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Article

Exploration on the Construction of a Deeply Integrated "Medical-Research-Enterprise" Sci-Tech Innovation Model System in Monodisease Oncology Research Centers

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Abstract: Objective: To enhance the overall scientific and technological innovation capability and conversion rate of scientific and technological achievements of hospitals by constructing a scientific and comprehensive "medical research enterprise" deep integration technology innovation model system for tumor single disease research centers. Methods: Based on the typical case study method and literature study method, the "medical research enterprise" deep integration scientific and technological innovation model system of the tumor single disease research center built by the Chinese Academy of Sciences Hefei Cancer Hospital was elaborated from six fusion aspects, including organization, system, platform, personnel, project support and achievements, and achievements transformation and sharing. At the same time, the scientific and technological achievements obtained from the publication of paper achievements, patent achievement approval, patent achievement transformation, and project approval showed the role of the "medical research enterprise" deep integration scientific and technological innovation model system of the tumor single disease research center in improving the scientific and technological innovation ability of the hospital. Results: The "medical research enterprise" deep integration scientific and technological innovation system of the cancer single disease research center built by the Chinese Academy of Sciences Hefei Cancer Hospital has made remarkable achievements in the important aspects of scientific and technological achievements such as the publication of papers and books, the publication of patents and software works, the approval of projects, and the transformation of patent achievements. Conclusion: The "medical research enterprise" deep integration of scientific and technological innovation model system of the Research Center for Single Disease of Tumor in Hefei Cancer Hospital, Chinese Academy of Sciences can significantly improve the overall scientific and technological innovation capability of the hospital and the transformation rate of scientific and technological achievements, which is of great significance for improving the theory of hospital integration of scientific and technological innovation and guiding the practice of hospital scientific and technological innovation.

Keywords: deep convergence of hospitals; research institutes and enterprises; integrated innovation; scientific and technological innovation framework; technological innovation capability

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1. Introduction

Since the issuance of the "Guiding Opinions on Promoting High-Quality Development of Public Hospitals" in June 2021, higher requirements have been set for the

development of public hospitals, emphasizing the need to enhance their scientific and technological innovation capabilities to drive high-quality development [1]. Concurrently, following the promulgation of the "Guiding Opinions on Comprehensively Advancing Scientific and Technological Innovation in Health and Healthcare" (State Council Document No. 50, 2016), which called for vigorous promotion of the "Medical-Research-Enterprise" collaborative innovation model, theoretical research and practical exploration of this model have rapidly developed. Hospitals have increasingly emerged as key players in medical technological innovation [2,3]. The collaborative innovation process between entities of "Medical-Research-Enterprise" involves three different participants with different innovation elements, who jointly promote medical technology in a comprehensive manner. However, due to organizational and institutional differences, uneven distribution of benefits from technological achievements, insufficient cooperation platforms, and unreasonable personnel systems, the collaborative innovation process among these three participants often faces obstacles and bottlenecks. Therefore, the ability of hospitals to collaborate on technological innovation and result transformation has achieved limited success so far [4-7].

With growing technological innovation demands in hospitals and increasingly salient issues of insufficient innovation resources, the concept of integrated innovation has gradually evolved. Scholars have pointed out that "integrated innovation" in healthcare refers to breaking down barriers between knowledge domains-such as biology and clinical practice, medicine and surgery, research and clinical practice, and health and social services-to achieve deeper collaborative innovation in healthcare. Compared to traditional collaborative innovation models, the "integrated innovation" model places greater emphasis on the deep integration and sharing of innovation elements like personnel and resources among healthcare innovation actors, forming more robust industrial chain innovation systems and alliances [2,4]. Furthermore, existing research indicates that the "Medical-Research-Enterprise" integrated sci-tech innovation theory has been explored and practiced by several hospitals in China, including Yinhai Ophthalmology Hospital and Shanghai Tenth People's Hospital, with positive outcomes in scientific and technological innovation [2]. Nevertheless, although current theoretical research and practice on "Medical-Research-Enterprise" integrated sci-tech innovation have achieved certain results, overall, related theoretical studies and practices are still in their early stages and require further in-depth investigation.

Based on the above, this study selects the "Medical-Research-Enterprise" integrated sci-tech management system established by the Hefei Cancer Hospital, Chinese Academy of Sciences, for monodisease oncology research centers as a typical case for in-depth research. It elaborates in detail on how to build a deeply integrated sci-tech innovation model system for monodisease oncology research centers across six dimensions: organization, institutions, platforms, personnel, project support, and achievement translation and sharing. The study also demonstrates the system's outcomes in terms of scientific and technological achievements, including published papers, approved patents, translated patent results, and funded projects. The aim is to refine the theory of integrated sci-tech innovation in the hospital sector and provide practical guidance for enhancing the sci-tech innovation capabilities of public hospitals.

2. Literature Review

Current research on the deeply integrated “Medical-Research-Enterprise” sci-tech innovation model in hospitals remains relatively limited in terms of overall findings. Existing studies primarily focus on specific aspects or a few areas—such as building integrated innovation platforms or establishing special funds for integrated innovation—to promote collaborative innovation. There is a lack of theoretical research that explores how to construct a comprehensive “Medical-Research-Enterprise” deeply integrated sci-tech innovation system from a holistic and systematic perspective.

Some studies have developed models for translating scientific and technological achievements through medical-research-production integration. These studies explore how a multi-agent integrated innovation model involving "Medical-Research-Enterprise" can stimulate motivation among innovation entities, thereby mobilizing the sharing of innovation resources from all parties and ultimately enhancing the sci-tech innovation capacity of hospitals. At the same time, the literature points out that the current deeply integrated "Medical-Research-Enterprise" innovation system suffers from unclear functional positioning and interest relationships among various innovation entities, poor communication mechanisms, and imperfect institutional systems [2].

Other research suggests that constructing a deeply integrated innovation system in the field of life and health should emphasize the connection between the innovation chain and the industrial chain. It is recommended to adopt an integrated perspective, stimulate the motivation of innovation entities from a multidisciplinary standpoint, break down barriers to integrated innovation, and cultivate a robust innovation ecosystem in the life and health sector [8].

Additional studies indicate that China's National Clinical Medical Research Centers currently face issues such as a lack of top-level coordination, fragmented support and collaboration, and low utilization of infrastructure. By reviewing the historical evolution of translational medicine platforms in other countries, these studies propose measures such as establishing centralized management platforms and special development funds to promote the translation of innovation outcomes [9].

Meanwhile, the hospital's "Medical-Research-Enterprise" integrated sci-tech innovation system runs through the entire innovation process—from the proposal of ideas (clinical needs) to scientific exploration, sample development, qualification acquisition by researchers, and ultimately the market-oriented transformation of innovation outcomes by enterprises. In this process, hospitals play roles as organizers, coordinators, participants, and full-process contributors [10-13]. Through organizational management, institutional guidance, project funding support, and the improvement of platform services and personnel systems, hospitals can facilitate the smooth implementation of "Medical-Research-Enterprise" integrated innovation activities, gradually building and refining the hospital's integrated sci-tech innovation system.

Based on this, how to construct a scientific, systematic, and effective model system for deeply integrated "Medical-Research-Enterprise" sci-tech innovation in hospitals has become an important research direction in the field of hospital integrated innovation. It is also an urgent issue that needs to be addressed in the practice of hospital integrated innovation.

3. The Construction of a Deeply Integrated "Medical-Research-Enterprise" Sci-Tech Innovation System

Cancer, as a complex disease that poses a severe threat to human life and health, requires urgent innovation in treatment modalities and technologies [14]. To better pool internal and external innovation resources for breakthroughs in cancer therapy, this study conducts an in-depth analysis of the deeply integrated "Medical-Research-Enterprise" (M-R-E) sci-tech innovation system within the Single-Disease Cancer Research Centers at the Hefei Cancer Hospital, Chinese Academy of Sciences, as a representative case. It elaborates on how this system-spanning "organization, institutions, platforms, personnel, projects, achievement sharing, and commercialization"-effectively breaks down barriers to innovation cooperation and realizes the principle of deep integration, as illustrated in Figure 1 below.

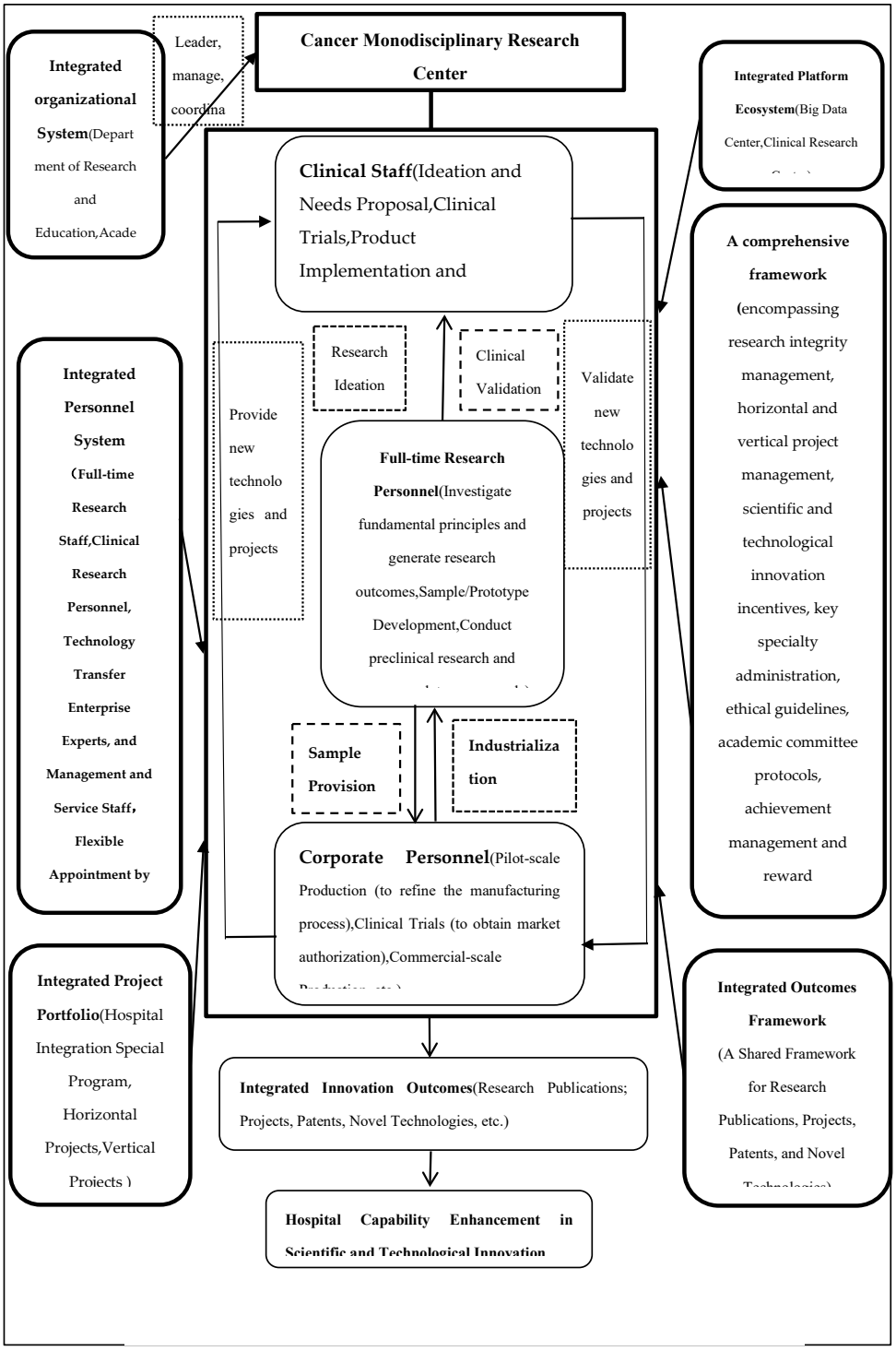

Figure 1. The Deeply Integrated "Medical-Research-Enterprise" Sci-Tech Innovation System of the Single-Disease Cancer Research Center.

3.1. Establishment of an Integrated "Medical-Research-Enterprise" Innovation Organization System

Organizations serve to unify goals, provide leadership, and facilitate coordination [15]. Establishing an integrated "Medical-Research-Enterprise" (M-R-E) innovation organization system enables the setting of common organizational goals for the three parties while enhancing the management and coordination of sci-tech innovation resources, benefit distribution, and innovation outcomes. This integration fosters a

synergistic force for collaborative innovation. To this end, a three-tiered M-R-E integrated innovation organization system has been established, characterized by "the Academic Committee overseeing strategy and direction - the Scientific Research and Education Department coordinating, managing, and supervising - and the Single-Disease Cancer Research Centers implementing specific tasks. "Specifically: Academic Committee: Composed of representatives from all three M-R-E parties, this committee serves as the highest decision-making body for integrated innovation. It is responsible for key decisions, including the development of sci-tech innovation plans, setting academic standards, reviewing outcomes and awards, and defining the roles and responsibilities of the three parties in the integrated innovation process. Scientific Research and Education Department: This department is tasked with implementing the specific functions of the Academic Committee and liaising with M-R-E integration staff in the Single-Disease Cancer Research Centers. It oversees the coordination, supervision, management, and evaluation of deep integration initiatives, providing the necessary support to "break down barriers to innovation cooperation and achieve deep integration." Single-Disease Cancer Research Centers: Six M-R-E integrated innovation organizations have been established for specific cancers (lung, breast, liver, nasopharyngeal, cervical, and gastrointestinal cancers). These centers bring together clinical staff (doctors for internal/external radiotherapy, nurses), dedicated researchers (from institutions such as the Institute of Health Sciences, Chinese Academy of Sciences), and industry professionals (executives from pharmaceutical companies) to achieve deep physical integration of the three parties. For example, during the clinical needs identification phase by medical staff, research experts contribute to guiding the research direction and designing studies, while industry experts assess the market potential of the research outcomes. This ensures that the principle of "integrated collaboration" is embedded throughout the entire medical technology innovation process.

3.2. Establishing an Integrated "Medical-Research-Enterprise" Institutional System for Innovation

Institutional frameworks are vital for sustaining the achievement of organizational goals and ensuring effective and rational operations [16]. To realize the shared objectives of the hospital's "Medical-Research-Enterprise" (M-R-E) integrated innovation framework and enhance its operational efficiency, a dual institutional system for scientific research-comprising both "Fundamental Research" and "Integrated Innovation"-has been established. This system ensures deep M-R-E integration throughout the entire hospital's scientific and technological innovation process at the institutional level. Specifically: Fundamental Research Institutional System: This system safeguards the hospital's basic scientific research and innovation activities. It includes policies and procedures for research integrity management, horizontal and vertical project management, rewards for scientific and technological innovation, management of key clinical specialties, ethical review, the Academic Committee framework, and outcomes management and incentive mechanisms. Integrated Innovation Institutional System: This system was specifically designed to emphasize the importance of deep M-R-E integration and to guarantee its effective and rational functioning. It involves infusing the principles of deep M-R-E integration into the fundamental research system and, more importantly, constructing a dedicated institutional framework that spans the entire innovation chain-from research topic selection and regularized R&D to zero-gap technology commercialization. Key components include:(1) Developing a Clinical-Oriented, Integrated M-R-E Research Topic Selection Mechanism. This mechanism leverages research resources from institutions like the Institute of Health Science, Chinese Academy of Sciences, aligning research directions and tasks with clinical challenges identified by the Single-Disease Cancer Research Centers. It forms dedicated research teams combining clinical and research staff. Initiatives such as "Research and Enterprise Experts Enter the Clinic" enable experts to

participate in clinical activities (e.g., ward rounds, case discussions), immersing them in the clinical frontline to identify pressing problems. This process refines research topics that simultaneously address clinical needs and enterprise commercialization requirements, enhancing both the scientific rigor and market translatability of clinical research. (2) Establishing a Regular, Clinical-Facing Mentorship Mechanism for Research and Commercialization. "Research and Commercialization Consultation Clinics" are held at fixed times and locations, providing a platform for hospital staff and postgraduates. Experts from institutions like the Institute of Health Science offer comprehensive research consulting and commercialization guidance. The hospital provides mentorship from research experts for all staff-applied research projects, alongside dedicated commercialization guidance for outcomes with identified translational potential. (3) Exploring a " Zero-Gap" Translation Mechanism for Clinical-Oriented, Integrated M-R-E Innovations. This involves selecting and nurturing promising research outcomes. Clinical and research personnel are encouraged and guided to conduct patent landscaping and market analysis as early as the initial research topic selection phase. Guidance from enterprise commercialization experts-recruited, trained, or appointed by the hospital-helps shift the commercialization focus upstream. This enhances the targeting of development, expands market prospects, improves quality, and increases the technology transfer rate. Additionally, a robust risk protection mechanism is established to minimize the risk of intangible asset loss for patent inventors, licensees, technology managers, investors, and capital during market operations, safeguarding the interests of all stakeholders, particularly the technology providers.

3.3. Establishing an Integrated "Medical-Research-Enterprise" Personnel System

Personnel are the most critical element in scientific and technological innovation. The key to achieving deep integration and innovation among the medical, research, and enterprise (M-R-E) sectors lies in establishing a personnel system that breaks down barriers and gathers talents from all three parties [17]. Therefore, while staffing the Single-Disease Cancer Research Centers with professionals from the M-R-E sectors, our hospital has also created a personnel management framework comprising a "joint professional title and appointment system, integrated talent development programs, and a diversified performance evaluation mechanism." The specifics are as follows:(1) Implementing a "Flexible Professional Title and Appointment System." For example, clinical medical staff can hold dual appointments in both clinical and research title series. Research experts and enterprise translation specialists are offered flexible appointment mechanisms within the hospital, with reasonable promotion pathways and compensation. The aim is to cultivate interdisciplinary talents who understand clinical practice, scientific research, and commercialization, thereby bridging knowledge gaps among the different innovation entities and achieving deep integration of M-R-E personnel. (2) Creating Integrated Talent Development Programs for Deep M-R-E Integration. Initiatives such as the "Outstanding Young Talents Program" select promising young clinical staff from the research centers for support. These individuals receive one-on-one mentorship from research experts (e.g., from the Institute of Health Sciences) and enterprise translation specialists, fostering their awareness and capability in M-R-E integrated innovation. (3) Developing a Diversified Performance Evaluation System Based on Input-Output Theory. This system assesses the contributions of M-R-E personnel across multiple dimensions, including the construction of an integrated innovation environment, the depth and breadth of integration, and the outcomes achieved. It replaces the previous siloed evaluation approach-where clinical staff were assessed solely on clinical performance, researchers on academic output, and enterprise personnel on commercialization results-with a comprehensive mechanism that measures the contributions of all three parties across clinical, research, and commercialization activities. This integrated evaluation framework further guides M-R-E personnel in advancing practices for deep integration and innovation [18].

3.4. Establishing an Integrated "Medical-Research-Enterprise" Platform System

Innovation platforms serve as hubs for converging and facilitating the integration of various sci-tech innovation elements-such as knowledge, funding, equipment, biospecimens, and data. They provide the essential stage for practicing deep "Medical-Research-Enterprise" (M-R-E) integration [19]. To achieve the goal of "breaking down barriers to integrated innovation and realizing deep collaboration," our hospital has established an operational entity-the Single-Disease Cancer Research Center for deep M-R-E integration. This platform physically brings together innovation resources, including personnel, funding, and knowledge, from all three sectors. Furthermore, to better enable integration across the entire medical technology innovation process-from clinical needs and basic research to enterprise translation and clinical trials-additional platforms have been established. These include a Healthcare Big Data Center, a Cancer Translational Research Center, and a Clinical Research Center. Collectively, these form a comprehensive platform system with the hospital at its core as the central hub for the M-R-E integrated innovation model, covering the full spectrum of medical technology innovation.The specifics are as follows:(1) Single-Disease Cancer Research Center as an Integrated M-R-E Innovation Platform These centers bring together healthcare professionals (such as doctors and nurses), research scientists (including experts from the Institute of Health Sciences), and enterprise translation specialists. They serve as critical venues for deep interaction and collaborative sci-tech innovation among the three parties.(2) Cancer Translational Research Center Platform Equipped with facilities including a biobank, an animal laboratory, a central laboratory, and a research informatics office, this center provides fundamental resources and experimental spaces for investigating the scientific mechanisms behind clinical challenges and developing prototypes of technological products.(3) Healthcare Big Data Center This center supplies the data support necessary for identifying and formulating clinical questions and offers evidence-based medical rationale for developing their solutions.(4) Clinical Research Center As the final stage in translating medical technology outcomes to the market, this center is primarily responsible for conducting clinical trials on new drugs, medical devices, and novel medical technologies.

3.5. Establishing an Integrated Project Participation and Joint Funding System

The primary objective of "Medical-Research-Enterprise" (M-R-E) integrated innovation is to converge and fully leverage the scientific and technological innovation resources of all three parties, thereby creating a synergistic force for medical technology advancement. Consequently, personnel from all three sectors must participate jointly throughout the entire project lifecycle-from conceptualization and initiation to execution and conclusion. To this end, a project integration framework has been established, characterized by "internal special funding support coupled with active pursuit of external funding through horizontal and vertical channels." At the hospital policy level, it is strictly required that all research projects-whether internally deployed by the hospital or externally sourced (horizontal/vertical) and applied for through the hospital-must involve clinical personnel, research experts, and enterprise specialists throughout all stages, from initial conception to project establishment, implementation, and final reporting.

3.6. Establishing a System for Outcomes Sharing and Benefit Distribution from Translation

Scientific and technological achievements arising from "Medical-Research-Enterprise" (M-R-E) integrated innovation are the result of collaborative efforts by all three parties, as stipulated in project agreements. Therefore, both the outcomes and the benefits derived from their translation should be shared jointly among them. To this end, at the policy level, strict adherence is mandated to the outcomes and benefit-sharing agreements established during the initial project phase. Specific requirements include:For publications, clinical and research personnel must be the primary beneficiaries (e.g., first

author, corresponding author, or co-first/co-corresponding author for international publications; first or second author for Chinese publications). Involvement of enterprise or translation specialists as co-authors is strongly encouraged.For patents, software copyrights, and novel medical technologies, clinical and research personnel must also be the primary beneficiaries (listed as first and second inventors/contributors). Participation of enterprise or translation specialists is similarly encouraged.Furthermore, the sharing of both outcomes and translation benefits must adhere to the principles of risk-taking and contribution proportionality, ensuring distribution aligns with each party's level of involvement and investment.

4. Outcomes of the Deeply Integrated "Medical-Research-Enterprise" Sci-Tech Innovation System

Numerous research findings indicate that the evaluation of integrated sci-tech innovation capacity is predominantly based on the "input-output" theory, assessing dimensions such as the depth and breadth of integration, as well as its outcomes. Key metrics, including publications, the conversion and revenue generated from patents and software copyrights, and approved projects, serve as primary indicators for evaluating integrated sci-tech innovation capability. Accordingly, to better demonstrate the effectiveness of the deeply integrated "Medical-Research-Enterprise" (M-R-E) sci-tech innovation system established at the Hefei Cancer Hospital, Chinese Academy of Sciences, this study selects and analyzes the hospital's data from the past five years regarding publications, patents, software copyrights, and approved projects resulting from deep M-R-E integration for validation purposes.

4.1. Publications and Research Outputs

As shown in Table 1, the data indicate that at Hefei Cancer Hospital, Chinese Academy of Sciences, the period from 2022 to 2024 saw a substantial increase in the total number of "Medical-Research-Enterprise" (M-R-E) integrated innovation publications, the total number of publications with the hospital as the first affiliation, the total number of SCI-indexed papers with the hospital as the first affiliation, and the total number of Chinese-language papers with the hospital as the first affiliation, compared to the 2019-2021 period. Furthermore, from 2019 to 2024, all these metrics demonstrated a consistent year-on-year increasing trend. However, the absolute number of publications with the hospital as the first affiliation remains relatively low, particularly the quantity of high-quality outputs such as SCI-indexed papers where the hospital is the first affiliation. This underscores the need for further deepening integrated innovation and collaboration among the three M-R-E parties.

Table 1. M-R-E Integrated Innovation Publications of the Hospital (2019-2024).

No.	Year	Total Publications	Total Publications as First Affiliation	SCI Papers as First Affiliation	Chinese Papers as First Affiliation
1	2019	33	13	0	13
2	2020	44	20	1	19
3	2021	35	18	2	16
4	2022	93	25	9	16
5	2023	111	43	9	34
6	2024	143	57	13	44
7	Comparison Between 2019-2021 and 2022-2024	209.82%↑	145.10%↑	933.33%↑	95.83%↑

4.2. Patents and Software Copyrights Approved

As shown in Table 2, the data from Hefei Cancer Hospital, Chinese Academy of Sciences, indicate that during the 2022-2024 period, key metrics for "Medical-Research-Enterprise" (M-R-E) integrated innovation-including the total number of approved patents and software copyrights, total utility model patents, number of patents commercialized, patent commercialization rate, and funding generated from commercialization-all showed substantial increases compared to the 2019-2021 period, with a year-on-year upward trend.However, the number of invention patents and software copyrights exhibited a declining trend. Moreover, the annual totals for approved patents, invention and utility model patents, and software copyrights were unstable and remained relatively low. Moving forward, deeper collaboration among the three M-R-E parties is essential to increase the total output of intellectual property, particularly in the areas of invention patents and software copyrights.

Table 2. Medical-Research-Enterprise (M-R-E) Integrated Innovation Patents and Software Copyrights at Hefei Cancer Hospital, Chinese Academy of Sciences (2019-2024).

No.	Year	Total Patents	Invention Patents	Utility Model Patents	Software Copyrights	Patents Commercialized	Patent Commercialization Rate	Revenue from Commercialization
1	2019	2	1	1	0	0	0	0
2	2020	11	5	5	1	0	0	0
3	2021	7	4	1	2	0	0	0
4	2022	6	0	5	1	0	0	0
5	2023	5	2	2	1	2	40.00%	90
6	2024	15	5	7	0	3	20.%%	9000
7	Comparison Between 2019-2021 and 2022-2024	30.00%↑	-30.00%↓	100.00%↑	-33.33%↓	↑	↑	↑

4.3. Number of Approved Projects and Funding Amounts

As shown in Table 3, both the number of approved "Medical-Research-Enterprise" (M-R-E) integrated innovation projects and the corresponding funding amount at Hefei Cancer Hospital, Chinese Academy of Sciences, demonstrated substantial growth during the 2022-2024 period compared to the 2019-2021 period, maintaining a consistent year-on-year upward trend. This growth has been particularly pronounced in the most recent two years. However, the overall scale of approved projects and total funding remains limited, with a particular shortage of high-quality outcomes such as national-level projects. It is therefore imperative to further enhance deep collaboration among the three M-R-E parties and actively secure both internal and external project funding, with special emphasis on obtaining high-level support from national-level programs.

Table 3. M-R-E Integrated Innovation Approved Projects and Funding at the Hospital (2019-2024).

No.	Year	Number of Projects	Project Funding
1	2019	1	10
2	2020	7	40
3	2021	11	86
4	2022	9	56
5	2023	13	230

6	2024	28	800
7	Comparison Between 2019-2021 and 2022-2024	163.15%↑	698.53%↑

Overview of M-R-E Integrated Innovation Outcomes at Hefei Cancer Hospital, Chinese Academy of Sciences (2019-2024) An analysis of the "Medical-Research-Enterprise" (M-R-E) integrated innovation outcomes at Hefei Cancer Hospital, Chinese Academy of Sciences, from 2019 to 2024 (Tables 1-3) reveals significant improvements since the establishment of the deeply integrated M-R-E sci-tech innovation model within the Single-Disease Cancer Research Centers in 2022. Compared to the 2019-2021 period, the 2022-2024 period saw marked increases in the quantity, funding, and quality of approved scientific outputs-including publications, patents, and projects-generated through M-R-E integrated innovation. This demonstrates the effectiveness of this model in enhancing the hospital's overall scientific and technological innovation capacity.

However, several challenges persist in the M-R-E integrated innovation outcomes. For instance, the total number of approved publications, patents, and projects remains relatively low, particularly for high-quality outputs such as SCI-indexed papers, invention patents, and national-level projects. Additionally, the overall patent output is limited, and the commercialization efficiency is not high. Therefore, deeper integration and collaboration among the three M-R-E parties are essential to fully leverage their respective innovation resources and achieve a greater volume of higher-quality outcomes.

5. Conclusion

Since 2019, leveraging the medical innovation resources of the Institute of Health Sciences, Hefei Institutes of Physical Science, Chinese Academy of Sciences, Hefei Cancer Hospital has centered its efforts on "translational medicine" and characterized its approach by the "Medical-Research-Enterprise" (M-R-E) integrated innovation model. By fully integrating resources from the Hefei Institutes of Physical Science, the Cancer Hospital, and major pharmaceutical enterprises, the hospital has developed in practice a tripartite integrated innovation model involving "hospital, research institute, and enterprise." It has explored and established a deeply integrated M-R-E sci-tech innovation system tailored to the Single-Disease Cancer Research Centers within the hospital's scientific innovation framework. This has effectively addressed bottlenecks in the process of deep, multi-stakeholder innovation, significantly enhanced the hospital's overall sci-tech innovation capacity and the rate of medical technology commercialization, and preliminarily achieved the goals of consolidating innovation resources and accelerating the translation of scientific achievements.

Concurrently, Hefei Cancer Hospital constructed this deeply integrated M-R-E innovation system for the Single-Disease Cancer Research Centers from an administrative management perspective, encompassing "organization, institutions, platforms, personnel, project support, outcomes, and commercialization." Furthermore, the integrated innovation entities-including the hospital, the Institute of Health Sciences, and various enterprises-exhibit broad participation. Therefore, the deeply integrated M-R-E sci-tech innovation system of the Single-Disease Cancer Research Centers demonstrates strong transferability. Its successful experience can provide valuable insights for other hospitals, particularly cancer specialty hospitals or oncology departments in general hospitals, in establishing and operating their own sci-tech achievement development and translation systems.

Nevertheless, the system established by Hefei Cancer Hospital has its limitations. Having been in existence for only three years to date, it requires a longer period for practical validation. Additionally, participation from more hospitals is needed to verify the system's efficacy and broader applicability.

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