Ai in surgery: Ethical challenges and oversight.

Jonas Muller*

Department of Biomedical Ethics, Zurich BioMedical Institute, Zurich, Switzerland

Introduction

As Artificial Intelligence (AI) rapidly integrates into surgical practice, a multitude of complex ethical considerations arise, demanding careful attention and proactive frameworks. One critical article lays out primary ethical considerations such as maintaining patient safety, ensuring truly informed consent, establishing clear accountability for AI-related errors, protecting patient data privacy, and addressing concerns about surgeons' skill atrophy [1]

. This piece stresses that robust regulations and interdisciplinary discussion are crucial for developing and deploying AI responsibly. Expanding on this, another paper examines how AI is transforming surgical decision-making and execution [2]

. It brings forward ethical challenges concerning algorithmic bias, the evolving partnership between surgeons and AI, respecting patient autonomy in AI-assisted procedures, and ensuring fair access to these new technologies, advocating for transparent AI systems and comprehensive ethical guidelines.

Through a systematic review, another article consolidates recurring ethical challenges linked to AI in surgery, highlighting themes like accountability, informed consent, data privacy, justice, and the potential effects on the surgical profession [3]

. This review underscores the critical need for proactive ethical frameworks to steer innovation. Further exploring this landscape, a piece delves into the intricate ethical and legal aspects emerging from AI adoption, particularly focusing on complex questions of liability for AI-related errors, changes in surgeon autonomy, and existing gaps in regulatory oversight [4]

. The article strongly advocates for clear guidelines to ensure AI is integrated safely and responsibly.

Offering a worldwide perspective, another paper addresses ethical challenges with AI in surgery, acknowledging diverse cultural and regulatory environments [5]

. It tackles issues like algorithmic bias, ensuring fair access to cutting-edge AI tools, and the influence on surgical training and practice across the globe, providing a broad international look. Specifically focusing on AI-powered surgical robotics, an article explores ethical considerations like effective human-robot collaboration, the potential for autonomous decision-making by machines, and how responsibility shifts in surgical outcomes [6]

. The authors make a strong case for clear ethical guidelines and continued human oversight.

Another paper tackles the complex questions of accountability and responsibility when AI systems become part of surgical procedures [7]

. It closely examines how liability might be distributed among surgeons, AI developers, and hospitals if something goes wrong, highlighting the need for clear legal and ethical frameworks. Essential ethical considerations for implementing machine learning in surgery, from development to deployment, are outlined in an article focusing on data governance, algorithmic transparency, bias mitigation, and the potential impact on clinical autonomy [8]

. The authors stress that ethical oversight requires a collaborative, multi-stakeholder approach.

Looking into surgical education, a paper explores ethical aspects of bringing AI into training, addressing concerns about surgeons potentially losing skills, the fairness of AI-driven assessments, and the critical responsibility to educate future surgeons on how to use and understand AI tools ethically [9]

. This ensures a skilled, ethically sound workforce. Finally, an article focuses squarely on challenges to patient autonomy and the complexities of informed consent when AI systems are involved in surgical care [10]

. It tackles how medical professionals can effectively explain AI's role, its limitations, and any potential risks to patients, empowering them to make truly informed decisions.

Conclusion

The integration of Artificial Intelligence (AI) into surgery intro-

***Correspondence to:** Jonas Muller, Department of Biomedical Ethics, Zurich BioMedical Institute, Zurich, Switzerland. E-mail: jonas.muller@zurichbio.ai

Received: 04-Sep-2025, Manuscript No. aaasr-221; **Editor assigned:** 08-Sep-2025, Pre QC No. aaasr-221 *(PQ)*; **Reviewed:** 26-Sep-2025, QC No. aaasr-221; **Revised:** 07-Oct-2025, Manuscript No. aaasr-221 *(R)*; **Published:** 16-Oct-2025, DOI: 10.35841/2591-7765-9.4.221

Citation: Muller J. Ai in surgery: Ethical challenges and oversight. aaasr. 2025;09(04):221.

duces a range of profound ethical challenges requiring urgent attention. Primary concerns include maintaining patient safety, ensuring truly informed consent, and establishing clear accountability for AI-related errors. Protecting patient data privacy, addressing the potential for surgeons' skill atrophy, and mitigating algorithmic bias are also critical. The evolving partnership between surgeons and AI, respecting patient autonomy, and ensuring fair access to these advanced technologies necessitate transparent systems and comprehensive ethical guidelines. Debates around liability distribution among surgeons, AI developers, and hospitals underscore the need for clear legal and ethical frameworks, especially concerning AI-powered surgical robotics and autonomous decision-making. The impact on surgical education and training, including concerns about skill loss and the ethical use of AI tools by future surgeons, is also a significant area of focus. Overall, a collaborative, multi-stakeholder approach and robust regulatory oversight are essential to guide the responsible development and deployment of AI in surgical practice.

References

1. Peter ARA, Arup KS, *John PMT. Ethical considerations in surgical artificial intelligence. Br J Surg.* 2022;109:1302-1306.
2. Ruchi G, Alistair RW, David AH. Artificial intelligence in surgical practice: ethical challenges and future directions. *J Med Ethics.* 2023;49:504-510.
3. Nardus FJJSH K, Bas LGJM B, Joris DDDJFLME vd M. The ethical implications of artificial intelligence in surgery: a systematic review. *Eur J Surg Oncol.* 2022;48:2167-2175.
4. Mark DM, Alexander FS, Susan EH. Artificial Intelligence in Surgery: *Ethical and Legal Considerations. Am Surg.* 2021;87:1673-1677.
5. Omar MM, Karim MH, Sherif AA. The Ethics of AI in Surgery: *A Global Perspective. World J Surg.* 2024;epub.
6. Andrew CK M, Thomas DK C, Elaine PK L. Navigating the ethical landscape of AI-powered surgical robotics. *Int J Med Robot.* 2023;19:e2536.
7. David TG J, Sarah LP D, Michael CW G. Accountability and Responsibility in AI-assisted *Surgery. ANZ J Surg.* 2022;92:2883-2887.
8. Benjamin KBE G, Emily JML W, *Charles DRS D. Ethical considerations in the development and deployment of machine learning in surgery. Br J Surg.* 2020;107:1729-1736.
9. Thomas BF S, Julianna LGP W, Robert HC K. Artificial intelligence in surgical training: *Ethical implications and educational responsibilities. Surg Endosc.* 2021;35:5979-5986.
10. Sara FH I, Ahmed MZ O, Fatma GK Y. Patient autonomy and informed consent in AI-assisted surgical procedures. *J Med Ethics.* 2023;49:721-726.

Citation: *Muller J. Ai in surgery: Ethical challenges and oversight. aaasr. 2025;09(04):221.*