

Legal Construction of Telesurgery in National Health Law

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Abstract

The development of health technology must be accompanied by the establishment of robust healthcare laws to safeguard both healthcare professionals and patients from potential risks and losses arising from errors in telesurgery. In light of this, three key issues are formulated in this study: namely the development of telesurgery in the legal framework, the legal construction of telesurgery and legal responsibility in the event of errors in telesurgery. This study is a normative legal analysis examining the regulatory framework governing telesurgery and the legal responsibilities arising from potential errors. A literature review serves as the primary method for collecting both primary and secondary legal sources. The research employs a legislative and conceptual legal

approach, with qualitative analysis used to address the identified issues. Legal frameworks for the regulation of telesurgery must be developed at both the international level, particularly in relation to jurisdiction, and the national level, focusing on medical standardization in its implementation. The practice of telerobotic surgery must be regulated by law, derived from policy regulations, and regulated by internal guidelines from surgeons. At a minimum, several legal elements must be addressed, including jurisdiction, ethics committees within surgical organizations, inter-ministerial collaboration, the legal relationship between patients and physicians, pre-operative explanations and informed consent, legal accountability, medical confidentiality, medical team requirements, and information security management systems. Legal liability for failed surgical procedures may arise in cases of errors, whether intentional or due to negligence.

KEYWORDS: *Legal Construction, Telesurgery, Health, Legal Liability.*

Introduction

Artificial Intelligence (AI) is expected to bring significant advancements to the healthcare industry, particularly in improving the success rates of medical treatments. AI is likely to transform clinical practice in the coming decade in evaluating, diagnosing, and treating patients.¹ One notable application of AI is in robotic technology, which has the potential to revolutionize surgical procedures and enhance their outcomes. Robotic technology used in medical operations is often called telesurgery.² Telesurgery is an advanced field at the nexus of medicine and technology. This remote surgical practice has great potential to improve surgical capabilities, expand medical care, and improve patient outcomes.³ Robotic surgery reduces patient fear in the surgical process

¹ Ahmad, Zubair, et al. "Artificial Intelligence (AI) in Medicine, Current Applications and Future Role with Special Emphasis on Its Potential and Promise in Pathology: Present and Future Impact, Obstacles Including Costs and Acceptance among Pathologists, Practical and Philosophical Considerations. A Comprehensive Review." *Diagnostic Pathology* 16, no. 1 (2021): 24.

² Yolanda Nindiya Karolin and Adianto Mardijono. "Regulasi Penggunaan Teknologi Robotik Telesurgery dalam Praktik Kedokteran." *IBLAM Law Review* 4, no. 1 (January 30, 2024): 247–56. <https://doi.org/10.52249/ilr.v4i1.247>.

³ Santhosh Kumar Rajamani, Radha Srinivasan Iyer, and Iftekhar Ahmed. "Current State of Robotic Surgery and Telesurgery." In *Advances in Medical Technologies and Clinical Practice*, edited by Thangavel Murugan, Jaisingh W., and Varalakshmi P., 194–216. IGI Global, 2024. <https://doi.org/10.4018/979-8-3693-2901-6.ch011>.

and allows for more precise surgical procedures. This opens the door to better outcomes, faster recovery, and reduced complications.⁴ By combining artificial intelligence and robotic technology skills, medical care can achieve higher efficiency in surgery.⁵

The evolution of telesurgery is driven by technological advances and the pressing need to become a global healthcare solution.⁶ The development of telesurgery is an annual initiative to enhance the quality and accessibility of healthcare services in remote areas of Indonesia.⁷ Telesurgery aims to deliver medical services and uniformly enhance the quality of care across the country, particularly in remote areas. In addition, it aims to minimize the number of people who are referred to doctors or medical services in large cities. The types of operations performed through telesurgery include thoracic surgery, gastrointestinal surgery, and urology and gynecology surgery.⁸

In telesurgery procedures, while the surgeon may be in another location or medical facility, the assistant—who may be a robotic surgical assistant—is present and in direct contact with the patient.⁹ The challenges in developing telesurgery must be carefully considered. A retrospective study identified several risks associated with telesurgical procedures, with device failure being a significant concern. Between 2000 and 2013, device failure accounted for 75.9% of the reported adverse events. Of the 10,624 adverse events reported, 14.7% involved broken or burned instruments falling onto the patient, 10.5% were due to electrical arcing of the instrument, 8.6% resulted from unintended instrument operation, 5% were attributed to system errors, and 2.6% were linked to video or imaging problems. Intuitive, a leading manufacturer of surgical robots, publishes a list of safety concerns on its website, detailing both

⁴ Maryani Farwati et al. “Analisa Pengaruh Teknologi Artificial Intelligence (AI) dalam Kehidupan Sehari-Hari.” *Jursima: Jurnal Sistem Informasi & Manajemen* 11, no. 1 (2023). <https://doi.org/10.47024/js.v11i1.563>

⁵ Iulia Andras et al. “Artificial Intelligence and Robotics: A Combination That Is Changing the Operating Room.” *World Journal of Urology* 38, no. 10 (October 27, 2020): 2359–66. <https://doi.org/10.1007/s00345-019-03037-6>.

⁶ Mourão, Thiago Camelo, et al. “Telesurgery Applications, Current Status, and Future Perspectives in Technologies and Ethics.” In *Handbook of Robotic Surgery* (2025): 161–68.

⁷ Karolin, Yolanda Nindiya, and Adianto Mardijono. “Regulasi Penggunaan Teknologi Robotik Telesurgery dalam Praktik Kedokteran.”

⁸ Alexander Reinisch et al. “Robotic Operations in Urgent General Surgery: A Systematic Review.” *Journal of Robotic Surgery* 17, no. 2 (June 21, 2022): 275–90. <https://doi.org/10.1007/s11701-022-01425-6>

⁹ David Silvera-Tawil. “Robotics in Healthcare: A Survey.” *SN Computer Science* 5, no. 1 (January 11, 2024): 189. <https://doi.org/10.1007/s42979-023-02551-0>.

routine medical risks and those specifically associated with robotic systems. In addition, due to variations in disease, pathology, and patient needs, not all patients will be suitable for robotic surgery.¹⁰

Telesurgery presents both legal and ethical challenges, requiring robust technical reliability along with strict privacy and security measures.¹¹ An inadequately secured network could be vulnerable to malicious intrusion by hackers. Moreover, surgeons may wish to record surgeries for future reference, particularly given that, according to some scholars, medical errors are the third leading cause of death in the United States.¹² Robotic surgical devices could allow hospital staff to record audio and video of the entire surgery, which could aid in post-mortem reviews of medical errors.¹³ However, this could raise serious privacy concerns. Networked surgical systems could expose telesurgical procedures to hacking threats. Beyond technical network specifications, addressing cybersecurity, data privacy, and redundancy in the event of technical malfunctions is crucial for successful telesurgery implementation. Expanding the discussion to encompass ethical, financial, regulatory, and legal considerations is also crucial before telesurgery can be adopted within the robotic surgery community.¹⁴ Persistent obstacles include network instability, legal uncertainty, limited scalability, and surgeon fatigue. Intercontinental telesurgery has the potential to transform global surgical inequities, but its sustainable adoption requires more than just technological readiness. A concerted effort in infrastructure development, equitable access, and ethical regulation is needed.¹⁵

The term "telesurgery" refers to a system where a surgeon conducts surgery remotely and is separated from the patient. This location difference can

¹⁰ Tyler Rexhouse. "Telesurgery: An Integrated Legal-Bioethical Approach." *Albany Law Journal of Science & Technology* 32AD (2021): 316–43. <https://www.albanylawscitech.org/article/34728-telesurgery-an-integrated-legal-bioethical-approach>.

¹¹ Fernando Fuertes-Guiró and Eduardo Viteri Velasco. "Ethical Aspects Involving the Use of Information Technology in New Surgical Applications: Telesurgery and Surgical Telementoring." *Acta Bioethica* 24, no. 2 (December 2018): 167–79. <https://doi.org/10.4067/S1726-569X2018000200167>

¹² Steve Sternberg. "Medical Errors Are Third Leading Cause of Death in the US 2016." *U.S. News and World Report*, 2016.

¹³ Jay Kalra et al. "Enhancing the Quality and Delivery of Healthcare: A Decade Review of Autopsy Data." (2022). <https://doi.org/10.54941/ahfe1002103>.

¹⁴ Rocco, Bernardo, et al. "Insights from Telesurgery Expert Conference on Recent Clinical Experience and Current Status of Remote Surgery." *Journal of Robotic Surgery* 18, no. 1 (2024): 240.

¹⁵ Misra, Sidharth, et al. "Telesurgery across Continents: A Scoping Review." *Journal of Robotic Surgery* 19, no. 1 (2025): 1–17.

be across countries or even continents.¹⁶ When a medical error occurs during telesurgery, a critical issue is determining which country's jurisdiction holds authority. This becomes even more complex if one country prohibits telesurgery while another permits it. Establishing criminal liability is also crucial in enforcing the law when surgical failures result from errors by a legal subject. To make telesurgery more effective, it is imperative to strengthen ethical and legal standards. Developing robust national and international policies is essential to address the challenges posed by differing regulations across countries and geographical regions.¹⁷ Kaspar Rosager Ludvigsen and Shishir Nagaraja conducted a study titled *"Dissecting Liabilities in Adversarial Surgical Robot Failures: A National (Danish) and EU Law Perspective."* The study found that a patient compensation system could serve as a viable model for addressing losses. Under this system, patients can apply free of charge to the Danish Patient Compensation Association and receive full compensation. If a machine malfunctions, the patient is entitled to appropriate compensation regardless of the cause.¹⁸

Several researchers have previously explored the legal aspects of telesurgery. Alice Guerra, Francesco Parisi, and Daniel Pi authored a study titled *"Liability for Robots I: Legal Challenges."* In this study, the researchers highlight new issues arising from robot malfunctions and assess the institutional opportunities and legal challenges legislators must address to regulate robot-related lawsuits. Building on existing research and employing an economic model, the study proposes a new liability regime that combines strict manufacturer responsibility regulations with negligence-based regulations to provide optimal incentives for robot-related lawsuits.¹⁹ Suryo Wahyu Raharjo, Pujiyono Suwadi, and Widodo Tresno Novianto conducted research titled *"An Ideal Regulatory Framework for Robotic Surgery Utilization in Indonesia."* The study's findings suggest that if

¹⁶ Man Li Jin et al. "Telemedicine, Telementoring, and Telesurgery for Surgical Practices." *Current Problems in Surgery* 58, no. 12 (December 2021): 100986. <https://doi.org/10.1016/j.cpsurg.2021.100986>.

¹⁷ Jianmin Li et al. "Application of Improved Robot-Assisted Laparoscopic Telesurgery with 5G Technology in Urology." *European Urology* 83, no. 1 (January 2023): 41–44. <https://doi.org/10.1016/j.eururo.2022.06.018>

¹⁸ Kaspar Rosager Ludvigsen and Shishir Nagaraja. "Dissecting Liabilities in Adversarial Surgical Robot Failures: A National (Danish) and EU Law Perspective." *Computer Law & Security Review* 44 (April 2022): 105656. <https://doi.org/10.1016/j.clsr.2022.105656>.

¹⁹ Alice Guerra, Francesco Parisi, and Daniel Pi. "Liability for Robots I: Legal Challenges." *Journal of Institutional Economics* (November 25, 2021): 1–13. <https://doi.org/10.1017/S1744137421000825>.

the Artificial Intelligence (AI) system developed by a third party has shortcomings, the use of robotic surgery in clinical settings could lead to significant issues. Virus-infected systems, systems that are rarely updated, and doctors who do not have the skills needed to perform robotic surgery are some examples of these risks. Thus, it is essential to form a special committee consisting of legal specialists, medical professionals and government representatives, whose task is to examine errors made during robotic surgical procedures.²⁰

Another study addressing the legal aspects of telesurgery is “*Cybersecurity, Safety, and Robots: Strengthening the Link Between Cybersecurity and Safety in the Context of Care Robots*” by Eduard Fosch-Villaronga and Tobias Mahler. This paper explores the interaction between robots, cybersecurity, and safety from a European legal perspective. While telesurgery is not specifically governed by European law, several overlapping regulatory requirements focus on particular areas, such as the safety of medical devices and products. Additionally, the cybersecurity certification framework established by the recently passed European Cybersecurity Act can be used to define cybersecurity standards for robots. However, specific requirements for cyber-physical systems have not yet been established. The study concludes that to ensure robots are safe to operate, policymakers should consider cybersecurity as an integral aspect of safety.²¹ Davorin Pichler and Josip Juraj Strossmayer examine “*Civil Liability for Damage Caused by a Robot When Performing a Medical Procedure*.” The study's findings highlight the need to determine the appropriate liability model for errors caused by robots in medical procedures. The key issue is whether a subjective liability system, based on fault (guilt), or an objective liability system, which does not assign fault to the individual responsible for the injury, should be applied. The study concludes that legislative intervention is urgently required within the Croatian legal system to address the growing use of robots in medicine.²²

²⁰ Suryo Wahyu Raharjo, Pujiyono Suwadi, and Widodo Tresno Novianto. “An Ideal Regulatory Framework for Robotic Surgery Utilization in Indonesia.” (2024): 640–43. https://doi.org/10.2991/978-2-38476-218-7_106

²¹ Eduard Fosch-Villaronga and Tobias Mahler. “Cybersecurity, Safety and Robots: Strengthening the Link between Cybersecurity and Safety in the Context of Care Robots.” *Computer Law & Security Review* 41 (July 2021): 105528. <https://doi.org/10.1016/j.clsr.2021.105528>.

²² Davorin Pichler and Dražen Tomić. “Civil Liability for Damage Caused by a Robot When Performing a Medical Procedure.” *Zbornik Radova Pravnog Fakulteta Nis* 60, no. 91 (2021): 211–25. <https://doi.org/10.5937/zrpfno-33944>.

Telesurgery is a component of telemedicine. The regulatory framework for telemedicine in Indonesia is outlined in the Law of the Republic of Indonesia Number 17 of 2023 concerning Health (hereinafter referred to as the Health Law), Government Regulation Number 28 of 2024 concerning the Implementing Regulations of the Health Law (hereinafter referred to as the Government Regulation on Health), and Regulation of the Minister of Health Number 20 of 2019 concerning the Implementation of Telemedicine Services Between Health Service Facilities (hereinafter referred to as the Ministerial Regulation on Telemedicine Services). However, Indonesian health law does not yet include specific provisions for this emerging surgical technology. Therefore, researching the "Legal Construction of Telesurgery in National Health Law" is of significant interest.

The method is written in descriptive and should provide a statement regarding the methodology of the research. This method as much as possible to give an idea to the reader through the methods used. Both Research and Review Article should explain the method. For the research article it is clear the method should describe the location of the study, the data collection method, and how the data were analyzed. Meanwhile, in the Review Article, the method is written descriptively regarding the topic being analyzed, what theories and laws are used to analyze the topic and the limitations of the study.

This study is a normative legal analysis that examines the lack of norms regulating telesurgery within national health law. It delves into the legal construction of telesurgery and the legal responsibilities that arise in the event of an error during the procedure. The research approach is carried out using a multidisciplinary approach that helps understand normative issues and legal practices in a broader legal, medical, technological and management context, thus producing research that is more holistic and relevant to the needs of society. A literature review is employed as the method for collecting both primary and secondary legal sources. The primary legal materials include the Health Law, the Government Regulation on Health, and the Ministerial Regulation on the Provision of Telemedicine Services Between Health Service Facilities. The secondary legal materials consist of research studies on telesurgery, as well as various works exploring the legal and ethical aspects of health law. The research approach is based on a legislative and legal conceptual framework, with qualitative analysis used to present normative discussions and conclusions, ultimately offering recommendations.

The Legal Construction of Telesurgery Regulations

1. *Development of Telesurgery within the Legal Framework*

Following main headings should be provided in the manuscript while preparing. Tables and Figures are presented center and cited in the manuscript. The figures should be clearly readable and at least have a resolution of 300 DPI (Dots Per Inch) for good printing quality. Table made with the open model (without the vertical lines) as shown below:

Telesurgery, also known as robotic telesurgery, derives from the Greek words *tele*, meaning "far," and *cheirurgia*, meaning "working with the hands."²³ It is a rapidly evolving surgical intervention that "uses wireless networks and robotic [surgical] technology to enable surgeons to operate on patients far from home." Specifically, it allows surgeons to connect conventional surgical systems to the Internet to provide services worldwide.²⁴ Robotic-assisted surgical procedures are becoming increasingly common in hospitals due to their numerous advantages. In some cases, this robotic technology represents a highly advanced version of laparoscopic techniques, while in others, it enables procedures that were previously unattainable with laparoscopic methods.²⁵

The concept of robotic telesurgery originated in the 1970s when the National Aeronautics and Space Administration (NASA) initiated a project to develop remotely controlled robots for operating on astronauts. The true potential of remote telesurgery began to be realized in the 1980s and 1990s, driven by significant advancements in telecommunications and robotic surgery. These technological breakthroughs made telesurgery a practical reality, ushering in a new era of surgical innovation.²⁶

²³ Gualter de Medeiros Sousa and Arnaldo Manuel Pinto Santos. "The Viability of Telesurgery Service in the Autonomous Region of the Azores, Supported by the 5G Network." *Procedia Computer Science* 219 (2023): 422–30. <https://doi.org/10.1016/j.procs.2023.01.308>.

²⁴ Vipul Patel et al. "Technical and Ethical Considerations in Telesurgery." *Journal of Robotic Surgery* 18, no. 1 (January 17, 2024): 40. <https://doi.org/10.1007/s11701-023-01797-3>.

²⁵ De Paola, L., et al. "Legal and Forensic Implications in Robotic Surgery." *La Clinica Terapeutica* 176, no. 2 (2025).

²⁶ Paola Picozzi et al. "Telemedicine and Robotic Surgery: A Narrative Review to Analyze Advantages, Limitations and Future Developments." *Electronics* 13, no. 1 (December 28, 2023): 124. <https://doi.org/10.3390/electronics13010124>.

In 1985, Kwoh et al. employed the Puma 200 robot to perform neurosurgical biopsies with enhanced precision, marking the beginning of robotic surgery. Shortly thereafter, in 1988, PROBOT, a robotic device designed for ultrasound-guided prostate resections, was introduced.²⁷ A major milestone in the field was the Lindbergh Operation, the first transatlantic telesurgical procedure, performed on September 7, 2001. During this groundbreaking event, Professor Jacques Marescaux conducted a telerobotic cholecystectomy on a patient in Strasbourg, France, while operating from New York City. The procedure, completed in 54 minutes without complications, demonstrated the feasibility and safety of remote surgical interventions.²⁸ Since the Lindbergh Operation, telesurgery has been successfully performed in various locations worldwide, achieving consistently positive outcomes and paving the way for further advancements in this revolutionary field.

Furthermore, studies have shown that the NATO Ministry was among the first to develop robotic-assisted surgery, driven by the necessity of providing medical assistance to soldiers on the battlefield. In California, Phil Green pioneered a system designed for use on the battlefield, which included a surgical table equipped with two cameras and a telerobot. The cameras transmitted surgical images to a remote computer, where a surgeon operated the telerobot.²⁹ Revolutionary master-slave systems emerged in the 1990s. One prominent example is the da Vinci robot developed by Intuitive Surgical Inc. The second-generation robot, the "Mona" prototype, became the first surgical platform used in human trials to perform cholecystectomy in 1997.³⁰ The Zeus and da Vinci telerobotic surgical systems allow for remote operation by a single surgeon. The telerobot holds a camera, replaces both of the surgeon's hands with robotic instruments, and acts as a master-slave for the surgeon.³¹

²⁷ Kementerian Kesehatan Republik Indonesia. *Kurikulum Pelatihan Pemeliharaan Alat Robotik Telesurgery bagi Elektromedia di Rumah Sakit*. Jakarta: Direktorat Jenderal Tenaga Kesehatan & Direktorat Peningkatan Mutu Tenaga Kesehatan, 2022.

²⁸ Barbara Seeliger and Jacques Marescaux. "Robot-Assisted Laparoscopic Telesurgery: From Inception to Future Perspectives." *秀傳醫學雜誌* 22 (December 1, 2023): 454–59. [https://doi.org/10.30185/SCMJ.202312_22\(3\).0018](https://doi.org/10.30185/SCMJ.202312_22(3).0018).

²⁹ Farid Gharagozloo et al. "History of Robotic Surgery." In *Robotic Surgery*, 21–29. Cham: Springer International Publishing, 2021. https://doi.org/10.1007/978-3-030-53594-0_3.

³⁰ Jiang, Aimin, et al. "Current Application Status and Innovative Development of Surgical Robot." *Med Research* (2025).

³¹ Ballantyne, Garth H. "Robotic Surgery, Telerobotic Surgery, Telepresence, and Telementoring." *Surgical Endoscopy and Other Interventional Techniques* 16, no. 10 (2002): 1389–1402.

Since the early 2000s, robotic-assisted surgery has experienced significant global growth due to its numerous proven advantages. These benefits include enhanced surgical precision, superior three-dimensional visualization of the surgical field, and advanced ergonomics that reduce operator discomfort and fatigue. Robotic surgery has also been associated with lower transfusion rates, fewer wound complications, faster recovery times, shorter hospital stays, and an expedited return to work for patients.³²

The application of telerobotic surgery in gastrointestinal surgery began with remote surgical assistance and was first successfully demonstrated in 2001 by Marescaux et al. In this landmark procedure, known as a transatlantic cholecystectomy, New York-based surgeons operated remotely on a patient in Strasbourg, traveling a round-trip distance of over 14,000 kilometers (km). The operation was completed in just 54 minutes using a dedicated asynchronous transfer mode (ATM) communication service, with an average transmission latency of only 155 milliseconds (ms).³³

Telesurgery, a subset of telemedicine, is a remote surgical procedure performed by a surgeon or surgical team located at any distance from the patient and operating room. This innovative diagnostic and treatment approach leverages robotic and electronic medical equipment to provide optimal care at a location separate from the patient.³⁴ Despite its invention over two decades ago, remote telesurgery remains a relatively novel technology.³⁵ In Indonesia, a group of urologists successfully performed the nation's first telesurgery. The procedure was conducted from the I.G.N.G. Ngoerah Hospital in Bali while the patient was located at RSCM Jakarta, approximately 1,200 kilometers away.³⁶

³² N. D. Perera and R. E. Wickramarachchi. "Asia's Robotic Revolution: Redefining Affordable Surgery and Challenging Da Vinci's Legacy." *Sri Lanka Journal of Urology* 15, no. 1 (November 22, 2024): 1–13. <https://doi.org/10.4038/slju.v15i1.4107>.

³³ Ding, Yichen, et al. "Telerobotic Surgery: A Comprehensive Two-Decade Evolution and the Integration of Emerging Technologies." *International Journal of Surgery* (n.d.): 10–1097.

³⁴ Sohail Iqbal et al. "SecureSurgiNET: A Framework for Ensuring Security in Telesurgery." *International Journal of Distributed Sensor Networks* 15, no. 9 (September 5, 2019): 155014771987381. <https://doi.org/10.1177/1550147719873811>

³⁵ Patrick Barba et al. "Remote Telesurgery in Humans: A Systematic Review." *Surgical Endoscopy* 36, no. 5 (May 4, 2022): 2771–77. <https://doi.org/10.1007/s00464-022-09074-4>.

³⁶ Antaranews.com. "Indonesian Urologist Successfully Performs First Telerobotic Surgery." *Antara News*, August 30, 2024. <https://en.antaranews.com/news/324155/indonesian-urologist-successfully-performs-first-telerobotic-surgery>.

Telesurgery in Indonesia complies with citizens' fundamental rights to access quality healthcare facilities. Article 28 H (1) of the 1945 Constitution of the Republic of Indonesia states, "Everyone has the right to live in physical and spiritual prosperity, to have a place to live, and to have a good and healthy living environment and the right to obtain health services." Fulfilling the right to health for the people of Indonesia as much as possible is indeed not easy to implement directly. The difficulties that the large nation of Indonesia faces include limited access to transportation and a shortage of medical professionals to treat patients. The use of technology is very necessary to reach and facilitate the provision of medical services.

Although telesurgery has been successfully performed in Indonesia, there is currently no established legal framework supporting this technique. Specifically, there is no explicit regulation governing telesurgery in Indonesia. The Regulation of the Minister of Health on the Implementation of Telemedicine Services Between Health Service Facilities does not directly address telesurgery. According to this regulation, telemedicine is defined as the practice of healthcare professionals utilizing information and communication technology to provide remote health services. This includes sharing information related to disease and injury prevention, diagnosis, treatment, research, evaluation, and ongoing education for healthcare providers, with the aim of improving the health of individuals and communities.³⁷ While telemedicine could encompass the use of robotic surgical methods, the regulation limits its scope to consultations for the purposes of establishing diagnoses, treatments, and/or disease prevention. Consequently, the regulation does not explicitly address the broader application of telesurgery within the healthcare system.³⁸ This means that the practice of telerobotic surgery in Indonesia is being carried out without a clear legal framework. This will create legal issues if untoward circumstances arise.

Telesurgery has experienced development and expansion beyond regional boundaries, even across national borders. The presence of a legal and ethical framework is urgently needed to guarantee patient rights and protect surgeons performing these medical procedures. The lack of regulation regarding tele

³⁷ "Article 1 Number 1 of the Regulation of the Minister of Health of the Republic of Indonesia Number 20 of 2019 Concerning the Implementation of Telemedicine Services Between Health Service Facilities," 2019.

³⁸ "Article 1 Number 2 of the Regulation of the Minister of Health of the Republic of Indonesia Number 20 of 2019 Concerning the Implementation of Telemedicine Services Between Health Service Facilities," 2019.

surgical procedures demonstrates a gap between the technology's potential and practical applications in medicine and the legal framework that should protect them. This medical procedure requires urgent regulatory and policy adaptations to support its responsible growth. The reliance on advanced robotic surgical platforms and real-time digital communications requires a multidisciplinary approach to regulation. The interplay between medical ethics, international law, cybersecurity, and telecommunications standards underscores the multifaceted nature of cross-border telesurgery.³⁹

2. The Legal Construction of Telesurgery

The development of surgical robots and the latest network telecommunication technology has opened new doors for Telerobotic Surgery.⁴⁰ Telesurgery is a new surgical tool that uses robotic technology and wireless networks to connect geographically distant patients and surgeons. Telesurgery uses a form of networked robot control. Even though the robot does the surgery, the surgeon controls it directly using a robotic system that the surgeon controls from a distance.⁴¹ This technology helps address the existing scarcity of surgeons and removes geographic obstacles that hinder quick, high-quality surgeries as well as the costs, difficulties, and frequently dangerous long-distance travel. This system also helps improve surgical precision and ensures the surgeon's safety.⁴²

With no actual interaction, the distance between the patient and the surgeon is the primary sign of telesurgery, which can raise doubts on both sides. The application of telemedicine must adhere to the same ethical standards that underpinned medicine prior to the use of this novel technology. However, the details of this medical advancement bring up a number of moral dilemmas that have just recently surfaced a few years after it was put into practice. These problems include the impact on the patient-doctor relationship, including the loss of direct physical contact between the professional and the patient, which

³⁹ Elendu, Chukwuka, et al. "The Legal and Ethical Considerations in Cross-Border Telesurgical Procedures." *Annals of Medicine and Surgery* 87, no. 6 (2025): 3660–72.

⁴⁰ Nakauchi, Masaya, et al. "Establishment of a New Practical Telesurgical Platform Using the Hinotori™ Surgical Robot System: A Preclinical Study." *Langenbeck's Archives of Surgery* 407, no. 8 (2022): 3783–91.

⁴¹ Anmol Mohan et al. "Telesurgery and Robotics: An Improved and Efficient Era." *Cureus*, March 26, 2021. <https://doi.org/10.7759/cureus.14124>.

⁴² Angelescu Valeriu. "Telesurgery and Robotic Surgery: Ethical and Legal Aspect." *Journal of Community Medicine & Health Education* 5, no. 3 (2015). <https://doi.org/10.4172/2161-0711.1000355>.

can cause depersonalization. In many instances, when surgery is done online, the surgeon and patient make physical touch. Traditionally, surgery is done at a distance of millimetres or millimetres from the patient.⁴³

It is also crucial to broaden the conversation to cover ethical, economic, regulatory, and legal issues prior to telesurgery being used in the field of robotic surgery. In this case, the members of our cooperative telesurgery community collaborate to address and develop industry best practices.⁴⁴ The ethical guidelines for medical practice, which include data collecting and storage, privacy, and device security, do not change whether telesurgery or robotically assisted surgery is used. Legal and ethical aspects must be improved to ensure professional accreditation and medical qualifications and unify standards of practice to avoid limiting patient access to robotic surgery services. Since the code of medical ethics is a component of the general ethics that govern society, its application must not conflict with either the medical code or the general code of ethics.⁴⁵ As telesurgery continues to evolve, understanding the knowledge, attitudes, and awareness of healthcare professionals is critical to its successful integration into medical practice.⁴⁶

It can be suspicious to receive medical care from a surgeon who does not interact with the patient in person. On the one hand, the emergence of telesurgery has created political and geographical limitations that must be overcome. Due to state and national legal differences, it has brought up a number of ethical and legal concerns.⁴⁷ One state's laws may conflict with the laws of another, giving rise to a legal conflict. In this case, many situations can arise. One possibility to think about is that it is unlawful for a healthcare professional who is licensed to work only in their jurisdiction to provide services in another jurisdiction. There are also situations where a country has no regulation at all regarding the practice of telesurgery. Numerous situations could arise in this situation, such as an intervention being permitted in one state

⁴³ Karolin, Yolanda Nindiya, and Adianto Mardijono. "Regulasi Penggunaan Teknologi Robotik Telesurgery dalam Praktik Kedokteran."

⁴⁴ Bernardo Rocco et al. "Insights from Telesurgery Expert Conference on Recent Clinical Experience and Current Status of Remote Surgery." *Journal of Robotic Surgery* 18, no. 1 (June 4, 2024): 240. <https://doi.org/10.1007/s11701-024-01984-w>

⁴⁵ R. A. Siregar. *Hukum Kesehatan Jilid 1*. Jakarta: Uki Press, 2020.

⁴⁶ Bilawal, Makhdoom, et al. "Knowledge, Attitudes, and Awareness of Telesurgery and Robotic Surgery among Medical Students and Health Professionals in Karachi, Pakistan: A Cross-Sectional Study." *Journal of Robotic Surgery* 19, no. 1 (2025): 1–14.

⁴⁷ Mohan et al. "Telesurgery and Robotics: An Improved and Efficient Era."

but prohibited in another, or one state's laws being more advantageous than another.

Telesurgery, a form of robot-assisted surgery, involves the surgeon controlling a robot remotely, without being in the same operating room as the patient or the rest of the operating room (OR) team. Using a surgical robot, the surgeon operates from a controller located outside the sterile area. The surgeon manipulates one or more robotic arms attached to surgical instruments, which are inserted into the patient through "trocars"—small tubes connected to body ports.⁴⁸ A surgical robot is defined as a computer-controlled, powered manipulator equipped with programmable artificial senses designed to move and position instruments for performing various surgical tasks. Instead of standing beside the patient, the surgeon conducts the procedure from a remote console. As a result, unlike traditional open surgery or minimally invasive surgery, all forms of robot-assisted surgery can be classified as a type of "remote" surgery. The use of a surgical robot increases the physical distance between the surgeon, the patient, and the other members of the OR team.⁴⁹ The use of robots in surgical procedures raises legal issues regarding jurisdiction. Jurisdiction is the legal power or authority a country has to create, implement, and enforce laws against a specific person. Therefore, jurisdiction refers to two things: which country's laws are applied and which court in that jurisdiction has jurisdiction to adjudicate.

In traditional medical procedures, jurisdiction is typically determined based on the location of the healthcare provider or institution where the care is provided. However, in telesurgery, the physical separation between patient and surgeon complicates this determination. For example, if a surgeon in the United States operates on a patient in India using a robotic system, it may be unclear whether US or Indian law governs the procedure. This ambiguity can lead to disputes about liability, malpractice claims, and the enforcement of legal judgments.⁵⁰ The next legal concern that may arise is if a professional makes a mistake during the operation, which legislation should be used, and in which court? Traditionally, criminal law has a territorial principle. The territorial

⁴⁸ D. M. Herron and M. Marohn. "A Consensus Document on Robotic Surgery." *Surgical Endoscopy* 22, no. 2 (February 28, 2008): 313–25. <https://doi.org/10.1007/s00464-007-9727-5>.

⁴⁹ Pieter Duysburgh, Shirley A. Elprama, and An Jacobs. "Exploring the Social-Technological Gap in Telesurgery." In *Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 1537–48. New York, NY: ACM, 2014. <https://doi.org/10.1145/2531602.2531717>

⁵⁰ Elendu, Chukwuka, et al. "The Legal and Ethical Considerations in Cross-Border Telesurgical Procedures." *Annals of Medicine and Surgery* 87, no. 6 (2025): 3660–72.

principle holds that criminal jurisdiction depends on the place where the crime occurred. This means that the country in whose territory the crime occurred has jurisdiction over the crime.⁵¹ The territorial principle certainly cannot be applied immediately in cases of errors in telesurgery practices. The most commonly recognized view of the legal relationship between doctors and patients with regard to these situations is that the law of the nation in which the patient resides should be applied. Some contend that during the procedure, the patient is "transported" by the physician. As a result, the laws of the nation in which the doctor practices must be followed. However, the law does not support the latter interpretation.

The resolution of which country's jurisdiction is used if there is a legal problem in the implementation of telesurgery must be resolved at the international level. Several scenarios can be done to overcome legal and ethical obstacles in telesurgery. First, the WHO can initiate an international agreement between countries to form a commitment and take policies that encourage countries worldwide to formulate regulations in telesurgery. Second, in order to offer precise and globally applicable regulations to govern the practice of telesurgery, the telemedicine community needs to establish an ad hoc international committee to handle this and other legal concerns.⁵² Third, through guidelines created by the International Society of Surgeons.

The rapid development of telesurgery must be balanced with the legal construction of this surgical method. A legal framework permitting remote surgical help under a surgeon's supervision was established in Japan in 2019. Telerobotic surgery techniques were legalized in 2019.⁵³ The Japanese "Telesurgery Guidelines" were developed in June 2022 through a collaborative effort led by the Japan Surgical Society, with contributions from multiple stakeholders, to conduct social verification tests for telesurgery. These guidelines outline the requirements for robotic systems, medical teams, communication environments, and safety measures for maintaining secure communication connections. They also address the allocation of responsibilities, financial implications, and procedures for managing adverse outcomes during telesurgery.

⁵¹ R. M. Perkins. "The Territorial Principle in Criminal Law." *Hastings Law Journal* (1970). https://repository.uclawsf.edu/hastings_law_journal/vol22/iss5/2.

⁵² Jacques Marescaux et al. "Transcontinental Robot-Assisted Remote Telesurgery: Feasibility and Potential Applications." *Annals of Surgery* 235, no. 4 (April 2002): 487–92. <https://doi.org/10.1097/00000658-200204000-00005>.

⁵³ Hakamada, Kenichi. "Surgical Education through Integration of Robotic Telesurgical Technology and AI." *Annals of Gastroenterological Surgery* 7, no. 6 (2023): 846.

In addition to full telesurgery, the guidelines also encompass telementoring practices. It is anticipated that these recommendations will be periodically updated to reflect the evolving use of telesurgery, advancements in surgical robots, and progress in information technology.⁵⁴

Telesurgery can be divided into three stages: telementoring, where only instructions are given remotely; telesurgical support, where the actual surgery is performed remotely; and full telesurgery, where all surgery is performed remotely, in a doctor-less environment, such as in space or the deep sea. Currently, Japan has legally approved telesurgical support, where operations are performed remotely with the assumption of a surgeon on-site.⁵⁵ From the surgeon's perspective, robotic surgery allows for a more controlled surgical experience. The precision and dexterity of instruments allow for better tissue handling. Equipped with tremor-filtering technology and stabilized cameras, surgeons can handle more complex cases with a higher level of skill.⁵⁶

Indonesia is one of the countries that does not yet have specific regulations regarding telesurgery. Article 274 of the Health Law only regulates the obligation to provide health services. When performing their duties, medical and health personnel must deliver healthcare in compliance with patient health demands as well as professional standards, operational process standards, professional ethics, and professional service standards. This provision only regulates medical services to patients who meet professional service standards and does not specifically regulate the use of remote surgery. Another important telesurgery issue is legal considerations, especially in licensing matters, including the standardization of hospitals and health workers in telesurgery practices.

Robotic surgery must consider several factors, namely clinical evaluation of the benefit/risk ratio, real economic sustainability, adequate patient information (informed consent), determination of responsibility for malpractice (surgeon, designer, manufacturer), and training for professional medical personnel in robotic surgery.⁵⁷ Compliance with various medical regulations is very important. This is very important considering that

⁵⁴ Masaki Mori et al. "Clinical Practice Guidelines for Telesurgery 2022." *Surgery Today* 54, no. 8 (August 3, 2024): 817–28. <https://doi.org/10.1007/s00595-024-02863-5>.

⁵⁵ Hakamada, Kenichi, and Masaki Mori. "The Changing Surgical Scene: From the Days of Billroth to the Upcoming Future of Artificial Intelligence and Telerobotic Surgery." *Annals of Gastroenterological Surgery* 5, no. 3 (2021): 268.

⁵⁶ Obstetrics, Gynaecology & Reproductive Medicine. 収録起迄年: 2007–Present, 2009.

⁵⁷ De Paola, L., et al. "Legal and Forensic Implications in Robotic Surgery." *La Clinica Terapeutica* 176, no. 2 (2025): 233–40.

telesurgery can not only be performed in surgery in one country but can also reach surgery in other countries. This means that there needs to be international licensing and certification for hospitals and health workers who will carry out telesurgery practices.

Provisions specifically addressing telesurgery are not yet included in the Government Regulation on Health. Article 561 of the regulation defines the types of telemedicine services as: a. teleconsultation, b. telepharmacy, and c. other telemedicine services aligned with advancements in science and technology. Additionally, Article 3 of the Regulation of the Minister of Health on the Implementation of Telemedicine Services Between Health Service Facilities elaborates on telemedicine services, which include: a. teleradiology, b. teleelectrocardiography, c. teleultrasonography, d. clinical teleconsultation, and e. other telemedicine consultation services that align with developments in science and technology. However, in practice, Indonesia already has two hospitals with robotic surgery training centers in Indonesia, namely Hasan Sadikin Hospital, Bandung and Sardjito Hospital, Yogyakarta.⁵⁸

Telesurgery presents many interdisciplinary challenges, including important technical and non-technical considerations, such as cybersecurity, ethics, finance, and regulation.⁵⁹ The absence of regulations regarding telesurgery indicates a lack of regulations governing medical services between doctors and patients through this surgical method. Telesurgery only relies on conventional legal standards, which can cause legal uncertainty. Surgeons' licensing is also a legal issue that must be resolved. Regulations regarding cross-border licensing need to be concretely regulated. Are surgeons performing remote surgery required to be licensed in the country or location where the patient is operated on? This legal question will guide the formulation of a licensing mechanism for telesurgery. Medical practice standards in the location where the surgeon performs telesurgery and where the patient is located also need to be regulated.

In terms of ethics, telesurgery will be subject to the medical code of ethics, which states that practitioners must always give patients the opportunity to communicate with their advisors and families while providing competent care

⁵⁸ Reno Rudiman, Alireza Mirbagheri, and Valeska Siulinda Candrawinata. "Assessment of Robotic Telesurgery System among Surgeons: A Single-Center Study." *Journal of Robotic Surgery* 17, no. 6 (2023): 2757–61.

⁵⁹ Sumeet Kumar Reddy et al., "Telesurgery: A Systematic Literature Review and Future Directions," *Annals of Surgery* 282, no. 2 (2025): 219–227.

with complete technical and moral autonomy and compassion.⁶⁰ Ethics in the modern medical profession will be challenged by the absence of communication between physicians and patients, as well as their advisors and families. The reduction in direct physical contact between surgeons and patients will have implications for changes in the informed consent model. In health law, the term informed consent is known, where according to Article 274 of the Law on Health, Medical Personnel and Health Workers in carrying out practice are required to: b. obtain consent from the patient or their family for the procedure to be performed. Robotic telesurgery raises concerns about patient autonomy and informed consent. Given the complexity and novelty of remote surgery, patients may not fully understand the potential risks associated with procedures performed by remote surgeons.⁶¹

Traditional informed consent models, which focus on explaining the risks and benefits of a particular procedure, need to be balanced with information about the potential privacy risks associated with creating a digital copy of the patient that will be collected, stored, used, and shared.⁶² The consent process should outline the type of surgery to be performed, the team and center involved, the role of the remote surgeon and the responsibilities of the local surgical team at each step of the procedure, how potential complications will be addressed, and clearly define the patient's expectations and preferences for handling unexpected events. This collaborative approach fosters trust between patients and their surgical teams and can ensure ethical and professional standards are maintained in this rapidly evolving field.⁶³

In addition to jurisdictional concerns and the rules governing doctor-patient relationships, the legal framework for telesurgery in national health law also encompasses aspects of consumer protection and insurance law. The matter remains contentious for insurance companies, as insurance plans vary from one company to another, and policies typically cover only specific medical issues. Consequently, each medical facility must select the insurance plan that best fits its operations. Hospitals can negotiate insurance contracts

⁶⁰ Article 8 and Article 15 of the Indonesian Code of Medical Ethics, 2012, <http://mkekidi.id/wp-content/uploads/2016/01/KODEKI-Tahun-2012.pdf>.

⁶¹ Xin Xie et al., "Surgery without Distance: Will 5G-Based Robot-Assisted Telesurgery Redefine Modern Surgery?," *Translational Lung Cancer Research* 14, no. 5 (2025): 1821.

⁶² P. Omid and F. Soren, "The Digital Double: Data Privacy, Security, and Consent in AI Implants," *Digital Journal of Engineering Science and Technology* 2, no. 1 (2025): 105.

⁶³ Marcio Covas Moschovas, Mischa Dohler, and Vipul Patel, "Telesurgery: Challenges, Ethical Considerations, and Opportunities in the Robotic Surgery Era," *European Urology Focus* 11, no. 1 (2025): 40–42.

with particular companies and tailor them to meet their needs.⁶⁴ It is crucial to adapt insurance coverage to ensure that malpractice policies specifically address the unique risks associated with telesurgery. As the regulatory landscape evolves, collaboration is required to balance patient welfare with innovation. Ultimately, the ethical and secure integration of telesurgery into broader healthcare systems depends on a proactive legal strategy.⁶⁵ Insurance companies, in protecting their policyholders, must also recognize telesurgery as a claimable medical procedure.

In conducting telesurgery practices, specific regulations are required regarding telesurgery technology standards, including standardization of the security of surgical robots and communication systems, as well as patient medical data. Challenges such as data security and connectivity delays require robust security measures, innovative solutions, and a secure and robust framework for telesurgery systems.⁶⁶ Transmitted data includes incoming and outgoing traffic to identify malicious commands. Regulations to ensure robust security and maintain patient privacy are crucial in ensuring the maintenance of medical confidentiality.⁶⁷ Connectivity delays can lead to surgical failure, which will have implications for legal liability. Ensuring signal stability is crucial in this type of surgery.

The practice of telesurgery should be regulated by law, derived from policy regulations, and regulated by internal guidelines from surgeons. Some recommended regulatory elements are as follows:

TABLE 1. Draft Telesurgery regulatory framework

No	Substance Regulation	Details
1.	Jurisdiction	Regulations regarding jurisdiction and legal territory when telerobotic surgery is performed across national or regional borders. The recommended model is the jurisdiction where the patient is located. The applicable law is the law of the country where the patient is located. The competent court is the court in the jurisdiction where the patient is located.

⁶⁴ S. M. Saceanu et al., "Telesurgery and Robotic Surgery: Ethical and Legal Aspect," *Journal of Community Medicine & Health Education* 5, no. 3 (2015), <https://doi.org/10.4172/2161-0711.1000355>.

⁶⁵ Picozzi et al., "Telemedicine and Robotic Surgery: A Narrative Review to Analyze Advantages, Limitations and Future Developments."

⁶⁶ Rhythm Matchiswala et al., "Blockchain-Based Network Security Analysis Framework for Telesurgery Systems in Healthcare," *Security and Privacy* 8, no. 2 (2025): e70017.

⁶⁷ S. Punitha and K. S. Preetha, "Enhancing Reliability and Security in Cloud-Based Telesurgery Systems Leveraging Swarm-Evoked Distributed Federated Learning Framework to Mitigate Multiple Attacks," *Scientific Reports* 15, no. 1 (2025): 27226.

2.	Ethics Committee of the Surgeon's Organization	The host country must have an ethics committee to draft legal regulations, implement laws, and enforce laws regarding telesurgery. At the national level, these guidelines can be developed by the surgeon's association in the relevant country, while the practice of cross-border telesurgery must be agreed upon by the International Society of Surgeons.
3.	Inter-ministerial Collaboration:	Several ministries that can be involved are the Ministry of Health, the Ministry of Home Affairs, the Ministry of Communications, the Ministry of Manpower, and national research institutions.
4.	Patient-physician Legal Relationship:	The patient-physician relationship in telesurgical support. The local surgeon must treat the patient directly as the attending physician or equivalent. On the other hand, the remote surgeon can participate in telesurgical support without previously being involved in direct patient care.
5.	Preoperative explanation to the patient and provision of informed consent.	Patient consent for robotic surgery requires disclosure of the risks associated with remote procedures, including the potential for technical failure. Surgeons can ensure robust and interactive consent procedures, including video consultations and digital tutorials, can address these concerns and enhance understanding of the technology and its limitations. ⁶⁸ The informed consent process can involve three parties: the remote surgeon, the local surgeon, and the patient. Informed consent protocols must evolve to reflect the increasing complexity of these procedures, especially as machine learning algorithms continue to influence decision-making and surgical trajectories.
6.	Legal Liability.	Regulations regarding telerobotic surgery include the allocation of liability (criminal, civil, and administrative), costs, and the handling of adverse events during telesurgery.
7.	Medical Confidentiality.	Provisions regarding medical confidentiality must include the legal obligations of healthcare facility providers, medical and healthcare personnel, and record-keeping personnel to maintain patient confidentiality. Healthcare facilities must ensure patient privacy and provide provisions regarding archiving.
8.	Medical Team Requirements.	Regulations regarding telesurgery must include requirements for the medical team, such as surgeon certification, nurse certification, and operator qualifications. This will also relate to the licensing of

⁶⁸ Xin Xie et al., "Surgery without Distance: Will 5G-Based Robot-Assisted Telesurgery Redefine Modern Surgery?," *Translational Lung Cancer Research* 14, no. 5 (2025): 1821.

		doctors performing telesurgery and the standards of medical services between hospitals providing telesurgery.
9.	Information security management systems	Healthcare facilities must ensure the security of communication channels, and each collaborating healthcare facility must have equivalent and adequate security standards. Surgeon organizations can develop Safety Management Guidelines for Information System and Service Providers that Handle Medical Information.
10.	Insurance.	Insurance companies, in providing protection to their customers, are also required to list this surgical method as a claimable medical procedure.

Sources: Authors, 2025

A doctor-patient relationship is a consensual partnership in which patients seek and receive assistance from doctors to manage their health. The integration of AI in surgery introduces a new dynamic in this relationship, involving doctors, patients, and AI systems.⁶⁹ Doctors must inform patients about the involvement of robotic technology in surgical procedures, ensuring that patients provide clear and informed consent. This requirement becomes even more critical given the remote nature of telesurgery. Moreover, robust data privacy measures are crucial to protecting sensitive patient information during these advanced medical procedures. The complexity of medical liability necessitates a clear delineation of roles and responsibilities to address potential adverse outcomes or instances of malpractice effectively. Modern medical practice is also governed by professional ethical standards, which are integral to ensuring accountability and integrity.⁷⁰ Professional associations play a pivotal role in enhancing clarity regarding physicians' obligations by developing guidelines that address the liabilities associated with digital health. These guidelines can further define doctors' duties of care in the evolving context of AI-assisted medicine.⁷¹

⁶⁹ Giorgia Lorenzini et al., "Artificial Intelligence and the Doctor–Patient Relationship: Expanding the Paradigm of Shared Decision Making," *Bioethics* 37, no. 5 (June 25, 2023): 424–29, <https://doi.org/10.1111/bioe.13158>.

⁷⁰ Benjamin J. McMichael, "Malpractice," in *Laws of Medicine* (Cham: Springer International Publishing, 2022), 129–50, https://doi.org/10.1007/978-3-031-08162-0_8.

⁷¹ Anna V. Silven et al., "Clarifying Responsibility: Professional Digital Health in the Doctor–Patient Relationship, Recommendations for Physicians Based on a Multi-Stakeholder Dialogue in the Netherlands," *BMC Health Services Research* 22, no. 1 (December 30, 2022): 129, <https://doi.org/10.1186/s12913-021-07316-0>.

The construction of telerobotic surgery regulations within Indonesia's national health law must include provisions regarding the legal framework, including collaboration between countries, ministries, and international surgeons. Jurisdictional issues are also crucial in determining which laws apply and which law enforcement agencies in the jurisdictions are authorized to enforce them. Technical provisions are also necessary, including those governing medical team qualifications, informed consent, health confidentiality, security and data privacy, and legal accountability. Institutional strengthening can be achieved by establishing an ethics committee consisting of surgeons and legal experts.

The Legal Responsibility If an Error Occurs in Telesurgery

The fundamental concept behind the development of telesurgery is closely tied to public policy, particularly the equitable distribution of services and technology. To achieve this, the government, public and private health institutions, non-governmental organizations, and the media must actively collaborate to foster a new understanding of equality in the right to health.⁷² By leveraging AI, highly qualified surgeons can reach patients in rural areas. Telesurgery is a novel surgical technique in which a surgeon remotely operates a surgical robot via network communications technology to perform procedures on patients in remote locations.⁷³ The project involved collaboration between telecommunications specialists from both countries.⁷⁴ Telesurgery could provide the necessary opportunities to enable remote surgeons to assist local, less skilled, or less experienced surgeons when needed.⁷⁵ The development of telesurgery to ensure equitable access to healthcare must be supported by comprehensive legal regulations.

⁷² Roberto Garetto et al., "Ethical and Legal Challenges of Telemedicine Implementation in Rural Areas," (2022): 31–60, https://doi.org/10.1007/978-3-031-05049-7_3.

⁷³ Vipul Patel et al., "Best Practices in Telesurgery: Framework and Recommendations from the Society of Robotic Surgery (SRS) for Safe and Effective Implementation," *Journal of Robotic Surgery* 19, no. 1 (2025): 370.

⁷⁴ Saad Aldousari et al., "The Era of Telesurgery: Insights from Ultra-Long-Distance Asia to Middle East Human Telesurgery Robotic Assisted Radical Prostatectomy," *Journal of Robotic Surgery* 19, no. 1 (2025): 1–11.

⁷⁵ Shady Saikali et al., "Society of Robotic Surgery (SRS) Special Meeting in 2024: Insights from the Telesurgery Consensus Meeting," *Journal of Robotic Surgery* 19, no. 1 (2025): 1–3.

There are no universally established criteria in medical practice to assess the success of a surgical procedure.⁷⁶ This issue is closely tied to the legal relationship between the patient and the doctor, which is based on therapeutic transactions. The legal relationship between doctor and patient does not guarantee a cure but aims for the best possible outcome. This type of agreement is called *inspanningverbintenis*, which differs from the legal relationship typically seen in general agreements that promise a definite result (*resikoverbintenis* or *resultaatsverbintenis*).⁷⁷ The agreement between a doctor and a patient is a therapeutic agreement that seeks healing, not promises a guaranteed cure. A therapeutic agreement is an agreement made to provide therapy that covers all aspects of health, from promotive to preventive, curative, and rehabilitative.⁷⁸ The legal relationship between the surgeon and the patient in this robotic operation can result in legal consequences in the form of a demand for legal responsibility.

Legal accountability is a concept for responding to lawbreakers. Lawrenson, Anthony J., and Graham R. Braithwaite state that the imposition of legal standards in human endeavors is generally based on the assumption that affected parties are aware of their causal role and therefore legal responsibility. An intuitive response to this expectation is to provide a well-defined, measurable, and manageable safety culture structure.⁷⁹ In this regard, there are three categories of legal liability: administrative, civil, and criminal liability.

Administrative liability relates to the hospital's liability for the failure of telesurgery practices. According to Kranenburg and Vegtig, official liability is based on two theories: the *fautes personnelles* theory and the *fautes de services* theory. The *fautes personnelles* theory states that losses to third parties are borne by the official whose actions caused the loss. In this theory, the burden of responsibility is directed at the individual. The *fautes de services* theory states that losses to third parties are borne by the official's agency. According to this theory, responsibility is assigned to the position. In its application, the losses

⁷⁶ Eduard Fosch-Villaronga et al., "The Role of Humans in Surgery Automation," *International Journal of Social Robotics* 15, no. 3 (March 10, 2023): 563–80, <https://doi.org/10.1007/s12369-022-00875-0>.

⁷⁷ Widodo Tresno Novianto, "Penafsiran Hukum dalam Menentukan Unsur-Unsur Kelalaian Malpraktek Medik (Medical Malpractice)," *Yustisia Jurnal Hukum* 4, no. 2 (August 1, 2015), <https://doi.org/10.20961/yustisia.v4i2.8670>.

⁷⁸ Christiana Jullia Makasenggehe, "Aspek Hukum Transaksi Terapeutik Antara Tenaga Medis dengan Pasien," *Lex Privatum* 12, no. 1 (2023).

⁷⁹ Anthony J. Lawrenson and Graham R. Braithwaite, "Regulation or Criminalisation: What Determines Legal Standards of Safety Culture in Commercial Aviation," *Safety Science* 102 (2018): 251–62.

incurred are also adjusted to determine whether the error is serious or minor, where the severity of the error impacts the responsibility that must be borne.⁸⁰

Viewed from a civil context, there is legal responsibility based on unlawful acts. An unlawful act is a form of obligation that arises from the law as a result of human actions that violate the law, as regulated in the Civil Code.⁸¹ Unlawful acts themselves are actions that are contrary to the legal obligations of the perpetrator; violate the subjective rights of others; violate the rules of morality; and contradict the principles of propriety, accuracy, and caution that a person should have in social interactions with fellow citizens or regarding the property of others.⁸²

The theory of responsibility in tort liability is divided into several theories. Responsibility due to unlawful acts committed intentionally (intentional tort liability), the defendant must have committed an act in such a way that harms the plaintiff or knows that what the defendant did will result in a loss. Responsibility due to unlawful acts committed due to negligence (negligence tort liability), is based on the concept of fault (concept of fault) related to morals and law that have been mixed (intermingled). Absolute responsibility due to unlawful acts without questioning fault (strict liability), is based on the act whether intentional or unintentional.⁸³ In relation to the civil liability, there are four forms of claims that can be filed based on the unlawful act committed, namely a claim for compensation in the form of money for the losses incurred, a claim for compensation in kind or returned to the state of all, a claim in the form of a statement that the act committed is unlawful and a claim to prohibit the conduct of certain acts.⁸⁴

Criminal liability refers to a person's legal responsibility for a criminal act they have committed, which can result in punishment, such as imprisonment,

⁸⁰ Ibid., 365.

⁸¹ Anisa Suci Anjani, "Analisis Yuridis Ingkar Janji untuk Menikahi sebagai Perbuatan Melawan Hukum Menurut Kitab Undang-Undang Hukum Perdata," *Lex Privatum* 13, no. 1 (2024).

⁸² Nur Yuffikhati et al., "Perbuatan Melawan Hukum dalam Perspektif Hukum Perdata dan Hukum Pidana: Studi Kasus Putusan No. 28/Pdt.G/2024/PN Tmg & 113/Pid.Sus/2023/PN Tmg," *Jurnal ISO: Jurnal Ilmu Sosial, Politik dan Humaniora* 5, no. 1 (2025): 16.

⁸³ Muhammad Ihsan Abdurrahman, S. H. Agustina, and Prof. M. H., "Analisis Perbedaan Prinsip Kesalahan dan Implikasinya terhadap Tanggung Jawab dalam Perbuatan Melawan Hukum: Studi Komparatif antara Hukum Indonesia dan Hukum Inggris," *Lex Patrimonium* 3, no. 1 (2024): 5.

⁸⁴ Syaiful Badri, Pristika Handayani, and Tri Anugrah Rizki, "Ganti Rugi terhadap Perbuatan Melawan Hukum dan Wanprestasi dalam Sistem Hukum Perdata," *Jurnal USM Law Review* 7, no. 2 (2024): 974–985.

finer, or other sanctions.⁸⁵ Criminal liability can be carried out by other legal entities, or in situations where they are responsible for acts committed by others under their responsibility. The provisions of the Criminal Code also define the elements of fault in criminal acts. Essentially, the criteria for intent include intentional (*dolus*) or negligent (*culpa*) medical actions.⁸⁶ This refers back to the principle of *geen straf zonder schuld*, where the perpetrator of a crime cannot be punished without an element of fault, whether intentional or negligent.⁸⁷ Liability must have a basis, namely something that gives rise to a legal right for one person to sue another and something that gives rise to the legal obligation of that other person to provide accountability.⁸⁸ Liability for medical actions is essentially the individual responsibility of the surgeon who performed the procedure.

In the development of the doctrine of criminal liability, there is corporate liability. Analysis of economic crimes has made a significant contribution to the understanding of corporate criminal activity.⁸⁹ The system of corporate criminal liability consists of several systems: corporate management as the creator and the manager is responsible; Corporations as the creator and the manager is responsible; Corporations as the creator and also as the responsible.⁹⁰ Identification theory only covers the actions of senior officials (corporate brains), this narrow understanding is adopted in the UK. The broader understanding adopted in the United States states that responsibility is not only imposed on senior officials/directors, but also agents below them.⁹¹ The theory of vicarious liability is the imposition of criminal responsibility on an individual for the actions of another.⁹² Viewed from a historical perspective, vicarious

⁸⁵ Hifajatali Sayyed, "Artificial Intelligence and Criminal Liability in India: Exploring Legal Implications and Challenges," *Cogent Social Sciences* 10, no. 1 (2024): 2343195.

⁸⁶ Rini Apriyani et al., "Criminal Liability Arising from Medical Malpractice on Patients: A Review from the Perspective of Positive Law and Islamic Law," *Krtha Bhayangkara* 18, no. 1 (2024): 85–106.

⁸⁷ *ibid*

⁸⁸ Anisa Nadiyah, "Pertanggungjawaban Hukum atas Kerugian Korban Kecelakaan Lalu Lintas akibat Kelalaian Pengemudi," *Public Sphere: Jurnal Sosial Politik, Pemerintahan dan Hukum* 4, no. 1 (2025).

⁸⁹ Robin Christmann and Dennis Klein, "Game Theory, Compliance, and Corporate Criminal Liability: Insights from a Three-Player Inspection Game," *Decision Analytics Journal* 11 (2024): 100431.

⁹⁰ Joko Sriwidodo and M. S. Tumanggor, "Regulation of Corporate Criminal Liability According to Law Number 1 Year 2023 on the Criminal Code," *Krtha Bhayangkara* 18, no. 1 (2024): 197–214.

⁹¹ Muhammad Yusni and Bisdan Sigalingging, "Pertanggungjawaban Pidana Korporasi dalam Rangka untuk Deterrence Effect dan Effective Deterrence," *Iuris Studia: Jurnal Kajian Hukum* 5, no. 2 (2024): 425–437.

⁹² Beni Satria and Sidi Jambak, "Pertanggungjawaban Pidana Korporasi atas Dugaan Tindak Pidana Mempekerjakan Tenaga Medis dan Tenaga Kesehatan Tanpa Izin di Rumah Sakit," *Proceeding Masyarakat Hukum Kesehatan Indonesia* 1, no. 1 (2024): 90–99.

liability originates from the civil law tradition. Vicarious liability was originally a substitute responsibility that only existed in civil matters, namely tort law (the law of compensation) due to an unlawful act that resulted in or caused damage.⁹³ The strict liability theory refers to accountability whereby even if the individual is not at fault (*mens rea*), they can still be held responsible for certain crimes. The strict liability theory is also called liability without fault.⁹⁴ When the concept of vicarious liability, explained above, is linked to the strict liability theory, the difference between the two lies in the *mens rea* (fault) that must be proven. In the strict liability theory, *mens rea* is not required to convict someone who has committed a crime. In the vicarious liability theory, *mens rea* is the primary requirement for convicting someone who has committed a crime. Furthermore, there must be an employment relationship between the perpetrator and another person who should be held accountable for the crime committed by the perpetrator, for example, an employer and a worker, and the crime is still within the scope of their employment.

Failure of telesurgery, even if it causes disability or even death to the patient, does not always result in legal liability. All surgical procedures carry medical risks, which the doctor must explain to the patient in advance. In principle, a doctor cannot be held accountable for medical risks as long as the doctor has adhered to standard procedures and the patient has properly consented to the treatment based on the information provided.⁹⁵ Regarding medical risks, in legal science there is an adage *non fit injura* or assumption of risk, namely that if someone places themselves in a danger (risk) that they are already aware of, then they cannot hold others responsible if the risk actually occurs. If the risk arises without error, whether in the form of intent or negligence during medical services, then the patient cannot hold a medical professional responsible.⁹⁶

Criminal liability is a medicolegal area that requires very fundamental analysis. The term "medicolegal" relates to the intersection of medical issues and

⁹³ *ibid*

⁹⁴ Sigar P. Berutu et al., "Pertanggungjawaban Pidana Pekerja Perseroan Terbatas yang Melakukan Tindak Pidana Pengerusakan Lingkungan Hidup (Studi Putusan Nomor 40/Pid.Sus/2019/PN.PKY)," *UNES Law Review* 7, no. 4 (2025): 2002–2013.

⁹⁵ Judhith Vidya Dayati Panca Narayana and Miranti Verdiana, "Risiko Medik Dokter dalam Operasi Mata yang Mengakibatkan Kebutaan," *Jurnal Hukum Bisnis Bonum Commune* 3, no. 2 (July 22, 2020): 266–77, <https://doi.org/10.30996/jhbbc.v3i2.3991>.

⁹⁶ Aria Chandra Gunawan, Dika Yudanto, and Amir Junaidi, "Tinjauan Hukum Pidana terhadap Tindakan Malpraktek dalam Bidang Kesehatan atau Medis," *UNES Law Review* 6, no. 2 (2023): 5387–5397.

legal principles. This broadly encompasses cases involving misdiagnosis, medical malpractice or negligence, patient rights, injury or wrongful death, forensic assessments, and ethical considerations in healthcare.⁹⁷ In the case of telesurgery, the legal issues are not significantly different from those of traditional medical liability, particularly regarding the responsibility of medical professionals. Hospitals must ensure that surgeons possess the necessary knowledge and skills to operate the new technology safely, just as they would with any other new medical device. By implementing surgical monitoring by experienced surgeons, hospitals can associate credentials with consistent surgical quality across multiple locations.⁹⁸ In this situation, there are several possible scenarios that could give rise to legal liability. First, a surgical failure is caused by a surgeon's error. Second, a surgical failure is caused by a machine suddenly failing to operate. Third, a surgical failure is caused by signal interference.

From a legal perspective, the key issue is developing a framework that explores the elements of intent, negligence, and fault in a hybrid human-machine ecosystem. Criminal liability is traditionally required in analyzing legal liability for any surgical failure.⁹⁹ Determining liability in cases of telerobotic surgery failure due to technical malfunctions or communication errors remains ambiguous in most frameworks.¹⁰⁰ In relation to criminal liability, criminal liability in operational failure due to an element of error, no longer only refers to individual liability, but also corporate liability.

In the first scenario, where the surgical failure is due to a surgeon's error, the element of intent or negligence will be assessed. These two elements will carry different legal consequences, with liability for intent being more severe than for negligence. The element of intent can refer to other crimes, such as premeditated murder, unlawful organ transplantation, and so on. These acts are distinct offenses and fall under the category of health crimes. Surgical failure due to negligence gives rise to legal liability, both under criminal law and civil law, and even administrative law.

⁹⁷ Jeganathan, J. Ravichandran, Ravindran Jegasothy, and Woon Teen Sia. "Minimally invasive surgery: a historical and legal perspective on technological transformation." *Journal of Robotic Surgery* 19.1 (2025): 1-13.

⁹⁸ Amanda M. Artsen et al., "Surgeon Satisfaction and Outcomes of Tele-Proctoring for Robotic Gynecologic Surgery," *Journal of Robotic Surgery* 16, no. 3 (June 16, 2022): 563-68, <https://doi.org/10.1007/s11701-021-01280-x>.

⁹⁹ Husein Bani Issa, "Robotic Surgery and the Law: Defining Control and Criminal Responsibility," *Journal of Soft Computing and Data Mining* 6, no. 1 (2025): 423-434.

¹⁰⁰ Devesh Nagpure and Sheetal Asutkar, "Tele-Surgery and Remote Procedures: The Future of Global Surgical Care," *Multidisciplinary Reviews* 8, no. 5 (2025): 2025147.

The responsibility of the medical profession is generally understood as the duty of physicians to provide compensation for acts, omissions, and mistakes made while practicing medicine, whether intentional or accidental, within certain boundaries.¹⁰¹ Medical malpractice involves injuries caused by a doctor's deviation from the standard of care.¹⁰² Legal liability arises from a telesurgery failure due to the surgeon's error. In establishing the surgeon's legal liability for a telesurgery failure caused by their mistake, the doctrine of strict liability is more appropriate. In a system of absolute or causal liability, no fault or intent is required from the injured party for liability to occur. Thus, liability for damages arises when the following conditions are met: the harmful act, the loss suffered, the unlawfulness of the harmful act, and a causal relationship between the harmful act and the loss.¹⁰³

According to Indonesian law, specifically Article 440 of Law No. 17 of 2023 concerning Health, a surgeon can only be held criminally liable if the patient is seriously injured or dies. Article 90 of the Criminal Code defines serious injury as: illness or injury that leaves no hope of recovery, or that poses a mortal danger; continued inability to perform official duties or work; loss of one of the five senses; severe disability; paralysis; impaired cognitive function for more than four weeks; and miscarriage or death of a woman's fetus. The provisions regarding serious injuries are expanded in the Republic of Indonesia Law Number 1 of 2023 concerning the Criminal Code (National Criminal Code) which came into effect on January 2, 2026. Article 155 of the Law Number of Republic of Indonesia 1 of 2023 concerning the Criminal Code states that Serious Injuries are: a. illness or injury that has no hope of complete healing or that can cause death; b. continuously incapable of performing duties, positions, or work; c. no longer able to use one of the five senses or one of the body parts; d. severe or permanent disability; e. paralysis; f. impaired thinking for more than 4 (four) weeks; g. miscarriage or death of a fetus; or h. damage to reproductive function.

¹⁰¹ Fuertes-Guiró and Viteri Velasco, "Ethical Aspects Involving the Use of Information Technology in New Surgical Applications: Telesurgery and Surgical Telementoring."

¹⁰² John Azizian et al., "Medical Professional Liability in Gastroenterology: Definitions, Trends, Risk Factors, Provider Behaviors, and Implications," *Expert Review of Gastroenterology and Hepatology* (2021), <https://doi.org/10.1080/17474124.2021.1940957>.

¹⁰³ Pichler and Tomić, "Civil Liability for Damage Caused by a Robot When Performing a Medical Procedure."

In the second scenario, when the operational failure is caused by the machine suddenly not operating, it must be traced by conducting a technical inspection of the robot machine (this requires expert testimony from a mechanical engineer. If the machine is a production defect, then the responsibility is requested to the developer company. In practice, legal responsibility to the developer company is carried out through civil channels, namely by means of a lawsuit for compensation which can also be filed by the health care facility. If the machine stops working because it is not regularly maintained, then legal responsibility can be requested to the health care facility and the machine maintenance technician section. If the machine stops working due to a cyber attack, then legal responsibility is borne by the hacker who carried out the attack.

As cyber risks increase, a comprehensive framework outlining technical, administrative, and legal protocols is essential for securing critical systems and sensitive information.¹⁰⁴ Successfully implementing telesurgery requires addressing cybersecurity, data privacy, and redundancy measures in the event of technical failures alongside technical network specifications. Remote surgery relies on wireless and robotic technologies, which can potentially lead to surgical failures. In this context, legal questions arise concerning liability for such errors. The key distinction is that telesurgery involves a computerized device that screens and processes the surgeon's movements. Therefore, the source of any error that negatively impacts the patient's health could stem from the person initiating the maneuver (the surgeon) or from the way the maneuver is executed (the machine).

The study of the causal relationship between the cause of surgical failure and the conditions surrounding this failure is crucial for determining legal responsibility. A technically flawless surgical procedure can still result in an error due to a bug, blockage, or maintenance defect in the machine. Therefore, when assessing damages related to telesurgery, it is important to evaluate the causal relationship between the action and the event as accurately as possible in order to correctly interpret its origin and determine the division of responsibility between humans and machines. If the technical error can be traced back to a defect in the machine used by the surgeon, it seems clear that the manufacturer or programmer may be held liable (either alone or in conjunction with the

¹⁰⁴ Naeem AllahRakha, "Cybersecurity Regulations for Protection and Safeguarding Digital Assets (Data) in Today's Worlds," *Lex Scientia Law Review* 8, no. 1 (2024): 405–432.

doctor, depending on the circumstances). In cases where a robot malfunction is the cause, the manufacturer or the technical officer responsible for maintenance may be held accountable. However, if a doctor's mistake is the cause of the surgical failure, the doctor may be held legally responsible. Another important legal consideration is whether a practice license is required for the robot operator.¹⁰⁵

Malicious actors can target telesurgical networks to steal data or cause malfunctions that harm patients. While data flow monitoring tools and encryption can enhance the security of telesurgical operations, these measures do not entirely eliminate the risk of malicious data flows compromising the robotic console.¹⁰⁶ The potential threat of hacking poses significant concerns for patient safety and must be addressed when considering legal liability. Data security and privacy are critical in medical practice, especially in telesurgical settings.¹⁰⁷ When patient information and images are transferred between institutions, they become vulnerable to security breaches and unauthorized access.¹⁰⁸ For this reason, it is essential to establish clear standards for safeguarding this sensitive data. Developed countries such as the United States and the European Union have begun to integrate these issues through legal instruments that support patient data privacy and regulate technology-based medical practices, particularly through the General Data Protection Regulation (GDPR) and the Health Insurance Portability and Accountability Act (HIPAA).¹⁰⁹

In the third scenario, surgical failure is caused by signal interference. It is necessary to investigate whether the signal interference occurred due to force majeure conditions such as natural disasters (earthquakes, floods), war, or riots, in which case legal liability cannot be imposed on any party. If the signal interference is due to provider error, it is necessary to further investigate whether there is a causal relationship between the signal interference due to the

¹⁰⁵ Emmanuel Mendoza Navarro, Adrielly Nahomee Ramos Álvarez, and Francisca Irene Soler Anguiano, "A New Telesurgery Generation Supported by 5G Technology: Benefits and Future Trends," *Procedia Computer Science* 200 (2022): 31–38, <https://doi.org/10.1016/j.procs.2022.01.202>.

¹⁰⁶ Aimun A. B. Jamjoom et al., "Autonomous Surgical Robotic Systems and the Liability Dilemma," *Frontiers in Surgery* 9 (September 16, 2022), <https://doi.org/10.3389/fsurg.2022.1015367>.

¹⁰⁷ Meghana P. Lokhande et al., "Machine-to-Machine Communication for Device Identification and Classification in Secure Telerobotics Surgery," *Security and Communication Networks* (August 27, 2021): 1–16, <https://doi.org/10.1155/2021/5287514>.

¹⁰⁸ Patel et al., "Technical and Ethical Considerations in Telesurgery."

¹⁰⁹ Naya Puspita et al., "Patient Protection for Operations Using Telesurgery Technology," *Immortalis Journal of Interdisciplinary Studies* 1, no. 1 (2025): 88–97.

provider's error and the disruption of surgery due to the signal interference. Latency in telesurgery arises from various factors, including network infrastructure, geographic barriers, cybersecurity protocols, and hardware and software limitations. AI-based algorithms, edge computing, advances in 5G technology, and optimal haptic feedback mechanisms are promising solutions to reduce latency.¹¹⁰

In addition to legal liability related to surgical failure beyond medical risks, legal liability may also be imposed related to breaches of patient confidentiality obligations. Likewise, patient surgical recording data. Article 274 of the Health Law stipulates that medical and healthcare personnel, in the course of their practice, must uphold patient confidentiality and ensure the proper creation and storage of records and/or documents related to examinations, care, and procedures performed. Confidentiality and proper management of patient information are crucial, as data collected and transmitted during treatment is highly sensitive. Information regarding the type of surgery, the organs affected beyond the surgical area, and further diagnostic techniques can all reveal important details about a patient's health status. For example, if an ultrasound technique is used to detect gender, tumors, or malformations, stringent security measures must be in place. Consequently, a robust computer security system is essential due to the electronic nature of the data. Patients must be fully informed about what kind of information is being collected, how it will be transmitted, and how it will be stored. The location and duration of data storage must also be clearly defined, in accordance with the laws of the country where the procedure is conducted.¹¹¹

Conclusion

Telesurgery presents a collaboration between the healthcare and information technology sectors, which must be supported by concurrent legal developments. The ability for doctors and patients in different countries to engage in surgery raises challenges in determining jurisdiction, specifically regarding which country's laws apply and which court has the authority to adjudicate when legal issues arise. To address this, the World Health

¹¹⁰ Zainab Yusufali Motiwala et al., "Telesurgery: Current Status and Strategies for Latency Reduction," *Journal of Robotic Surgery* 19, no. 1 (2025): 153.

¹¹¹ Paolo Bailo et al., "Telemedicine Applications in the Era of COVID-19: Telesurgery Issues," *International Journal of Environmental Research and Public Health* 19, no. 1 (December 29, 2021): 323, <https://doi.org/10.3390/ijerph19010323>.

Organization (WHO) should initiate discussions among countries to establish a global legal framework for telesurgery. Legal liability for failed surgical procedures due to errors should be grounded in the doctrine of strict liability. Studies examining the causal relationship in these failures must be conducted to determine which legal subjects can be held accountable. Proving the cause of the failure using the doctrine of causality is crucial to determine whether the surgical failure was solely due to error or whether other factors were involved. The next step is to determine who caused the surgical failure: the surgeon, a local doctor, a hacker attack, or an error on the part of the surgical robot company. Hospitals must also prioritize the role of network infrastructure, ensuring low-latency, high-bandwidth, secure, and private connections to guarantee patient safety and surgical accuracy. Furthermore, ethical considerations in telesurgery, such as patient consent, data security, and the potential detachment of surgeons from their patients, must be addressed. The legal and regulatory framework needs to be updated to account for the unique aspects of telesurgery, including liability, licensing, and reimbursement.

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