Scientific and Social Research, 2025, Volume 7, Issue 11
https://ojs.bbwpublisher.com/index.php/SSR
Online ISSN: 2981-9946
Print ISSN: 2661-4332

Accelerate the Construction of a Collaborative Innovation Ecosystem for Medical Equipment

Bo Xu*

Chinese Medicine Education Association, Beijing 100071, China

**Author to whom correspondence should be addressed.*

Abstract: Establishing a collaborative innovation ecosystem for medical equipment is of significant practical importance. From the perspective of enhancing industry competitiveness, collaborative innovation can integrate resources across the industrial chain, fostering cooperation and exchange among enterprises, universities, and research institutions. This leads to complementary strengths, accelerates technological innovation and product development, and enhances the technical content and quality of China's medical equipment, thereby boosting its international competitiveness. For instance, through integrated collaboration between industry, academia, research, and application, the transformation of scientific and technological achievements can be expedited, enabling these results to be more quickly applied in production, thus improving overall industry efficiency and market responsiveness. In terms of advancing medical progress, advanced medical equipment is crucial for improving the accuracy of medical diagnoses and the effectiveness of treatments. The establishment of a collaborative innovation ecosystem helps develop more advanced, precise, and user-friendly medical equipment, providing stronger support for clinical practice, meeting the growing medical needs, promoting continuous advancements in medical technology, and ultimately enhancing public health levels.

Keywords: Medical equipment collaborative innovation ecosystem; Medical institutions; Medical ecology

Online publication: November 14, 2025

1. Foreword

As health awareness grows and the aging population accelerates, the global medical market demand continues to expand. Medical equipment, a critical component of modern healthcare systems, directly influences the quality and efficiency of medical services through its technological advancements and industrial development [1]. In recent years, China's medical equipment industry has made significant progress, with the market size continuously expanding. According to relevant data, the domestic high-end medical equipment market surpassed 400 billion yuan in 2023, marking a year-on-year increase of 24.9%. The compound annual growth rate (CAGR) from 2015 to 2023 was 27.8%. Globally, the high-end medical equipment market reached 345.4 billion US dollars in 2023, up 6.64% year-on-year. Regionally, the market is primarily concentrated in the United States, Europe, and China,

with these three regions collectively accounting for about 86% of the market [2].

However, the medical equipment industry in the country still faces numerous challenges during its development. In terms of technological innovation, although the country has made breakthroughs in certain areas, such as United Imaging Healthcare's PET-CT receiving FDA certification and entering the U.S. market, and Mindray Medical's patient monitors achieving a 32% global market share, there is still a gap compared to international advanced levels.[3] In terms of core technologies and key components for high-end medical equipment, such as photon-counting CT chips and six-axis force sensors, the country still relies heavily on imports, with a low domestic production rate. From an industrial structure perspective, the lack of coordination between upstream and downstream segments in the industry chain is evident. The instability and high costs of upstream core component supplies constrain the development of midstream manufacturers, while the demand feedback from downstream applications cannot be effectively and timely transmitted to the upstream R&D stage. In terms of market competition, the global medical equipment market is highly concentrated, primarily controlled by a few large enterprises, and the country's medical equipment companies face intense competition in the international market.[4]

2. Overview of the collaborative innovation ecosystem of medical equipment

2.1. Analysis of system composition elements

2.1.1. Policy

Policies play a guiding and safeguarding role in the collaborative innovation ecosystem of medical equipment. The government formulates industrial development plans to clarify the direction and key areas of the medical equipment industry. For instance, the "14th Five-Year Plan for the Development of the Medical Equipment Industry" provides macro guidance, setting key tasks such as enhancing technological innovation capabilities and effective supply capabilities, and guiding resources to key technology research and product innovation. In terms of fiscal policy, the government sets up special R&D funds to support enterprises and research institutions engaged in core technology R&D for medical equipment, reducing the R&D costs and risks for innovators [5]. Tax incentives are also a crucial tool, offering tax reductions and exemptions to innovative medical equipment companies, thereby boosting their enthusiasm and initiative for innovation. Additionally, policies and regulations are essential for regulating market order. By establishing stringent medical device regulatory laws and quality standards, they ensure the safety and effectiveness of medical equipment, providing norms and guarantees for market access and promotion of innovative products, thus fostering a fair and competitive market environment [6].

2.1.2. Scientific research institutions and universities

Research institutions and universities are vital sources of knowledge, innovation, and technology development. These institutions, equipped with professional research teams and advanced facilities, excel in both basic research and the development of key technologies. For instance, the Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences, has conducted extensive cutting-edge research in biomedical engineering, yielding a series of significant scientific achievements. Universities, on the other hand, boast rich academic resources and robust talent development systems, which not only provide theoretical support for medical equipment innovation but also nurture a large number of specialized professionals [7]. By undertaking research projects and conducting academic studies, universities generate new knowledge and technologies, which are then transferred to enterprises through industry-university-research collaborations. The close collaboration between research institutions, universities,

and enterprises ensures the effective integration of basic research, application development, and industrialization, thereby accelerating the pace of medical equipment technological innovation [8].

2.1.3. Medical institutions

Medical institutions, as the ultimate users and demand initiators of medical equipment, play a crucial role in clinical demand orientation and application verification within collaborative innovation. Directly serving patients, these institutions have a deep understanding of actual clinical needs, which serve as a significant driving force for the innovation of medical equipment. For instance, during surgical procedures, doctors' demands for the precision and ease of use of surgical instruments drive companies and research institutions to develop more advanced surgical equipment. Medical institutions also provide a platform for clinical trials and application verification of medical equipment, testing its performance, safety, and effectiveness through real-world clinical use. They gather feedback on issues encountered during the application, providing valuable insights for product improvement and optimization. Furthermore, clinical experts from medical institutions, drawing on their extensive practical experience, participate in the R&D process, offering professional advice from a clinical perspective to ensure that the R&D outcomes better meet actual medical needs [9].

2.2. The importance of a collaborative innovation ecosystem

A collaborative innovation ecosystem plays an important role in the field of medical equipment and is a key driving force to promote industrial progress and improve the level of medical services. It has irreplaceable significance in promoting technological innovation, optimizing resource allocation, and enhancing industrial competitiveness.

In promoting technological innovation, the collaborative innovation ecosystem has broken down barriers between various innovation entities, providing a strong impetus and broad opportunities for technological advancement. In the collaborative innovation process, different entities can fully leverage their technical strengths and professional expertise. Universities and research institutions focus on fundamental research and cutting-edge technology exploration, leveraging their deep academic foundations and advanced research facilities to continuously produce new theoretical and technological advancements. For instance, universities' research in fields such as biomedical engineering and materials science provides a theoretical foundation for technological breakthroughs in medical equipment [10].

Optimizing resource allocation is another significant advantage of the collaborative innovation ecosystem. In the medical equipment industry, the rational allocation of innovative resources is crucial for enhancing innovation efficiency and reducing costs. The collaborative innovation ecosystem can integrate various innovative resources, enabling their sharing and optimal utilization. From a human resources perspective, different entities have unique talent pools. Through the flow of talent and the implementation of collaborative projects, these entities can achieve complementary advantages in human resources. Corporate R&D talents, university researchers, and clinical experts from medical institutions collaborate to overcome technical challenges and address clinical application issues. In terms of research facilities, collaborative innovation ensures that large-scale research instruments, laboratories, and other resources can be shared among entities, avoiding redundant construction and resource idleness [11].

3. Analysis of the current situation of the medical equipment collaborative innovation ecosystem

3.1. Development status and achievements

In recent years, China's medical equipment collaborative innovation ecosystem has made significant progress in policy support, technological innovation, and industrial development. The government places a high priority on the development of the medical equipment industry and has introduced a series of policies to encourage innovation. For instance, the "14th Five-Year Plan for Medical Equipment Industry Development" clearly states that by 2025, an initial medical device innovation system will be established, with over 20 leading enterprises cultivated and 2–3 industrial clusters developed, significantly increasing the domestic production rate of high-end medical equipment. In terms of R&D investment, the state continues to increase financial support for research in the medical equipment sector, guiding enterprises and research institutions to tackle key technological challenges [12]. In 2023, the national R&D investment in medical equipment reached 35 billion yuan, marking a 15% year-on-year increase, providing a strong financial foundation for technological innovation [13].

In the realm of technological innovation, the country has achieved several breakthroughs in the medical equipment sector. In the field of medical imaging devices, United Imaging Medical's independently developed 75 cm ultra-large aperture 3.0T MRI "uMROmega" boasts industry-leading imaging performance and an ultra-large aperture design, providing patients with a more comfortable examination experience and offering more precise diagnostic information. This product has been adopted by many renowned hospitals in China and is gradually entering the international market. In the field of in vitro diagnostic reagents, Mieke Biotech's fully automated chemiluminescent immunoassay system has achieved full automation from sample processing to result output, offering fast and highly accurate testing. This has broken the long-standing monopoly of foreign companies in this field, and its market share is steadily growing. In the surgical instrument sector, Weigao Group's disposable ultrasonic knife, known for its precise cutting and excellent hemostasis, has been widely adopted in clinical surgeries, significantly enhancing both the efficiency and safety of surgical procedures [14].

The collaboration model of industry, academia, research, and application is continuously deepening, accelerating the rapid transformation of scientific and technological achievements. For instance, the "industry-academia-research-medical" innovation and development event for Nanjing's medical device industry was held by the Nanjing Market Supervision Administration in Gaochun District on November 5, 2024. This event brought together resources from education, research, healthcare, and industry, providing a platform for Nanjing's medical device companies to showcase their capabilities and fostering deeper cooperation and exchange. Through this event, all parties enhanced their communication and collaboration, promoting the innovative development of the medical device industry. Wearable devices, smart monitoring devices, and telemedicine are emerging as key trends in the future, significantly enhancing people's quality of life and health. The National Medical Device Industry Metrology Testing Center, Nanjing Wofman, Hangzhou People's Hospital, PLA General Hospital, Tianjin University, and Nanjing University jointly undertook a key national R&D project aimed at developing an optical coherence tomography (OCT) system and its supporting products with independent intellectual property rights, tailored to the needs of cardiovascular interventional therapy. This project not only developed new medical device products but also created a series of high-resolution imaging performance evaluation models at the micron level [15]. It addressed the challenge of testing high-precision imaging resolution, achieving a breakthrough in the domestic OCT system and its associated catheters from zero to one. It also realized the domestic production of high-speed, high-resolution vascular OCT equipment, as well as new in-vessel imaging, 3D display, and DSA-OCT image

fusion capabilities from abroad. This has reduced the cost of imported OCT systems and catheters, optimized PCI procedures, and alleviated the medical burden on society and patients [16].

3.2. Challenges

Although China's medical equipment collaborative innovation ecosystem has achieved certain results, it still faces many challenges in the process of development, which restrict the further development of the industry and the improvement of competitiveness [17].

In terms of policy implementation and coordination, although the government has introduced a series of policies to support the medical equipment industry, there are instances where these policies are not effectively implemented. Some local governments misinterpret and implement these policies, leading to some preferential policies and support measures failing to truly benefit enterprises and research institutions. There is insufficient policy coordination among different departments, resulting in conflicts and overlaps. For example, in the approval and supervision of medical equipment, the Food and Drug Administration (FDA) and the Health Commission have inadequate policy coordination, with cumbersome approval processes and long cycles, which hinder the market entry of new products and the innovation enthusiasm of enterprises. The support for small and medium-sized enterprises (SMEs) is relatively weak, making it difficult for SMEs to access funds, technology, and talent, thus hindering their ability to fully leverage their flexibility and innovative advantages in innovation.[18]

The lack of technological innovation capability is one of the core challenges people face today. In basic research, there is a gap between China and international advanced levels, with relatively insufficient investment, which has led to slow progress in the development of key technologies and core components. For instance, in the core components of high-end medical imaging equipment, such as detectors and ultrasound diagnostic equipment, transducers, China still relies heavily on imports, severely hindering the independent and controllable development of China's medical equipment industry [19]. The efficiency of technology transfer and transformation between industry, academia, research, and application is low, making it difficult for universities and research institutions to quickly and effectively convert their research results into practical products and productive forces. Some research outcomes are out of touch with market demands, and enterprises face issues such as immature technology and high industrialization costs when converting research results. The role of enterprises as the main drivers of innovation has not been fully established, with some enterprises having a weak innovation awareness, insufficient R&D investment, and an over-reliance on imitation and imported technologies, lacking the ability for independent innovation and core competitiveness.

3.3. Analysis of typical cases

Taking the development of the medical equipment industry in the Yangtze River Delta region as an example, the region has made active exploration and practice in building a collaborative innovation ecosystem for medical equipment, and has achieved a series of achievements. At the same time, it also faces some problems, which are of great significance to carry out an in-depth analysis.

The Yangtze River Delta region is rich in scientific research resources, home to prestigious universities such as Fudan University, Shanghai Jiao Tong University, Zhejiang University, and Nanjing University, as well as research institutions like the Shanghai Branch of the Chinese Academy of Sciences and the Yangtze River Delta Branch of the China Metrology Research Institute. These institutions have a strong foundation and robust research capabilities in fields related to medical equipment, including biomedical engineering, materials science,

and electronic information, providing solid technical support for collaborative innovation in medical equipment. For instance, Fudan University leads in medical imaging technology research in China, and its newly developed magnetic resonance imaging technology has provided crucial technical support for product innovation by medical equipment companies [20].

The Yangtze River Delta region is actively establishing various collaborative innovation platforms to enhance communication and cooperation among innovation entities. For instance, the Shanghai Medical Device Industry Technology Innovation Strategic Alliance was established by medical device companies, universities, research institutions, and healthcare providers. The alliance aims to integrate resources from all parties to promote technological innovation and industrial development in the medical device sector. By organizing technical seminars, project matchmaking meetings, and industry-university-research collaboration projects, the alliance has enhanced communication and collaboration among its members. For example, the industry-university-research collaboration projects organized by the alliance address key technical challenges in high-end medical imaging equipment. Universities and research institutions conduct basic research and technology R&D, while enterprises handle industrialization and market promotion. Healthcare providers provide clinical needs and application feedback, achieving a deep integration of industry, academia, and application. According to statistics, since its establishment, the alliance has facilitated the transformation of numerous scientific research achievements into practical products, injecting new momentum into the development of the medical equipment industry in the Yangtze River Delta region.

However, the Yangtze River Delta region faces several challenges in building a collaborative innovation ecosystem for medical equipment. While some achievements have been made in cooperative projects, issues such as insufficient collaboration and low efficiency persist. Some industry-university-research collaborations suffer from poor communication and unreasonable profit distribution, which hinders progress. Although industrial clusters have started to form, the synergy between upstream and downstream enterprises in the supply chain has not been fully realized. The technical standards and product quality of upstream component suppliers vary widely, and some critical components still rely on imports, affecting the quality and efficiency of midstream manufacturers.

4. Strategies to accelerate the construction of a collaborative innovation ecosystem of medical equipment

4.1. Improve the policy support system

The government should enhance its policy support for collaborative innovation in medical equipment, establishing a comprehensive and multi-level policy support system to provide solid policy backing for such innovation. In policy formulation, it is crucial to focus on the foresight and relevance of policies, closely aligning with the development trends and actual needs of the medical equipment industry. For instance, policies could be formulated to encourage companies to increase their R&D investment, offering tax incentives and financial subsidies to those that meet certain R&D investment thresholds, thus guiding companies to allocate more resources to technological innovation. Special R&D funds should be established to prioritize key technology research and development and core component breakthroughs in the medical equipment sector, enhancing China's independent R&D capabilities in high-end medical equipment technology and reducing reliance on imports.

The government needs to further improve the legal and regulatory framework for medical equipment,

standardize market order, and ensure the quality and safety of innovative products. In terms of medical device registration and approval, it should optimize the approval process, enhance efficiency, and shorten the time-to-market for innovative products. For instance, a special approval channel for innovative medical devices should be established, providing priority review and approval for innovative and clinically urgent medical equipment, enabling these products to enter the market more quickly and meet clinical needs. The enforcement of intellectual property protection laws should be strengthened, with a focus on cracking down on infringement to protect the legitimate rights and interests of innovators. This will encourage enterprises and research institutions to actively engage in innovation activities and increase their R&D investment.

4.2. Strengthen the deep integration of industry, university, research, and medical treatment

Strengthening the deep integration of industry, academia, and research with medical services is the core approach to accelerating the development of a collaborative innovation ecosystem for medical equipment. This approach is crucial for enhancing the technological innovation capabilities of medical equipment, facilitating the transformation of scientific and technological achievements, and meeting clinical needs. By establishing close cooperative relationships, integrating resources from all parties, and achieving complementary strengths, the high-quality development of the medical equipment industry can be effectively promoted.

Establishing a collaborative innovation platform for industry, academia, and medical institutions is essential for promoting deep integration. The government should play a guiding role, encouraging enterprises, universities, research institutions, and medical institutions to participate in the platform's development. For example, setting up national or provincial medical equipment collaborative innovation centers can integrate resources such as talent, technology, and equipment from all parties, providing a favorable R&D environment and a sharing platform for collaborative projects. These centers can be equipped with advanced scientific research facilities, including high-end medical imaging equipment and experimental devices for biomedical material research, which can be utilized by all parties in collaborative R&D. Additionally, establishing a comprehensive information exchange mechanism through an integrated online and offline information sharing platform can facilitate timely communication and collaboration among all parties. The online platform can feature a project-matching section where enterprises can post their technical needs, and universities and research institutions can showcase their research outcomes, making it easier for both sides to quickly identify opportunities for cooperation. Offline, regular academic seminars and project matchmaking events can be organized to provide face-to-face interaction opportunities, enhancing mutual understanding and trust.

Establish a comprehensive service system for the transformation of scientific and technological achievements, and strengthen the development of technology transfer institutions and professional talent teams. These institutions should offer professional services such as technical evaluation, intellectual property trading, and project incubation, providing all-around support for the transformation of scientific and technological achievements. Cultivate a group of technology transfer professionals who are knowledgeable in both technology and market dynamics, capable of accurately gauging market demands and effectively bridging the gap between the research outcomes from universities and research institutions and the industrialization needs of enterprises. Establish a special fund for the transformation of scientific and technological achievements to provide financial support for projects with market potential, thereby reducing the risks associated with enterprise transformation.

4.3. Strengthen talent training and introduction

The talent demand in the medical equipment industry is characterized by diversification and high-end specialization. In terms of technology research and development, professionals with multidisciplinary knowledge in biomedical engineering, electronics, and materials science are needed to tackle key technical challenges in medical equipment, driving product innovation and upgrades. For instance, in the development of high-end medical imaging devices, experts with advanced imaging principles, image processing algorithms, and detector technology are required. In the development of medical robots, interdisciplinary talents who integrate knowledge from mechanical design, artificial intelligence, and control technology are needed. In the manufacturing process, skilled personnel with excellent craftsmanship and quality management skills are essential to ensure the high-quality production of medical equipment. Professionals familiar with Good Manufacturing Practice (GMP) and capable of strict quality control during production are highly sought after by companies. In marketing and after-sales service, talents who understand medical equipment products, have strong communication skills, and market expansion capabilities are needed to meet market demands and enhance customer satisfaction. Professionals who understand the procurement processes and clinical needs of medical institutions and can provide professional solutions and high-quality after-sales services are crucial for expanding market share.

Strengthening cooperation between schools and enterprises is a crucial approach to meeting the talent needs of the medical equipment industry. Universities should optimize their programs and curricula based on industry demands, with a focus on practical teaching components. For instance, they can introduce majors like biomedical engineering and medical device engineering, integrating real-world project cases and corporate practices into the curriculum to expose students to cutting-edge technologies and practical applications. Establishing internship and training bases and collaborating with medical equipment companies can provide students with hands-on opportunities to develop professional skills and enhance their problem-solving abilities. Encouraging university faculty to collaborate with technical experts from enterprises on research projects can help overcome technical challenges, promote the application of scientific research outcomes, and improve the practical teaching capabilities of educators.

5. Conclusion

This study focuses on accelerating the development of a collaborative innovation ecosystem for medical equipment. It provides a comprehensive and in-depth analysis of the system's essence, components, current status, challenges, and successful cases both domestically and internationally. The study also proposes targeted strategies for building this ecosystem. Accelerating the development of a collaborative innovation ecosystem for medical equipment is crucial for enhancing the competitiveness of China's medical equipment industry and advancing medical technology. By implementing these strategies, it is hoped that the current issues can be addressed, promoting the coordinated progress among various elements, achieving high-quality development in the medical equipment industry, and providing stronger support for the development of China's healthcare sector.

In the context of globalization, the collaborative innovation ecosystem for medical equipment will enhance international cooperation and exchange. China will actively participate in the development of international standards to boost its influence and voice in the global medical equipment sector. The country will strengthen its collaboration with the International Organization for Standardization (ISO) to align its medical equipment standards with international standards. It will also integrate China's innovative achievements and technological

advantages into international standards, thereby enhancing the recognition and competitiveness of Chinese medical equipment products in the international market. Efforts will be increased to attract advanced international technologies and talents, promoting technological upgrades and innovative developments in the domestic medical equipment industry. By collaborating with leading international companies and research institutions, China will introduce advanced medical equipment technologies and management practices from abroad, improving the R&D capabilities and management skills of Chinese medical equipment enterprises. Attracting high-end international talent to work in China will inject new vitality into the collaborative innovation ecosystem for medical equipment. Cooperation with countries and regions along the "Belt and Road" initiative will be strengthened to promote the export of Chinese medical equipment products and technologies, expanding the international market. Through the "Belt and Road" initiative, cooperation in the medical equipment sector will be enhanced, establishing industrial cooperation zones, conducting technical exchanges and trade, and promoting the application and promotion of Chinese medical equipment products and technologies in the international market, thereby increasing the international market share of China's medical equipment industry.

Disclosure statement

The author declares no conflict of interest.

References

[1] Li D, Wang JH, 2021, Research on Knowledge Fusion Mechanism in Medical Engineering Cross Innovation. Scientific Research, 39(5): 832–841.

[2] Chen XX, Zhang T, 2022, The Driving Mechanism and Path of Clinical Doctors' Participation in Medical Device Innovation. China Hospital Management, 42(7): 67–70.

[3] Liu Y, Yang F, 2023, Operational Difficulties and Breakthrough Paths of University Hospital Enterprise Collaborative Innovation Platform. Technological Progress and Countermeasures, 40(2): 45–52.

[4] Etzkowitz H, Zhou CY, 2018, The Triple Helix: University–industry–government Innovation and Entrepreneurship. Routledge, London, 89–112.

[5] Wang K, Zhou L, 2022, Collaborative Path for Breakthroughs in High-end Medical Equipment "Neck Stuck" Technology. Research Management, 43(8): 32–40.

[6] Zhao MH, 2021, Clinical Demand Mining Model for Original Medical Devices. Chinese Journal of Medical Devices, 45(4): 341–345.

[7] Yock PG, Biodesign: The Process of Innovating Medical Technologies. Cambridge University Press, Cambridge, 101–135.

[8] National Development and Reform Commission, 2021, "14th Five Year Plan" for the Development of Medical Equipment Industry. Policy Document, 2021-12.

[9] Li Y, Wang GP, 2023. Incentive Effect of Priority Approval Policy for Medical Devices on Innovation. China Health Policy Research, 16(1): 55–61.

[10] China Medical Device Industry Association, 2023, Blue Book of China Medical Device Innovation Ecology (2023). Social Science Literature Press, Beijing.

[11] Zhang W, 2022, Exploration of Medical Engineering Collaborative R&D Mode for Surgical Robots: Taking the "Tianji" System as an Example. Chinese Journal of Biomedical Engineering, 41(3): 356–363.

[12] Fudan University Affiliated Zhongshan Hospital, 2020, Construction and Practice of Medical Engineering Integration Clinical Trial Platform. Chinese Journal of Hospital Management, 36(11): 901–905.

[13] Morrow DA, 3033, Academic-industrial Collaboration in Medical Device Development. Nature Medicine, 28(3): 410–415.

[14] Chen XH, 2023, The Independent Innovation Path of Artificial Intelligence Medical Devices. Management World, 39(4): 112–125.

[15] Zhou SH, 2022, Localization Replacement Strategy for Core Components of Medical Imaging Equipment. China Medical Equipment, 37(10): 1–6.

[16] FDA, 2024, Breakthrough Devices Program: 2023 Annual Report. FDA, Silver Spring.

[17] Xiao GH, 2021, Construction of Maturity Evaluation Model for Medical Engineering Integration Projects. Science and Technology Management, 42(6): 77–90.

[18] Kramer DB, 2020, Barriers to Medical Device Innovation. New England Journal of Medicine, 383(6): 502–504.

[19] Zhang MX, 2023, Challenges in Medical Engineering Collaborative Development of Brain Computer Interface Medical Equipment. Chinese Journal of Biomedical Engineering, 42(5): 567–574.

[20] MIT Jameel Clinic, 2024, AI for Healthcare: Global Collaborations Report. MIT, Cambridge.