Robotic Surgery by Artificial Intelligence (AI): Unveiling a New Possibility in the World of Surgery

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Abstract— Surgery is a traditional and technical procedure name. Surgery generally reflects a surgeon's skill subjectively. This procedure requires the surgeon to face some surgical risks. In this regard, artificial intelligence (AI) is revolutionizing the field of robotic surgery. Artificial intelligence (AI) is revolutionizing the field of robotic surgery. Artificial intelligence (AI) is defined as the ability of a computer to perform actions similar to those performed by the human brain. It can demonstrate surgical skills in the absence of a surgeon. Advances in science and the deployment of AI in surgery have begun to revolutionize the application of artificial intelligence (AI) algorithms to robotics in fields such as surgery. By applying algorithms it is possible to determine how patients will be treated in the operating theater before and after surgery. Surgical practice has always rested on the foundation of technological innovation. The evolution of AI-enabled work practices can therefore provide significant value to surgeons and health systems by increasing patient safety and surgical quality outcomes. This study discusses the overview, advantages, disadvantages and current innovations etc. of AI integration in robotic surgery. The paper explores future possibilities in the field of robotic surgery using AI technology.

Index Terms— Artificial Intelligence (AI), Robotic Surgery, Revolutionizing, Technological Innovation.

I. INTRODUCTION

Technological advancements in the medical field have been made possible by human curiosity, discovery, and innovation. AI robotic surgery is an ongoing trend that has emerged as one of the most advanced forms of surgery in the medical field today. AI robotic surgery is designed to enhance the skills of human surgeons by giving them greater control, flexibility, and access to complex anatomical structures [3]. These systems consist of specialized robotic arms, which the surgeon controls through a console. The addition of AI robots helps to avoid any interruptions during surgery by providing real-time data analysis [4].
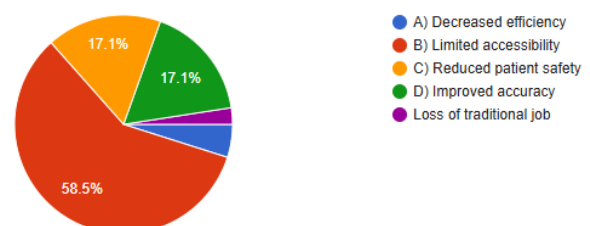
Currently, AI robotic surgery is controlled by a "master-slave" dynamic where the robot has no autonomy of its own without a human operator. However, advances in AI and machine learning (ML) have enabled robots to expand their capabilities in surgery and improve the surgical experience in the operating room. This review focuses on recent advances with a special emphasis on the intraoperative applications of AI robotic surgery. It is hoped that the subsequent integration of AI into robotic surgery will make surgery safer.

II. METHODOLOGY

The questionnaire is adapted according to the research context based on the basic knowledge of robotic surgery and artificial intelligence (AI). Some questions were considered as multiple choice questions and some were as single choice questions. There are different opinions about the current situation of artificial intelligence (AI) related to robotic surgery. A mixed survey design was used for this study to measure the current situation and make the data more effective and accurate. To make this work more informative, it has the advantage of collecting a large amount of data. It can be developed in less time to collect data to survey a large population. Therefore, it is easy to draw conclusions and important decisions with the help of it by collecting targeted results and ensuring an accurate sample. In this case, samples and surveys were collected from different sources through mixed questionnaire survey. Both qualitative and quantitative data were collected from designated engineers and doctors, industry experts, medical college students, engineering university students and students of various government and private institutions. Two different sampling methods were used for the sample data, one is purposive sampling and the other is simple random. The data has been processed by Statistical Package for Social Sciences (SPSS) and MS Excel graphical application software. After filtering and transformation, finally the data has been analyzed. Finally, some directions have been recommended from gap analysis, existing picture and sincere action of the concerned organization.

Graph 1: Graph of potential drawback of using AI-powered robots in surgery system.

- A) Decreased efficiency
- B) Limited accessibility
- C) Reduced patient safety
- D) Improved accuracy
- Loss of traditional job

Against the question 'Which of the following is a potential drawback of using AI-powered robots in surgery system?' Survey result says 59% participants agree with limited accessibility, 17% participants agree with reduced patient safety, 17% participants agree with improved accuracy and others are agree with loss of traditional job and decreased efficiency.

Graph 2: Graph of Commonly used for detecting obstacles in robotics surgery.
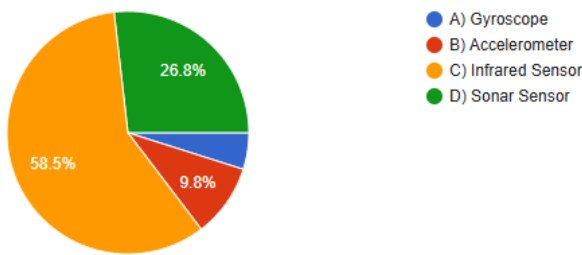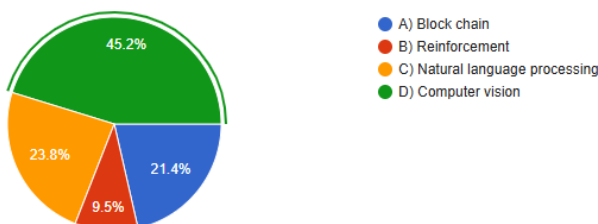

Against the question 'Which sensor is commonly used for detecting obstacles in robotics surgery?' survey result says 59% participants agree with Infrared sensor, 27% participants agree with sonar sensor, 10% participants agree with accelerometer and others agree with gyroscope.

Graph 3: Graph of the way of AI –driven robotics enhance surgery in healthcare.
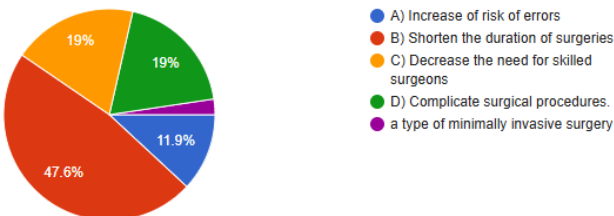
Against the question 'In what way can AI –driven robotics enhance surgery in healthcare?' survey result says 48% participants agree with shorten the duration of surgeries, 19% participants agree with decrease the need for skilled surgeons, 19% participants agree with complicate surgical procedures.

Graph 4: Graph of AI technique is commonly used to assist with patient monitoring and early diagnosis.

Against the question 'Which AI technique is commonly used in healthcare robotics to assist with patient monitoring and early diagnosis?' survey result says 45% participants

agree with computer vision, 24% % participants agree with natural language processing, 21%% participants agree with block chain and 10% participants agree with reinforcement.

**Graph 5: Graph of Robotic surgery differ from traditional surgery.**
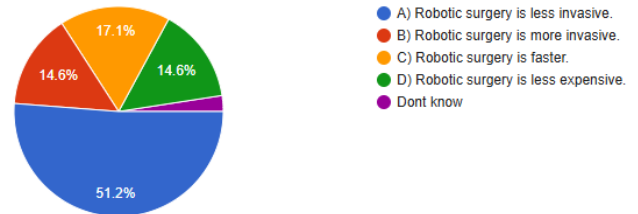
Against the question **'How does robotic surgery differ from traditional surgery?'** survey result says 51% participants agree with robotic surgery is less invasive, 17% participants agree with robotic surgery is faster, 15% participants agree with robotic surgery is more invasive, 15% participants agree with robotic surgery is less expensive and other participants are don't know.

Graph 6: Graph of following types of surgery is most commonly performed using robotic surgery.
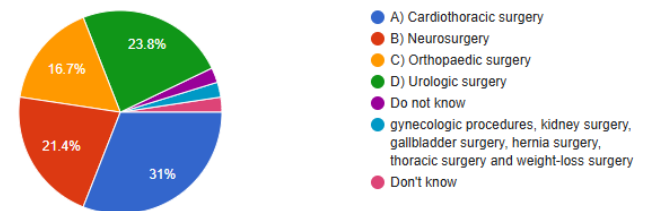
Against the question **'Which of the following types of surgery is most commonly performed using robotic surgery?'** survey result says 31% participants agree with cardiothoracic surgery, 24% participants agree with urologic surgery, 21% participants agree with neurosurgery, 17% participants agree with Orthopedic surgery and other participants are don't know.

Graph 7: Graph of potential limitation of robotic surgery.
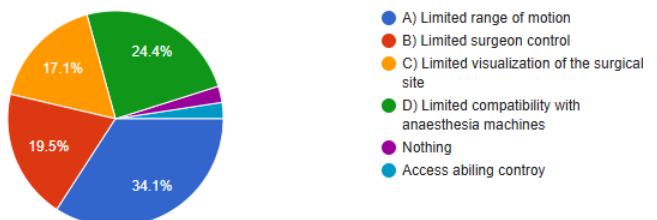
Against the question **'Which of the following is a potential limitation of robotic surgery?' '** survey result says 34% participants agree with limited range of motion, 24% participants agree with limited visualization of the surgical site, 20% participants agree with limited surgeon

control, other participants agree with access ability control.

III. CONCLUSION

AI in the field of robotic surgery in healthcare is a minimally invasive technologically driven device that is being targeted as a path to a future era alternative. Therefore, AI in the field of robotic surgery outlines the huge future potential. The global surgical community must now embrace the use of AI in complex surgeries.

Author Contributions

The author conceived, reviewed, and wrote the manuscript of the paper. Various information and data were collected through a questionnaire survey. Gratitude and thanks to all the participants who enriched the paper with their valuable information and time.

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