeding source.

In conclusion, with their current capabilities, chatbots require human supervision and can be used as a valuable assisting tools for healthcare providers.

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