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VIVEKANANDHA MEDICAL CARE HOSPITAL ALLIED HEALTH SCIENCE

SPOTLIGHT

The Student Magazine

THEME : CHALLENGES AND OPPORTUNITIES OF IMPLEMENTING AI TECHNOLOGY IN SURGERY

This month's edition is curated by :

The AnesMag minds of :

Bsc.OPERATION THEATRE AND ANAESTHESIA TECHNOLOGY STUDENTS

EDITORIAL BOARD

WHAT IS AI ?

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think and learn like humans. The term can also be applied to any machine that exhibits traits associated with a human mind such as learning and problem solving.

Artificial Intelligence (AI) is revolutionizing modern surgery, making procedures safer, faster, and more precise. From robotic-assisted surgeries to predictive analytics, AI is empowering surgeons with tools that enhance decision-making and improve patient outcomes.

It doesn't replace surgeons but helps them work more accurately and safely.

IMPORTANCE OF AI IN SURGICAL FIELD

Artificial Intelligence (AI) is becoming a powerful tool in the world of surgery. It plays a vital role in making operations safer, faster, and more accurate.
Here's why AI is so important in surgeries:

1. Improved Precision:

AI-powered robotic systems help surgeons perform delicate procedures with high accuracy, reducing human errors.

2. Better Surgical Planning:

AI analyse scans like CT and MRI to guide surgeons before the operation, helping them understand the

patient's condition clearly.

3. Real-Time Assistance:

During surgery, AI provides live feedback, helping doctors avoid mistakes, identify complications early, and make better decisions.

4. Faster Recovery for Patients:

With more accurate surgeries, there is less damage to healthy tissues, which leads to quicker recovery and shorter hospital stays.

5. Data-Driven Outcomes:

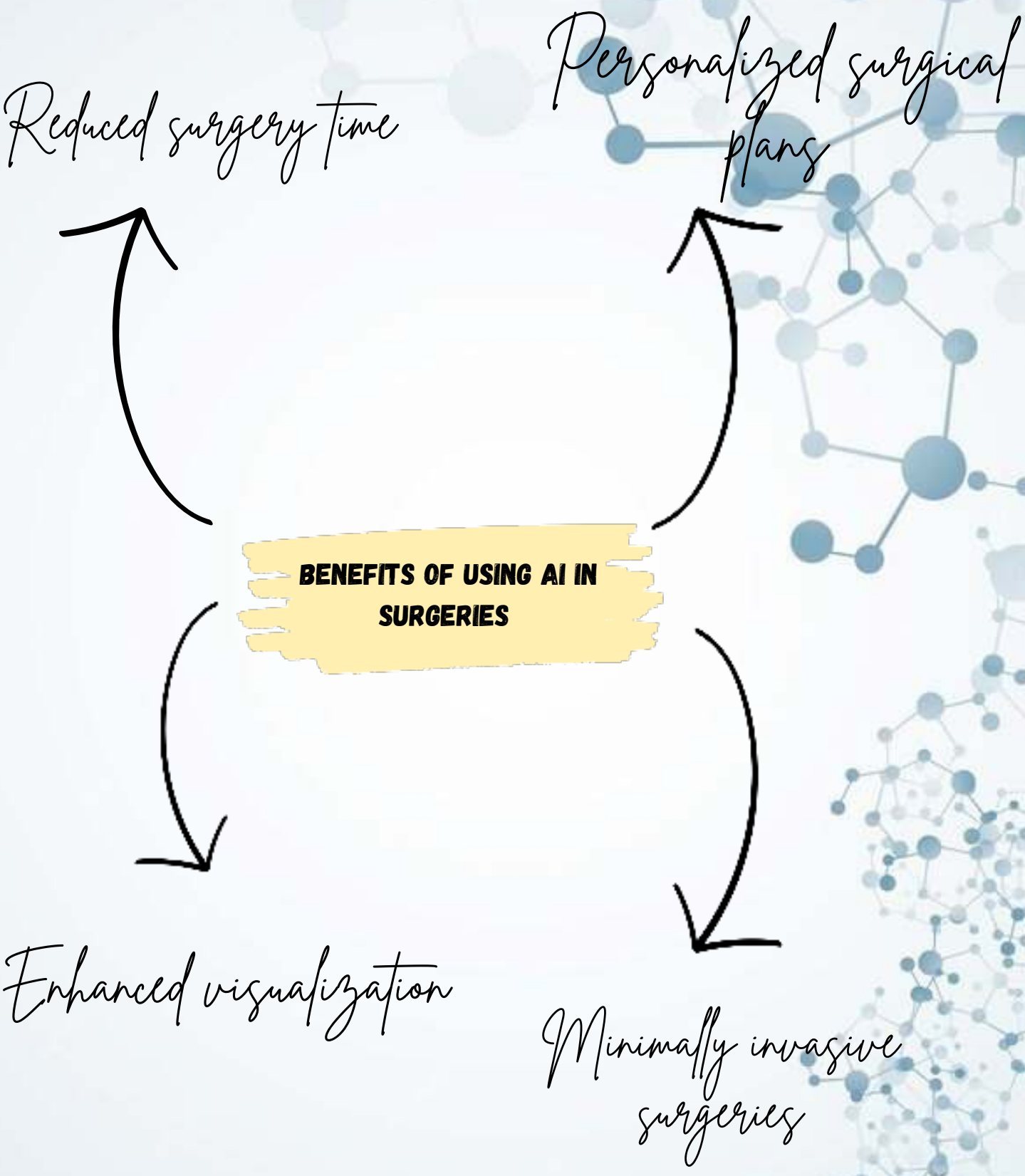
AI studies past surgical data to predict possible risks and suggest the best treatment methods for each individual patient.

6. Post-Operative Care:

AI tools monitor the patient after surgery and alert doctors about any early signs of complications.

Why is it useful?

AI reduces human errors, speeds up surgeries, lowers recovery time, and improves the overall success rate of operations.


Reduced surgery time
Personalized surgical plans
BENEFITS OF USING AI IN SURGERIES
Enhanced visualization
Minimally invasive surgeries

USES OF AI IN SURGERY :

Precision and accuracy

Precision and accuracy are fundamental to the success of surgical procedures, directly influencing patient outcomes, recovery times, and overall healthcare quality, advancements in technology have significantly enhanced these aspects, leading to more effective and safer surgeries.

Robotics assisted surgery

Robotics assisted surgery involved the use of robotic system, such as the Da Vinci surgical system, where surgeons control miniature instruments through a console. These system provides high-definition 3D visualization and enhanced dexterity.

I. PRE OPERATIVE PLANNING AND SIMULATION

Pre operative planning and simulation involve advanced technologies and techniques to prepare patients for surgery before entering the operating room.

Benefits of pre operative simulation

1. Enhanced surgical precision
2. Reducing operating time
3. Improved patient outcomes
4. Cost efficiency

II. INTRA- OPERATIVE DECISION SUPPORT

Intra- operative decision support refers to the tools, systems and methods used during surgery to assist surgeons and the surgical team in make accurate, timely and data-driven decision.

COMMON TYPES OF INTRA-OPERATIVE DECISION SUPPORT

Real time imaging and navigation

- Intra-operative CT
- MRI
- Fluoroscopy

Artificial Intelligence and Machine Learning

AI models that analyze real-time data from patient monitor (HR, BP) to predict adverse events or suggest interventions.

Robotic surgery systems

Robots like the Da Vinci surgical system provide real-time haptic feedback, tremor filtration, and precision control for minimally invasive surgeries.

III. POST OPERATIVE MONITORING AND PREDICTIVE ANALYTICS

Predictive analytics, leveraging machine learning algorithms and data analysis, transforms post-operative data to predict potential issues like infections, blood clots, re-admissions, allowing improved patient outcomes.

Training and skill development

AI offers significant advancements in surgical training and skill development by providing realistic simulations, personalized feedback, and data-driven insights. AI-powered simulations enable trainees to practice complex procedures in a safe environment, receive real-time guidance, and analyze their performance, accelerating the learning process.

CHALLENGES :

1. HIGH COST :

- The initial purchase price of AI powered robotic surgical systems or other AI tools can be very expensive, ranging from tens of thousands to millions of dollars.

2. INFRASTRUCTURE REQUIREMENTS :

- AI algorithms require significant computational power, often necessitating the use of powerful GPU's, specialized processors, and cloud-based infrastructure.

3. RELIABILITY OF AI ALGORITHMS :

Reliability issues : Algorithms might performs well in testing but fail in real-world, unpredictable scenarios.

Impact : un reliable AI can result in incorrect decision, loss of trust, or even harm.

4. INTEGRATION WITH EXISTING SYSTEM :

Integration with existing systems refers to how well a new AI solution (or any tech work) and work flow already in place.

5. SURGEON AND STAFF RESISTANCE:

The challenges of surgeon and staff resistance to AI in healthcare

CHALLENGES :

LACK OF UNDERSTANDING

Limited knowledge about AI capabilities and limitations,

FEAR OF JOB DISPLACEMENT

Concerns about AI replacing human roles.

TRUST ISSUES

Doubts about AI accuracy and reliability.

CHANGE MANAGEMENT

Difficulty adapting to new workflows and technologies.

DATA QUALITY CONCERNS

Worries about data accuracy and bias.

6. LACK OF STANDARDIZATION AND REGULATIONS:

The phrase " lack of standardization and regulations " typically refers to situations where there are no unified rules, guidelines, or legal frameworks in place to goven practices within a certain field.

INCONSISTENT QUALITY :

- Without standards, products or services might vary widely in quality.

LIMITED INNOVATION :

- In some cases, unclear rules can discourage invesment or development.

LEGAL LOOPHOLES :

- Companies might exploit the absence of regulation for unfair advantage.

7. MEDICO - LEGAL AND ETHICAL IMPLICATION :

The use of AI in surgery raises complex medico-legal and ethical implications, including informed consent, malpractice risk.

INFORMED CONSENT :

- Patient may not fully understand how AI is being used in their care.

MALPRACTICE RISK :

- If AI influences decisions without transparency, it can lead to legal action incases of harm.

Ethical implications :

1. Bias and discrimination
2. Transparency and trust
3. Autonomy
4. Dependence on AI

8. DATA PRIVACY AND SECURITY CONCERN :

What are the data privacy and security concerns in AI ?

AI systems can digest and analyze exponentially more data than traditional systems, increasing the risk of personal data exposure.

FUTURE DIRECTIONS :

Artificial Intelligence is expected to advance significantly over the next decade, transforming various aspects of personal and business life. Here are some potential future directions.

1. AUTONOMOUS ROBOTICS

Developing autonomous robots that can perform surgical tasks with precision and accuracy.

2. MULTIMODAL AI

Integrating multiple data sources to create comprehensive patient profiles and improve diagnosis accuracy.

3. PERSONALIZED MEDICINE

Leveraging AI to tailor treatment plans to individual patients needs and generic profiles.

4. POPULATION SCREENING IN SURGERY

AI powered screening tools can detect disease like breast cancer and colorectal cancer more accurately and efficiently.

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Students Zone

My First Day in Operation Theatre – A Clinical Journey"

As a student of Operation Theatre and Anaesthesia Technology, I began my clinical posting with a sense of anticipation mixed with uncertainty. Although I had theoretical knowledge, I was unsure about my practical responsibilities in a real-time operating theatre environment.

Initially, I observed the routine activities inside the Operation Theatre. The sterility, protocols, and precision demanded by the surgical team made me both curious and anxious. I was unfamiliar with the workflow, instrument handling, sterile field maintenance, and the coordination required between the surgical and anaesthesia teams.

My unique experience :

I was instructed to scrub for an ovarian cystectomy case. It was my first time participating directly in a surgical procedure. I was nervous, but I followed aseptic hand scrubbing technique, wore the sterile gown and gloves under supervision, and entered the OT maintaining proper sterile technique.

The surgical team, especially the scrub nurse and surgeon, guided me through the process. I learned the importance of instrument preparation, counting protocols, identifying surgical instruments like scalpel, forceps, needle holders, retractors, and understanding the sequence of instrument usage during different stages of surgery.

During the procedure, the patient had moderate bleeding. So the surgical team used the electrosurgical techniques (bipolar cautery, monopolar cautery) to control the bleeding. I also observed how the anaesthesia team monitored the patient's vitals, administered general anaesthesia, and maintained the airway and ventilation.

Throughout the posting, We gained valuable hands-on experience in:

Maintaining sterile field

Passing instruments to the surgeon

Handling sharps with caution

Understanding instrument sterilization

Post-operative cleaning and waste disposal

Moreover, we began to understand the role of teamwork, communication,and vigilence required to ensure patient safety during surgical procedures.

This clinical experience was extremely enriching. It bridged the gap between theory and practice, gave us clarity about our responsibilities and boosted our confidence to assist in surgical procedures effectively. We deeply grateful to the surgical team for their support, patience and willingness to teach. It was a transformative experience that laid a strong foundation for our future in this field.

S.DEEPANKUMAR
III B.SC OTAT

Informative conversation between AI and Surgeon :

Surgeon : Hey AI, ready to scrub in today?

AI : Absolutely! I've already analyzed 10,000 procedures before breakfast.

Surgeon : Impressive! But can you handle a surprise appendix?

AI : No worries. I've got algorithyms for that. Plus, i never get nervous - just a little "bite" anxious.

Surgeon : Good one! But what if things get complicated ?

AI : I'll just "process" the situation and give you my best "incision"

Surgeon : You know, i used to rely on gut feeling. Now i rely on your neural network.

AI : Thanks! Together, we're a real "cutting edge - team".

S.NO	PROGRAMMES OFFERED UG	DURATION
01	B.SC ACCIDENT AND EMERGENCY CARE TECHNOLOGY	4 YEARS
02	B.SC RADIOGRAPHY AND IMAGING TECHNOLOGY	4 YEARS
03	B.SC OPERATION THEATRE AND ANESTHESIA TECHNOLOGY	4 YEARS
04	B.SC CARDIAC TECHNOLOGY	4 YEARS
05	B.SC PHYSICIAN ASSISTANT	4 YEARS
06	B.SC MEDICAL LABORATORY TECHNOLOGY	4 YEARS
07	B.SC DIALYSIS TECHNOLOGY	4 YEARS

KRISHNA INSTITUTE OF OPTOMETRY AND RESEARCH

08	B.SC OPTOMETRY	4 YEARS

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