CEC CAPITAL
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CEC Capital China Healthcare Industry White Paper 2025

Key Perspectives

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I. Overview

In our CEC Capital China Healthcare Industry White Paper 2024, released last year, we estimated that as China fully emerged from the COVID-19 pandemic—while accounting for domestic volume-based procurement (VBP) policies and ongoing healthcare anti-corruption efforts—the country's healthcare industry reached an estimated market size of approximately RMB13.3 trillion (around USD 1.8 trillion) in 2023. This included roughly RMB3 trillion in pharmaceutical-related markets, RMB1.2 trillion across medical devices and diagnostics, and approximately RMB9.1 trillion encompassing healthcare services, digital health, and wellness sectors. After adjusting for overlapping segments, we projected

the total market size of China's healthcare industry in 2023 to be between RMB10.5 trillion and RMB11.0 trillion (USD 1.4–1.5 trillion).

In 2024, with China's economy generally stabilizing and the healthcare industry continuing to expand in scope, we estimate the market size of China's healthcare sector as follows: the pharmaceutical-related market remains steady at approximately RMB 3 trillion, similar to 2023; the medical devices and diagnostics segment is projected to grow modestly, reaching around RMB 1.4 trillion. Driven by China's rapidly aging population and the widening industry boundaries enabled by emerging technologies—such as artificial intelligence, robotics, and biomanufacturing—we forecast the combined market size of healthcare services, digital health, and broader health-related sectors to reach RMB 10 trillion. After adjusting for overlapping components, we estimate the total size of China's healthcare industry in 2024 to range between RMB 11.5 trillion and RMB 12.0 trillion (USD 1.5–1.6 trillion), reflecting a year-on-year growth rate of 9% to 10%.

Rapid population aging is a global phenomenon, and China is experiencing one of the most rapid and large-scale demographic shifts in history — a trend expected to accelerate significantly over the next two decades. This demographic transition presents both systemic challenges to China's socioeconomic fabric and transformative opportunities for industrial growth. The aging population is placing unprecedented strain on China's healthcare infrastructure, while simultaneously driving the rise of a substantial elderly care economy with significant growth potential. According to projections from the China Research Center on Aging, the elderly care economy is expected to reach RMB 30 trillion by 2035, accounting for roughly 10% of GDP, with health-related technological innovation and evolving consumer demand emerging as key engines of economic growth. We anticipate that technologies such as artificial intelligence, embodied robotics, and brain-computer interfaces (BCI) — once confined to the realm of science fiction — will rapidly evolve into practical solutions for eldercare, offering innovative approaches for Chinese society to meet the challenges of an aging population.

The reform and opening-up initiative launched in the late 1970s transformed China into a globally competitive manufacturing powerhouse over the past four decades. Today, China is evolving beyond its role as a manufacturing leader to become a global hub for technological innovation, product R&D, and the export of intellectual property (IP). Chinese innovation is gaining international prominence across sectors — from new energy vehicles represented by BYD, and semiconductor manufacturing led by Huawei, to artificial intelligence exemplified by DeepSeek, and cultural IP showcased by Black Myth: Wukong and Nezha.

China's growing innovation capabilities, R&D strength, and expanding IP exports are playing an increasingly important role in advancing global healthcare. China's healthcare innovation is being propelled by increasing demand and rapid acceleration of technological development. This dynamic not only helps address global disparities in medical resource

allocation but also accelerates China's transformation from the "world's factory" into a "global laboratory" and an "innovation epicenter."

In 1994, Professor William Kissick of Yale University introduced the Iron Triangle of Healthcare, a renowned framework that describes the inherent tension within traditional healthcare systems: high quality, low cost, and broad accessibility are universally desired, yet only two of these objectives can typically be achieved simultaneously. Throughout human history, quality healthcare has never been an equal-access resource — it remains a scarce asset, and at times, a privilege that wealth alone cannot fully secure.

One of the most pressing challenges of China's rapidly aging society is precisely this scarcity of medical resources. In cities with dense elderly populations, healthcare demand is surging, while medical expertise and resources remain disproportionately concentrated in first-tier urban centers, resulting in severe distribution imbalances.

Today, the accelerating progress of artificial intelligence (AI) and robotics — particularly embodied robotics — offers a pathway to partially alleviate the constraints of the Iron Triangle. These technologies hold vast potential across numerous healthcare applications, including AI-assisted diagnosis, medical imaging interpretation, surgical planning and execution, chronic disease management, health monitoring, new drug development, postoperative rehabilitation, and elderly care.

While AI and robotics will likely never fully replace the expertise of skilled physicians and specialists, technological advancements are steadily propelling Chinese society toward the long-term goal of healthcare equity. The road ahead remains challenging — but the first light of that future is already visible.

Bio-manufacturing and synthetic biology, much like artificial intelligence, exhibits foundational infrastructural characteristics and is emerging as a core driver in the transformation of traditional industries. Over the next 5 to 10 years, it is expected to fundamentally reshape global industrial ecosystems across biopharmaceuticals, food production, and agriculture.

Projections indicate that the sector's market size will expand from RMB 417.6 billion in 2023 to RMB 476.2 billion in 2024, representing year-on-year growth of over 15%. By 2030, China's bio-manufacturing market is projected to reach approximately RMB 1.8 trillion, while the global market is forecast to surpass USD 1.1 trillion (around RMB 8 trillion), with China accounting for nearly 23% of global capacity.

Our analysis suggests that China's growing technological leadership and strong industrial base are enabling its transition from participant and contributor to catalyst and global leader in bio-manufacturing. The country is well-positioned to become a central hub in global bio-

production, extending its long-standing industrial manufacturing strengths into this strategically critical sector.

In 2024, China's healthcare industry recorded approximately 148 M&A transactions totaling RMB 75 billion, marking a clear rebound from the downturn in 2023. The total deal value approached the 2021 peak, making 2024 the second-highest transaction year since 2019. The normalization of M&A activity in China's healthcare sector represents an important milestone in both industry development and capital market maturation, ushering in a new era of consolidation.

A-share listed companies remain the dominant force in China's M&A market, leveraging capital strength and industrial synergies to lead in deal-making. The strategic rationale behind M&A has evolved from a focus on market capitalization management toward deeper vertical integration. The ongoing capital investment winter has forced more rational valuations, bringing high-quality assets to market at more attractive price points. The adoption of innovative deal structures has further enhanced transaction viability, significantly accelerating deal momentum on both the buy and sell sides.

We believe that in this environment, a clearly articulated M&A strategy, strong execution capabilities, and disciplined post-merger integration are critical competencies that will enable leading players to navigate market cycles and reshape the competitive landscape.

II. The Most Significant Investment Themes in China's Healthcare Industry Today

1. Population aging is a global trend, and is particularly acute in China. The country is undergoing the world's largest and fastest aging process — a demographic shift that will intensify markedly over the next two decades. This transformation presents both significant challenges and new opportunities for societal evolution.

1) China's aging population is expanding at an exceptionally rapid rate both in scale and pace, placing sustained pressure on social security and elderly care systems.

China's elderly population has reached an unprecedented scale. As of 2024, there are 310 million people aged 60 and above (22% of the total population), including 220 million aged 65 and older (15.6%), signifying the country's transition into moderate aging. Over the next decade (2025–2035), the 60+ population is projected to grow by more than 10 million annually, surpassing 400 million by 2035 and accounting for over 30% of the total population — moving society into an era of severe aging. By around 2050, China's elderly

population is expected to peak at 487 million, representing one-quarter of the world's elderly population, with an aging rate of 34% — twice the global average.

The pace of this demographic shift is unprecedented. China's aging rate is projected to rise from 10% in 2000 to over 20% by 2025 and surpass 30% by 2035 — completing the transition from mild to severe aging in just 35 years, far faster than in Western economies. At the same time, the working-age population (ages 20–64) is projected to shrink by 47 million by 2035 and by 124 million by 2050, exacerbating structural imbalances between labor supply and pension demand.

Severe aging brings multiple systemic challenges: the elderly dependency ratio continues to rise, pension funding gaps are widening, and demand for healthcare and long-term care is surging. For example, the potential workforce required for disabled elderly care could reach 74 million by 2050 — representing 11% of the working-age population. Stark urban-rural disparities persist: rural regions are aging faster than urban areas but lack adequate elderly care infrastructure.

At the same time, declining birth rates and demographic imbalances remain unresolved. In 2024, China recorded 9.54 million births — an increase of 520,000 from 9.02 million in 2023 — ending a seven-year consecutive decline since 2016. However, the birth rate remains low at just 6.77‰, and overall population growth remains negative. The dual challenges of aging and low fertility rates continue to strain family support structures and intensify intergenerational pressures.

2) Population aging is placing unprecedented pressure on China's healthcare and medical services industry, while simultaneously creating significant new opportunities. Both supply-side players and payer stakeholders are rapidly adapting to this evolving landscape. The elderly care economy is driving substantial market expansion and has become a key focus of broader socioeconomic development.

- Aging populations present the clearest growth opportunities in specialized healthcare segments — particularly in medical nutrition, chronic disease management, rehabilitation, and long-term care for disabled patients.

Demand for food for special medical purposes (FSMP) is growing exponentially, fueled by demographic shifts and changing disease patterns. With accelerated aging, China is facing a worsening prevalence of chronic diseases. Data shows that among residents aged 40 and above, the combined morbidity rate for cardiovascular diseases, cancer, and diabetes has reached 34.3%. Moreover, 80% of patients with chronic diseases suffer from nutritional imbalances. Among hospitalized elderly patients, the incidence of malnutrition reaches 65%, with 42% experiencing more than 5% body weight loss during hospitalization — significantly increasing infection risk and prolonging recovery times.

FSMP provides targeted nutritional interventions to address these challenges. Clinical evidence shows that elderly patients receiving standardized FSMP protocols experience 35% slower muscle loss, a 28% reduction in infection rates, and an average hospital stay shortened by 12 days. In diabetes-specific FSMP, formulations incorporating resistant dextrin and dietary fiber reduce postprandial glucose fluctuations by 40%, with this segment projected to exceed RMB 7.5 billion in market size in 2024. In oncology FSMP, formulations enriched with ω-3 fatty acids and arginine have raised weight maintenance rates to 78% — a 26-percentage-point improvement over conventional nutritional support.

China's FSMP (Food for Special Medical Purposes) market is expanding rapidly, with a compound annual growth rate (CAGR) of 30%. The market is projected to reach RMB 23.42 billion in 2024 and exceed RMB 80 billion by 2030, establishing FSMP as a trillion-yuan growth pillar within the elderly economy. The sector is evolving from a medical adjunct into a core component of routine health management.

Regulatory authorities continue to introduce favorable policies to support industry development. The revised Administrative Measures for Registration of Foods for Special Medical Purposes (2023) shortened the standard approval cycle to 18 months, with priority review products now eligible for accelerated approval within just 30 days. In 2024, 196 domestically produced FSMP products were approved across three key categories: complete nutrition, disease-specific complete nutrition, and non-complete nutrition. Simultaneously, several cities — led by Wuxi — have begun incorporating FSMP into medical insurance coverage, driving faster adoption and industry penetration.

This sector is also attracting increasing attention from investors, with several significant transactions recently emerging. Driven by strong supply and demand dynamics, we recommend focusing on enterprises pursuing breakthrough innovations in three key areas:

- **Overcoming technical barriers** to demonstrate R&D strength and enable domestic substitution of specialized imported FSMP products.

- **Leveraging synthetic biology applications** to achieve transformative cost advantages.

- **Integrating AI technologies** to develop personalized, AI-driven nutrition solutions and establish differentiated market positioning.

At the same time, China's chronic disease management industry is undergoing a paradigm shift — moving from passive treatment toward proactive care. China currently has over 460 million chronic disease patients, with a prevalence rate of 62.3% among those aged 65 and older. Chronic conditions such as cardiovascular diseases and diabetes account for over 70% of total healthcare expenditures, fueling the growth of a health management market now valued at several hundred billion yuan.

China's chronic disease health management industry has steadily evolved, with its ecosystem now spanning five key areas: pharmaceutical companies, hospitals, pharmacies, home care, and insurance. Market players are pursuing diverse entry strategies tailored to their respective capabilities and resource advantages. For example, e-commerce platforms such as Ali Health and JD Health leverage their strong distribution channels to expand into healthcare services. Insurance-backed players like Ping An Good Doctor draw on their large policyholder bases, while companies such as Ark Health rely on physician networks to enter the telemedicine and medication procurement space. These differentiated approaches aim to deliver continuous, integrated care — both within and beyond hospital settings — to China's vast chronic disease patient population. Building a large patient base and creating closed-loop business models across service touchpoints remain key competitive advantages.

We believe the rapid advancement of AI foundation models will further energize this sector, creating new opportunities in internet-based health management and enabling more proactive chronic disease interventions. For example:

- **AI-powered dynamic risk prediction systems** can analyze large-scale patient datasets to forecast acute complication risks up to six months in advance, helping reduce the incidence of chronic disease complications.

- **Personalized behavior modification engines,** utilizing reinforcement learning algorithms, can continuously adjust intervention strategies. By analyzing patient dietary and exercise data, these systems generate tailored plans to promote long-term lifestyle optimization for chronic disease patients.

Medical AI foundation models are propelling the chronic disease management industry into a new era of predictive, preventive, personalized, and participatory (4P) medicine. Companies that combine strengths in data, algorithms, and ecosystem integration will be best positioned to lead this transformation.

The rehabilitation healthcare sector has also emerged as a key growth area within China's precision healthcare transformation, with its inelastic demand continuing to rise. The rehabilitation market has surpassed RMB 700 billion, with geriatric rehabilitation accounting for 58% of this total. Statistics show that 60% of individuals aged 60 and above require rehabilitation services (e.g., post-stroke, post-fracture surgery, cognitive impairment), with potential service volume exceeding 145 million patients in 2024.

Key clinical scenarios include:

- **Neurological Rehabilitation:** Stroke patients have a critical treatment window within 3–6 months post-onset, yet only 38% received systematic rehabilitation in 2024.

- **Post-Surgical Rehabilitation:** Demand among knee replacement patients is highly concentrated within the first three months post-operation, while public hospital rehabilitation beds have an average waiting period of 4.2 weeks.

- **Geriatric Syndrome Management:** 72% of functionally impaired seniors require combined physical therapy and cognitive training, yet current service coverage remains below 20%.

China's rehabilitation medical institutions are predominantly privately operated, yet the sector faces severe supply shortages. As of 2024, there were only 823 rehabilitation hospitals nationwide (152 public and 671 private), translating to just 6.1 facilities per 10 million people — well below the OECD average of 15.3. Rehabilitation beds account for only 1.8% of total hospital beds (327,000 beds in 2024), compared to 12% in the United States.

Government policy explicitly encourages the development of chain-based private rehabilitation hospitals. The 14th Five-Year Plan for Digital Economy Development calls for "supporting non-governmental entities in establishing chain-based and group-based rehabilitation medical institutions, and promoting the extension of rehabilitation services to communities and households." In parallel, the Opinions on Promoting the Sustainable, Healthy and Standardized Development of Non-Public Medical Institutions allows private rehabilitation hospitals to exceed regional bed quotas, with chain operators eligible for a "one-license, multiple-location" registration system. A range of construction subsidies, tax incentives, and other supportive measures are also in place to encourage private sector participation.

Against this backdrop, we maintain a positive outlook for the development of private rehabilitation medical institutions over the next 3–5 years, with particular attention to operators demonstrating experienced operational and management capabilities. At the same time, demand for intelligent rehabilitation hardware and assistive devices continues to expand. The integration of emerging technologies — including VR/AR systems, exoskeleton robotic platforms, and 3D printing — with AI-driven algorithms is propelling technological advancements in the rehabilitation equipment sector.

Disability care services have become a critical frontier for professionalization and standardization. China currently has 45 million elderly individuals with disabilities, of whom 32% are severely disabled. The average care duration exceeds 7.3 years, with annual nursing costs surpassing RMB 50,000 — fueling explosive demand as the population continues to age rapidly. However, the disability care sector faces a pronounced supply-demand gap. International benchmarks recommend a nursing bed ratio of 1:3 (one bed per three disabled elderly), which implies that China should have 8–10 million professional nursing beds when accounting for additional demand from dementia, post-operative

rehabilitation, and related conditions. Yet, as of 2024, China's elderly care institutions provided only about 3.2 million nursing beds — leaving a shortfall of over 6 million beds. Against this backdrop, the government is actively promoting private sector investment in integrated eldercare and medical services. The National Health Commission has adopted a multi-pronged approach to enhance administrative efficiency, including streamlining approval processes through record-filing management and consolidating establishment approvals with operational registrations. In terms of facility development, the Commission has removed regional quota restrictions for privately operated eldercare medical institutions and accelerated the inclusion of qualified medical facilities within retirement communities into the designated medical insurance network. Local governments are also encouraged to establish industrial investment funds to further support sector growth.

The accelerating aging trend is transforming long-term care insurance and disability care into a trillion-yuan market. Structural inefficiencies in the public system — spanning service quality, technological advancement, and payment flexibility — are creating significant opportunities for private operators. Leading enterprises with strong chain operation capabilities, intelligent service platforms, and integrated value chain competencies are projected to capture more than 70% of market share by 2030.

- **China's social health insurance, the primary payer, is under mounting pressure amid demographic aging, spurring the rise of diversified alternative payment mechanisms such as private pension insurance and commercial pension insurance to strengthen the overall payment system.**

China's healthcare insurance fund is facing growing challenges in maintaining fiscal sustainability and has now entered a critical inflection period marked by "declining contributions and rising expenditures." While the national employee medical insurance fund remains in surplus (RMB 416.4 billion as of 2024), the resident medical insurance system is under increasing strain. For example, in 2024 Tianjin's urban-rural resident medical insurance fund posted contributions of RMB 5.88 billion versus expenditures of RMB 7.24 billion, resulting in a deficit of RMB 1.36 billion. Similarly, Beijing's medical insurance program recorded an annual funding gap of RMB 526 million.

The underlying cause of this imbalance is demographic in nature: individuals aged 65 and older now account for 13.5% of the population, with per capita medical expenditures 3-5 times higher than those of younger age groups. Under China's pay-as-you-go system, a shrinking contributor base combined with a growing pool of elderly beneficiaries is creating severe fiscal challenges for the health insurance system.

The national rollout of personal pension insurance will be completed by December 2024, marking the formal establishment of a third pillar in China's pension system to complement basic medical insurance and enterprise annuities. However, current resident contribution patterns indicate limited participation enthusiasm. By the end of 2024, approximately 70

million personal pension accounts had been opened, representing 42% of urban employee basic pension insurance participants, with actual contributors accounting for less than 30% of account holders. Two primary factors have contributed to this phenomenon: first, current tax incentives exclude individuals with annual incomes below RMB 96,000, thereby dampening participation among middle- to low-income groups; second, as closed-end investment accounts, these products lack competitive yield advantages compared to alternative wealth management instruments, fostering wait-and-see attitudes among potential contributors. Potential policy relaxations regarding tax incentives and early withdrawal mechanisms are anticipated to enhance the product's overall appeal.

Concurrently, the commercial pension insurance market continues to expand, supported by active government promotion and multiple policy incentives. Regions such as Shanghai and Shandong have successively implemented "medical insurance + commercial insurance" one-stop settlement systems, covering over 1,000 public and private hospitals while reducing claims processing cycles to under two hours. The long-term care insurance pilot program is accelerating, with mandatory coverage targets set for 50% of prefecture-level cities nationwide by the end of 2025. This initiative establishes a tripartite funding mechanism involving government, enterprises, and individuals, while enabling insurers to develop supplemental products covering non-policy nursing durations and premium care institutions. At the national healthcare security administration level, efforts are underway to expedite the opening of medical insurance data to commercial insurers. Commercial insurance, as a supplement to public healthcare, is progressively transitioning from singular financial supplementation to comprehensive lifecycle health management.

By 2035, China's elderly care economy is projected to reach RMB 30 trillion, accounting for approximately 10% of GDP, with health-related consumption poised to become a significant market growth driver.

The period from 2025 to 2035 represents a critical transition window, as China's aging population moves from moderate to severe levels. In the coming decade, retirees will primarily comprise younger seniors aged 60–74, who generally enjoy better health and possess substantial accumulated wealth. This demographic will serve as the core driver of the "elder economy benefit." Projections indicate that China's elderly care economy will expand from approximately RMB 9–10 trillion today to RMB 30 trillion by 2035, representing a compound annual growth rate of 12%–15%. This growth will be fueled by policy tailwinds, technological innovation, and increasing consumption— though it will require careful management of regional disparities and varying payment capacities across population segments.

The rise of the elderly care economy has positioned health-related consumption at the center of market attention. In the functional foods segment, specialized categories are experiencing strong demand growth, including:

- products designed for age-related swallowing and chewing difficulties;
- low-sodium and low-GI formulations for chronic disease management;
- cognitive support supplements featuring PS128 and Omega-3;
- probiotic solutions aimed at gut microbiome regulation.

Technology innovation in senior-oriented products continues to accelerate. For example, high-pressure microfluidics now achieves 80% fragmentation of meat fibers, enabling the production of "soft-textured yet nutrient-dense" foods. Nano-encapsulation technologies have tripled the bioavailability of lutein compared to conventional products. The industry has evolved from providing basic nutritional coverage to offering functional enhancements targeting cardiovascular, skeletal, digestive, and cognitive health.

China's senior population is also driving growth in the wellness tourism sector. Travelers aged 60 and above now account for 28% of total tourism spending, with an average annual travel frequency of 3.2 trips — well above the overall average of 1.8 trips. The domestic wellness tourism market is projected to reach RMB 90 billion in 2024, maintaining a compound annual growth rate exceeding 20%, with forecasts suggesting the market will surpass RMB 160 billion by 2029.

Integrated healthcare and elderly care is emerging as a new investment hotspot. The Boao Lecheng International Medical Tourism Pilot Zone hosted over 260,000 medical tourists between January and August 2024, introducing more than 440 licensed medical devices and pioneering innovative healthcare–eldercare models. A diverse range of players — including tourism operators, listed pharmaceutical companies, and real estate developers — are actively entering this space. Examples include: Takeda Pharmaceuticals' planned development of traditional Chinese medicine wellness tourism parks; PanLong Pharma's initiative to build integrated medical-rehabilitation-wellness complexes; and OCT Group's rollout of comprehensive wellness tourism resorts.

Overall, the consumption wave driven by the elderly care economy remains in a strong growth phase. We maintain a positive outlook on companies that demonstrate robust capabilities in healthcare resource integration, age-friendly service design, and innovative product development, anticipating that such enterprises will achieve superior market performance in the years ahead.

3) A new wave of revolutionary technological advancements—spanning artificial intelligence (AI), brain-computer interfaces (BCI), and embodied robotics—is opening novel pathways for Chinese society and families to address the challenges of an aging population.

Groundbreaking progress in AI is injecting new momentum into elderly care services. A continuous stream of innovative applications is emerging, significantly improving quality of life, strengthening health protection systems, and reshaping care

delivery models. These developments are becoming a key driving force behind the development of intelligent elderly care ecosystems.

Through the deep integration of intelligent sensing, big data analytics, and human-machine collaboration, AI now enables comprehensive coverage across the spectrum of elderly care—from basic life support to personalized health management. Moreover, AI is restructuring the traditional value chain of elderly care services through intelligent service networks, delivering an innovative approach that balances efficiency with human-centered care to tackle the challenges of an aging society.

Intelligent hardware devices enable real-time, in-home health monitoring for elderly individuals, supporting multidimensional personalized interventions. By integrating physiological data, behavioral patterns, and genomic information, these systems create precise individual profiles for deeper, data-driven health management.
For example:

- U.S.-based startup **VitalConnect** has developed wearable smart sensors capable of real-time monitoring of multiple vital signs and biometric parameters, positioning the company as a leader in dynamic cardiac monitoring. By 2025, VitalConnect has attracted over $100 million in funding.

- London-based **Zoe** analyzes blood and stool samples to assess lipid profiles, blood glucose levels, and gut microbiome health, providing personalized nutritional plans. The company is now valued at over $300 million.

Smart wearable manufacturers are further integrating AI learning models to predict chronic disease progression, optimize dietary plans, and enable proactive interventions—representing one of the most promising applications in the sector.

By combining digital AI technologies—such as video consultations and smart sensing—a remote healthcare system has been established to support home-based elderly care. Leveraging wearable devices and smart home sensors, seniors can transmit real-time vital sign data to cloud-based diagnostic platforms, enabling remote diagnosis and e-prescription issuance by tertiary hospital specialists. This creates a closed-loop service model of **“data collection – intelligent analysis – cloud consultation.”** Concurrently, AI-powered emergency response systems leverage multimodal sensors to detect abnormal physiological signals (e.g., sudden spikes in heart rate or fall posture changes), achieving second-level critical condition identification via medical knowledge graphs. These systems then activate emergency services and community networks through a tiered alert mechanism, reducing critical rescue times by over 40%.

AI-powered companion robots are also providing emotional support and cognitive interaction training for elderly users. Enabled by large language models such as ChatGPT

and DeepSeek, these AI-driven interactive terminals have rapidly advanced. They now offer natural conversational exchanges, information services, cognitive training games, and personalized entertainment modules—supporting 24/7 interaction with seniors. Integrated psychological state recognition algorithms enable these systems to deliver targeted emotional interventions that help mitigate isolation-related loneliness and cognitive decline. Globally, Intuition Robotics' elderly companion robot ElliQ provides daily companionship, combats loneliness, and supports independent living. The company has secured over $100 million in cumulative funding, with continued investment from Japanese firms including Toyota AI Ventures.

AI technologies are further enabling intelligent transformations in home environments to reduce risks for elderly individuals living alone. IoT-based smart home systems are being widely implemented. For example:

- **Smart mattresses** monitor sleep patterns and automatically adjust firmness to improve sleep quality, while mechanized functions assist bedridden seniors with repositioning and personal care, helping prevent pressure ulcers.
- **Intelligent lighting control systems** provide responsive illumination to help prevent nighttime falls.

Through these AI-driven advancements, comprehensive age-friendly residential environments are being established—creating livable, adaptive homes for China's growing elderly population.

- **Brain-computer interfaces (BCIs) are widely regarded as having significant potential in the treatment of age-related neurodegenerative diseases, particularly in restoring motor function and enhancing neurocognitive capabilities—areas where early conceptual breakthroughs have already been demonstrated.** With continued technological advancement and progressing clinical trials, broader clinical adoption is anticipated within the next 3–5 years.

The global BCI industry is experiencing exponential growth, with market size projected to expand from $2.44 billion in 2024 to $6.52 billion by 2030, representing a compound annual growth rate (CAGR) of 18.1%. Non-invasive BCI currently dominates the market, accounting for an 85.9% share in 2024, largely driven by EEG headset devices that have found widespread adoption in consumer applications. In contrast, invasive BCI remains limited by surgical risks and high costs, with current usage largely confined to medical rehabilitation.

In the context of Alzheimer's disease, early diagnosis and intervention can be supported through monitoring brainwave signals to detect characteristic EEG abnormalities (such as variations in theta and alpha wave rhythms), aiding the identification of early cognitive impairment. AI-driven algorithms can further enhance this process by tracking the evolution

of disease-related biomarkers, facilitating earlier intervention by clinicians. For example, Neurable has developed BCI-enabled headphones currently used to monitor attention in Alzheimer's patients, with plans to expand into early dementia screening. As the disease progresses, customized cognitive training programs can be developed to activate targeted brain regions through tailored exercises. Invasive BCIs may additionally provide precise stimulation of the hippocampus or prefrontal cortex, with the goal of repairing damaged neural circuits, slowing cognitive decline, and delaying disease progression. MIT researchers, for instance, have developed a BCI-based neural prosthesis that improves short-term memory in mice via hippocampal stimulation, offering a promising new therapeutic direction for Alzheimer's disease. While late-stage interventions may offer more limited potential, BCI technologies that convert brain signals into speech outputs can still assist patients in maintaining verbal communication and functional control.

BCI applications for restoring motor function in cases of paralysis caused by spinal cord injuries, stroke, or amyotrophic lateral sclerosis (ALS) also represent a critical focus area for the industry. By bypassing damaged neural pathways and establishing direct communication between the brain and external devices, BCI technology enables patients to regain varying degrees of motor or environmental control.

Governments worldwide are actively funding BCI research to accelerate clinical progress. In the U.S., the BRAIN Initiative continues to support projects in neuroregulation and stimulation, with its research emphasis shifting in 2024 from proof-of-concept toward clinical validation. The National Institute of Health (NIH) launched the Blueprint Medtech program in 2024 to facilitate the commercialization of BCI devices. In Europe, Horizon Europe added 18 new BCI projects in 2024, spanning neuroprosthetics development and biomarker screening.

Amid this favorable global backdrop, overseas BCI technologies have already achieved breakthrough clinical milestones. Leading companies initiated multiple trials in 2024: Neuralink completed three human cases with its invasive BCI device, targeting 20–30 additional cases in 2025 and over 22,000 implants by 2030. Synchron's BCI for paralysis treatment has also advanced to large-scale human trials, with 10 successful implants completed to date.

- **The caregiving demands of an aging society are creating substantial incremental market opportunities for embodied robots.**

Since Alan Turing first introduced the concept of embodied intelligence in the 1950s, embodied robots have undergone more than half a century of technological evolution, and are now reshaping the technology landscape at an exponential pace.

- **Phase I (1950s–2000s)** marked the theoretical exploration era, dominated by bionic robotic arms and early AI algorithms. While Honda's ASIMO achieved basic motion

control, limited computational power and restricted sensory perception confined functionality to pre-programmed tasks.

- **Phase II (2010s–2019)** represented the sensory awakening epoch, driven by deep learning breakthroughs. Boston Dynamics' Atlas demonstrated complex parkour maneuvers through reinforced learning, signaling a shift from mechanical execution to dynamic environmental interaction.
- **Phase III (2020–present)** is witnessing the convergence of large language models and multimodal technologies, triggering an mobility/movement intelligence explosion. Commercial deployments such as Tesla's Optimus and Ubtech's Walker in industrial and household service applications are driving projections of a trillion-dollar global market for embodied robots by 2030.

From an economic perspective, industrial applications are expected to mature earlier than consumer applications. As production scales, robotic costs will decline while performance improves. Over the long term, demographic-driven labor shortages—particularly in aging societies—will make embodied robots a necessary and viable supplement to the workforce.

In elderly care, embodied robots offer the potential to augment or partially replace human caregivers, thereby improving nursing efficiency and addressing acute caregiver shortages. For example, at the 2024 IEEE International Conference on Robotics and Automation (ICRA), the GARMI nursing robot—developed by the Munich Institute of Robotics and Machine Intelligence (MIRMI) at the Technical University of Munich—demonstrated its ability to autonomously perform 20 high-frequency care tasks, including repositioning, feeding, and hygiene assistance, by interpreting instructions via ChatGPT. This technology frees caregivers from repetitive physical tasks and allows them to focus instead on providing emotional support and managing emergency interventions, thereby improving overall care quality. Japanese firms are also developing transfer-assist robots that enable safe patient repositioning, reducing the incidence of pressure ulcers and minimizing risks and injuries associated with manual handling.

Technological breakthroughs and supportive policy measures are working in tandem to accelerate adoption. Since 2023, major cities including Shanghai, Beijing, and Guangzhou have launched pilot programs to include devices such as exoskeleton robots and smart monitoring mattresses under long-term care insurance coverage, with reimbursement rates ranging from 30% to 50%. For instance, Shanghai's 2023 Implementation Opinions on Further Improving the Long-Term Care Insurance System explicitly endorsed the inclusion of eligible smart care devices (e.g., exoskeleton robots, non-invasive monitors) in insurance coverage. In 2024, the Smart Elderly Care Application Demonstration Zone Construction Plan issued by Shanghai's Pudong New Area specifically incorporated "rental services for care robots" into the long-term care insurance payment pilot, setting a monthly reimbursement cap of RMB 800 per device.

Despite challenges in consumer applications—where high development and manufacturing costs currently constrain widespread commercial deployment—policy-driven pilot programs represent a powerful catalyst. We anticipate that innovative leasing models combined with insurance reimbursement will drive adoption of embodied robots in elderly care. This evolution will enable broader implementation, address workforce shortages in the senior care sector, and optimize cost structures for care institutions. Ultimately, embodied robotics will become a critical component of the technology toolkit to manage the challenges of an aging population.

2.Generative AI and robotics are reshaping the global healthcare landscape by enhancing diagnostic precision, accelerating drug development, and improving medical accessibility. While China possesses distinct competitive advantages in large-scale datasets and application-driven innovation, it also faces foundational bottlenecks, including data silos, algorithmic dependency, and regulatory lag. Future breakthroughs will require advancements in intelligent medical devices, compliant data circulation, and differentiated innovation — all within a synergistic technology-governance-humanities framework to enable the distributed transformation of healthcare resources.

As a key technology driver, AI's most significant advantage lies in rapidly enhancing precision and efficiency across a wide range of medical applications. By replacing manual processes and facilitating the integration of personalized solutions, AI substantially improves healthcare accessibility and drives systemic industry transformation. In clinical practice, AI is enabling breakthroughs in drug discovery and medical imaging diagnostics, while surgical robotics and brain-computer interfaces are advancing precision in surgical and rehabilitation therapies. Robotics is evolving from simple automation toward intelligence-driven applications, unlocking new possibilities such as customized physical examinations and personalized health management. In parallel, AI's inclusive capabilities are helping bridge healthcare resource disparities by strengthening primary care through diagnostic assistance tools.

However, significant implementation challenges remain. Healthcare's highly regulated environment requires prolonged validation cycles for medical AI applications, while human expertise remains irreplaceable in key clinical decision-making. At present, AI technologies primarily serve as efficiency enhancers within medical workflows rather than as autonomous decision-makers.

China holds notable advantages in the scale of its data resources (derived from a population of 1.4 billion) and in application scenario innovation (such as AI-driven medical imaging and chronic disease management), particularly relative to the U.S. Yet key foundational gaps persist: stringent regulatory constraints; reliance on foreign databases for clinical research; dependence on imported algorithmic frameworks and medical technologies; fragmented data silos across healthcare institutions; and an underdeveloped innovation ecosystem for integrating pharmaceuticals with medical devices.

To build a healthcare technology development pathway that reflects China's unique strengths, it will be essential to strengthen computational infrastructure, promote compliant data circulation, refine regulatory frameworks, and drive breakthroughs in specialized areas such as intelligent medical devices and AI-assisted drug development. A concerted focus on these priorities will help China establish a globally distinctive, innovation-led healthcare ecosystem.

1) AI Drives Transformative Changes in the Healthcare Industry

Generative AI and robotics are rapidly converging with the healthcare sector, catalyzing a broad transformation through the alignment of technological innovation, policy support, and clinical demand. Intelligent medical devices are making breakthroughs in replacing foreign products with domestic substitutes, generative AI is reshaping drug R&D paradigms, distributed healthcare systems are optimizing resource allocation, and automated diagnostics are extending into primary care. Rehabilitation robotics are leveraging reforms in medical insurance reimbursement to expand into home-based health management, forming an integrated ecosystem of devices, data, and services. While China is at the forefront of application-driven innovation, it still faces key challenges—including limited penetration of smart technologies at the grassroots level and lagging payment systems. Moving forward, the sector must forge a development path grounded in technological iteration, institutional adaptation, and ecological synergy.

- **Technology-Policy-Clinical Demand Resonance Triggers Industry-Wide Transformation**

Breakthroughs in AI and robotics technology are not isolated developments but the product of deep integration across policy guidance, aging society shifts, and foundational technology innovation. At the policy level, the government has elevated AI + healthcare to a strategic priority, establishing application boundaries through documents such as the Healthcare Industry AI Application Scenarios Reference Guide, while also encouraging the development of large-scale medical AI models. Clinically, shortages in primary healthcare resources and the complexity of disease management are accelerating the adoption of intelligent solutions. In county-level hospitals, AI-assisted diagnostic systems have evolved from basic tools to core decision-support systems. On the technological front, multimodal data integration—spanning imaging, pathology, and genomic data—is moving the sector beyond single-point optimization toward a closed-loop system that supports prevention, diagnosis, treatment, and rehabilitation. These forces are shifting the healthcare industry from equipment-centric models toward data-driven transformation—though challenges such as data silos and fragmented computing infrastructure remain critical bottlenecks.

- **The Critical Threshold of Medical Device Intelligence: From Substitution to Surpassment**

The wave of replacing foreign products with domestic substitutes has advanced from low-value consumables to high-end equipment, underpinned by intelligent technologies and precision manufacturing capabilities. AI navigation systems are pushing the limits of robotic arm precision through dynamic compensation algorithms, enabling domestically produced endoscopic robots to perform sub-millimeter procedures while reducing the surgical learning curve for grassroots physicians by up to 70%. Flexible sensing technologies have cut the cost of electromyography monitoring to one-fifth that of imported systems, accelerating the transition of rehabilitation exoskeletons from laboratories to communities. Intelligent upgrades are redefining product value curves through a standardized hardware and customized software model—transforming devices from standalone tools into data-enabled platforms that support value-added ecosystems spanning hardware, data services, and outcome-based payment models. However, with equipment idle rates exceeding 30% in county-level hospitals, intelligent adoption must be aligned with clinical pathway optimization to realize its full potential.

- **The efficiency revolution in pharmaceutical R & D: Generative AI breaks through the traditional challenges of high cost, high risk, and long cycles.**

Generative AI is fundamentally transforming the drug discovery paradigm. The LucaProt model enhances RNA virus detection efficiency by 30x through multimodal feature extraction, while target prediction models can compress preclinical cycles from 5 years to 14 months, replacing traditional trial-and-error approaches. This paradigm shift is driven by three pillars: cross-disciplinary data integration (e.g., closed-loop systems combining protein structure prediction with virtual screening); intensive computing infrastructure deployment (e.g., regional medical supercomputing hubs); and innovation in incentive mechanisms (e.g., data property rights trading frameworks).

- **Healthcare Service Model Transformation: From Centralized to Distributed Healthcare, Enabling the Decentralization of High-Quality Medical Resources**

The decentralized healthcare system is undergoing structural transformation. Telesurgical robots are achieving over 95% success rates in remote operations with distances across 5,000 kilometers. AI-powered health management platforms enable real-time monitoring of 10+ physiological parameters via wearables, increasing chronic disease complication prediction accuracy to 89%. WeDoctor's Tianjin Digital Health Consortium has validated a closed-loop model of primary screening - AI diagnosis - efficacy tracking, tripling efficiency in grassroots diabetes management. This shift redefines the value of medical resources, moving from equipment procurement costs to health management outcomes. Yet, widespread adoption remains constrained by outdated payment models—only 12% of AI services are reimbursed under DRG—and continued dependence on primary care subsidies.

- **AI Diagnostics & Robotic Automation: Transforming Medical Testing – From Efficiency Gains to Grassroots Accessibility**

The convergence of AI and robotics is transforming diagnostics from isolated optimizations to full-chain automation with intelligence. Leading domestic companies are rapidly advancing large-scale clinical deployment of AI-assisted diagnostic tools, backed by Class III medical device certifications. These solutions translate physician expertise into reusable algorithmic models, improving diagnostic accuracy and consistency.
Major IVD manufacturers have adopted fully automated laboratory workflows, enabling unmanned, closed-loop systems for sample handling, testing, and analysis—powered by integrated robotic arms, smart transfer mechanisms, and AI-driven quality control. However, primary care adoption remains limited, with coverage below 20%, hindered by fragmented sample volumes, limited operator training, and high maintenance costs. To address this, the industry is pursuing two approaches: 1) Establish regional testing hubs using a "hub lab + satellite clinic" model to centralize demand, and 2) Developing lightweight, cost-effective POCT + AI systems to empower tertiary hospitals and strengthen primary care services.

- **Domestic Surgical Robot Substituting Foreign Imports Accelerates, Achieving Breakthroughs in Accessibility and Procedure Decentralization**

Domestic surgical robots are entering a rapid acceleration phase of import substitution, driven by parallel advances in technology and reimbursement frameworks. Domestically produced endoscopic and orthopedic robots are now matching imported models in precision and haptic feedback performance. Expanded reimbursement policies—such as those in Beijing and Zhejiang that include robotic surgical consumables—are lowering adoption barriers and enabling the adoption of robotic systems from tertiary hospitals to county-level institutions. This expansion relies on the integrated advancement of technology, payment systems, and training infrastructure. Modular equipment designs help reduce maintenance costs, making solutions more accessible to grassroots institutions. At the same time, manufacturers are partnering with regional centers to establish training hubs, cutting learning curves from months to weeks. Despite this progress, peripheral hospitals often lack stable technical support teams, leading to reliance on OEM engineers and inconsistent usage. In response, the industry is pursuing two paths: 1) Robotic surgery subscription models to eliminate heavy upfront capital investment, and 2) Remote expert networks powered by 5G + AR, enabling hybrid-reality surgeries that integrate specialist expertise with local execution.

- **Rehabilitation Robotics Secures Insurance Coverage, Home Care Becomes Key Commercialization Battleground**

The commercialization of rehabilitation robotics is shifting from hospital-centered care to home-based adoption. Breakthroughs in medical insurance policies—such as rental

coverage pilots in Shanghai and Nanjing—combined with lightweight device designs have enabled exoskeletons and upper-limb rehabilitation robots to enter households. This shift redefines value: from episodic therapeutic intervention to continuous health management through high-frequency, low-intensity home training that enhances quality of life.
However, the industry faces two key challenges: 1) Meeting the higher adaptability demands of home environments—ensuring device safety, ease of operation, and spatial compatibility, and 2) Overcoming reliance on limited regional insurance pilots, in the absence of a scalable medical-commercial-personal cost-sharing model. Emerging solutions are beginning to address these gaps. Leading companies are developing bundled models that combine hardware, services, and insurance—offering tele-rehabilitation guidance with each robot purchase and collaborating with insurers to create coverage for device failure or suboptimal outcomes. Looking ahead, competition will shift from hardware specifications to ecosystem integration—focusing on building seamless device-data-service platforms that enable home-based health management and realize the full potential of the hospital-to-home rehabilitation transition.

2) Constraints and Future Prospects of AI + Robotics Development in China

China's AI + healthcare sector shows strong competitive advantages in pharmaceutical R&D across the value chain, yet still faces significant foundational challenges—including fragmented data silos, dependence on foreign algorithms, and a lack of target diversity. The gap with the U.S. remains wide in key ecosystem capabilities such as open data infrastructure and computing power subsidies. While breakthroughs are emerging in frontier areas like AI-integrated organ-on-chip models and virtual clinical trials, three key barriers persist—data governance, grassroots clinical adoption, and ethical certification.
Advancing future development will require strengthening foundational innovation and maturing the ecosystem—through mechanisms such as data property rights trading, collaborative R&D between industry and academia, and tiered accountability frameworks.

- **AI empowers entire pharmaceutical R&D value chain, with policies continuously evolving to align with industry realities.**

AI is rapidly transforming drug discovery and development. In target identification, DeepMind's AlphaFold has been widely adopted by pharmaceutical companies, having predicted over 200 million protein structures. Generative AI is reshaping drug design paradigms—Insilico Medicine's PandaOmics platform, for example, identified the TNIK target and advanced it from discovery to preclinical candidate nomination in just 18 months—at one-third the cost of traditional approaches—making it one of the fastest AI-developed drug programs globally. AI is also revolutionizing clinical trials: Flatiron Health's cancer data analytics uncovered novel biomarkers for predicting drug response, reducing patient recruitment timelines from months to days. TechMed's "Internet + AI" recruitment

platform now supports over 1,200 clinical trials with 45% efficiency gains, while its RPA-based automation has cut labor needs for adverse drug reaction reporting by 37%. Although no AI-developed drugs have yet received market approval, the global pipeline now exceeds 300 programs. With continued progress in data sharing, human-AI collaboration, and ethical governance, the industry is well positioned to overcome the traditional "valley of death" in drug development. Notably, the U.S. FDA has recently announced new policy initiatives to reduce, refine, or replace animal testing requirements for monoclonal antibody therapies and other drugs—signaling growing regulatory openness to technological innovation.

- **China's medical AI sector continues to face significant foundational infrastructure deficiencies, limiting its ability to scale deep industrial applications—particularly when compared to the U.S. in several key domains.**

China benefits from unique advantages, including the vast scale of its healthcare data from 1.4 billion people and a strong track record of application-driven innovation, such as AI-powered medical imaging and chronic disease management. However, major foundational challenges persist: strict regulatory constraints, dependence on foreign research databases and imported algorithmic frameworks, reliance on overseas medical equipment, fragmented data silos across institutions, and an immature innovation ecosystem for integrating AI with drugs and medical devices.

In contrast, the U.S. demonstrates robust infrastructure strengths. Public data access is high—NIH alone has released over 1 million clinical imaging cases. Cloud computing leaders like Google and Nvidia offer pharmaceutical companies up to 50% subsidies on computing power. Additionally, target innovation in the U.S. has reached 43%, compared to 67% target homogenization in China, where 92% of AI algorithms still rely on foreign open-source frameworks.

- **The AI + robotics industry has reached a breakthrough inflection point, yet must overcome three critical challenges: data governance frameworks, clinical adoption barriers, and robust ethical accountability protocols.**

Clear opportunities are emerging in pharmaceutical R&D, healthcare accessibility, and ethical frameworks:

- Pharmaceutical R&D: AI-organ-on-a-chip technology is accelerating complex disease modeling, and virtual clinical trials projected to replace 30% of conventional trials.
- Healthcare accessibility: AI-assisted diagnostic systems aim to achieve 80% primary-care coverage by 2027, narrowing urban-rural treatment disparities.
- Ethical governance: GDPR-style cross-border medical data regulations and AI misdiagnosis liability frameworks are anticipated to be formalized by 2026.

While the industry foundation for growth is solid, several critical barriers remain:

Data Governance

- Compliance rate for medical data anonymization remains below 45%.
- Questionable authenticity of historical data limits model generalization capabilities.

Clinical Adoption

- 90% of grassroots AI healthcare projects remain dependent on government subsidies.
- Completion rate for equipment operation training remains below 50%.

Ethical Considerations

- 65% of AI-related misdiagnosis disputes currently lack standardized liability assessment criteria.
- Emerging technologies such as mind control and neural enhancement are raising new bioethical concerns.

Overcoming these challenges requires an integrated framework that bridges technology, institutional capacity and the humanities.

- Establish a property rights exchange mechanism for medical big model training data.
- Accelerate the deployment of joint R&D centers between tier-3 hospitals and enterprises.
- Refine a tiered liability framework for AI-driven medical incidents.

3. Accelerated Globalization of Chinese IP Rights

China's industrial sector is undergoing a pivotal shift— from "Made in China" to "Innovated in China," with a growing emphasis on Chinese IP ownership. The transformation is driving a broader restructuring of global industrial value chains. In the pharmaceutical sector, the rise of the "NewCo" transaction model is setting a new paradigm for the international expansion of Chinese innovative drugs—and increasingly, medical devices.

1) As China's fundamental R&D capabilities strengthen across multiple sectors, a transformative shift is underway—from "Made in China" to "Innovated in China," restructuring global industrial value chains.

Between 1980 and 2010, China leveraged its vast labor force and engineering talent drive rapid industrialization, laying the groundwork for a robust manufacturing base. By 2009, manufacturing accounted for nearly 30% of China's GDP. The industrial landscape evolved from labor-intensive production to capital-intensive processes, and ultimately to technology-

intensive, solidifying the “Made in China” identity across key sectors such as electronics, automotive, home appliances, and pharmaceuticals.

In the second decade of the 21st century, the Chinese government pivoted toward an innovation-driven development strategy, significantly increasing investments in science and technology. This policy pivot aligned with a critical inflection point in the accumulation of fundamental scientific research. According to the *World Intellectual Property Indicators* report published by the World Intellectual Property Organization (WIPO), China filed 1.59 million patent applications in 2021—accounting for nearly half of global filings and maintaining its position as the world leader for the 11th consecutive year. That same year, China surpassed the United States for the first time in active patents, holding 3.6 million valid patents in 2021 and maintaining its status as the global leader in patent application volume.

China’s sustained investment in high-tech industries, fundamental research, and frontier technologies is transforming its scientific research dividend into a new engine of economic growth. Characterized by high investment, high risk, and high returns, this strategic shift is accelerating the transition from “Made in China” to “Designed in China” and “China IP”—signaling the dawn of a new era in global technological leadership.

In the pharmaceutical sector, China’s early development phase (2000–2015) was marked by a focus on active pharmaceutical ingredients (APIs) and generic drug production. Leveraging significant cost advantages, Chinese drugmakers rapidly entered global markets, establishing the “Made in China” label as a key part of international pharmaceutical supply chains. Today, China supplies nearly 30% of global API demand and remains the world’s largest API producer.

The golden era of Chinese innovative drugs began in 2015, marked by China’s accession to the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) and a systematic overhaul of new drug reviews by national regulatory authorities. Over the past decade, China has rapidly advanced to become the world’s second-largest pharmaceutical R&D hub. According to *Citeline’s Pharmaceutical R&D Annual Review 2025*, China now accounts for 29.5% of the global drug development pipeline, second only to the United States.

This shift is already driving tangible results in the globalization of Chinese pharmaceutical IP. According to DealForma data, 29% and 31% of innovative drugs licensed by multinational corporations in 2023 and 2024, respectively, originated from China. The industry is now undergoing a fundamental transition—from “Made in China” to “IP from China”—marking a new chapter in China’s evolving role within the global life sciences ecosystem.

2) In the field of novel drug development, the NewCo transaction model—which entails the acquisition of Chinese biotech IP by U.S. investors—has rapidly emerged, signaling global recognition of China's drug R&D capabilities.

Earlier this year, *The Wall Street Journal* published "The Drug Industry's DeepSeek Moment," highlighting how Chinese biotech firms are now developing drugs faster and more cost-effectively—ushering in what the article calls a "DeepSeek timing" for the global biopharmaceutical industry. In 2023, China's biopharmaceutical sector experienced a surge in outbound licensing activity, with outbound deals surpassing inbound ones for the first time. By 2024, this trend accelerated further, with outbound deal volume and value both increasing—most notably, upfront payments surpassed total financing proceeds for the first time. As of Q1 2025, transaction volume and value for domestic innovative drugs had nearly tripled year-over-year, establishing a diversified outbound model built around both License-Out and NewCo structures.

- **The NewCo model is rapidly emerging as a hybrid structure combining product licensing with equity participation to drive international expansion.**

NewCo (New Company) refers to a transaction model in which a company licenses the overseas or global rights to specific pipeline assets to offshore investors, leading to the formation of a new entity. This structure leverages the global reach and expertise of international capital to build an experienced management team, with typical exit pathways including overseas IPOs or M&A transactions. Investors generally acquire a controlling equity stake—typically over 50%—and assume primary operational responsibility.

In May 2024, Hengrui Pharmaceuticals licensed the overseas rights to its GLP-1 product portfolio to U.S.-based Kailera (Hercules), receiving a $110 million upfront payment, near-term milestone payments, and a 19.9% equity stake in Kailera—bringing the total deal value to over $6 billion. At the same time, Kailera completed a $400 million Series A financing round led by Atlas Venture, Bain Capital, RTW, and Lyra Capital.
This NewCo structure enabled Hengrui to secure significant upfront and milestone proceeds while retaining long-term value through equity participation in future commercialization or exit events. Meanwhile, investors gained access to high-potential pipeline assets along with operational control, maximizing product value realization.

The deal catalyzed a wave of "license + equity" NewCo transactions, in which offshore investors acquire innovative Chinese drug IP as core assets. Within six months, leading biotechs including Connect Biopharma, EddingMed, EpimAb, LintonPharm, and Sciwind adopted the model. By Q1 2025, Chinese pharmaceutical companies had completed 13 NewCo transactions totaling over $10 billion in aggregate deal value.

- **The rise of the NewCo model reflects a novel pathway for bringing Chinese innovative drug assets to global markets—emerging amid a biotech capital winter and escalating U.S.-China tensions.**

China's pharmaceutical sector continues to face capital market headwinds, with biotech companies persistent financing challenges. Domestic innovative drug companies face uncertain exit pathways—IPO prospects remain constrained, and current pricing and reimbursement frameworks are insufficient to support dividend-driven exits.

Chinese pharmaceutical companies have advanced beyond early fast-follower strategies to develop globally competitive Best-in-Class (BIC) candidates. Leading players such as BeiGene and Akeso have clinically validated China's ability to develop globally competitive BIC assets. Against a backdrop of rising geopolitical tensions, the NewCo model provides an effective mechanism to decouple core assets from potential legal and regulatory risks, while aligning with capital-driven development paradigms of international biotech markets. The structure ensures regulatory compliance regarding sensitive data, while preserving operational flexibility in complex cross-border environments.

The NewCo model introduces a distinctive "product licensing + equity" co-expansion framework, enabling Chinese pharmaceutical companies to raise capital while retaining partial ownership for long-term value sharing. Investors contribute not only funding, but also play an active role in incubation, management, and global clinical development—helping to mitigate geopolitical risk and accelerate product globalization.

- **NewCo may herald a new era in which Chinese biotech firms emerge a prime targets for cross-border M&A by multinational pharmaceutical companies.**

Historically, Chinese biotech companies have primarily relied on IPOs for capital exits. However, tightening regulatory requirements have made this pathway increasingly difficult to pursue. In contrast, overseas biotech firms typically adopt dual exit strategies—IPOs and mergers & acquisitions—with M&A representing the ultimate goal for many. Despite ongoing IPO market weakness, particularly in the U.S., the past three years have seen robust M&A activity, with both deal volume and value rising amid broader market headwinds. Over the long term, M&A continues to serve as the dominant exit mechanism for global biotech firms, including publicly listed ones.

NewCo acts as a strategic transitional structure. Assets spun out via NewCo may not yet meet the threshold for direct licensing or acquisition by multinational pharmaceutical companies, often requiring further clinical development or de-risking. By facilitating this

process—and injecting international operational expertise—NewCo structures enhance the attractiveness and acquisition potential of Chinese biotech assets on the global stage.

As market capitalization for domestic innovative pharmaceutical companies begins to rebound and IPO constraints gradually ease, investment sentiment across the sector is improving. The growing normalization of the NewCo model is offering fresh strategic perspectives for both Chinese biotech firms and their investors.
Chinese biotechs are no longer reliant solely on IPOs as an exit pathway. Instead, a more diversified and resilient capital exit strategy is emerging—one that incorporates IPOs, mergers & acquisitions (M&A), and business development (BD) transactions. This parallel approach marks a shift toward a more balanced, adaptable roadmap for long-term growth and value realization.

3) We anticipate that the NewCo transaction model, already established in the novel drug sector, will soon be replicated in the medical device industry.

Amid the current wave of globalization, international markets present unprecedented opportunities for Chinese medical device enterprises. The sector now embodies a dual identity—"Made in China" and "Innovated in China"—positioning Chinese medical device assets as highly competitive and increasingly sought-after on the global stage. Establishing NewCos represents a strategic pathway to accelerate international expansion, leveraging existing capital platforms and commercial networks to maximize both global product reach and enterprise valuation. Against the backdrop of escalating Sino-U.S. trade tensions, the NewCo model also serves as a valuable mechanism for mitigating geopolitical risks associated with cross-border medical device IP transactions.
We anticipate that this transaction structure—already well established in the innovative pharmaceutical sector—will catalyze a new wave of adoption within the medical device industry.

- **Chinese medical device companies' pursuit of global interests is fundamentally driven by domestic market pressures—particularly the heightened uncertainty introduced by centralized procurement policies.**

The combined forces of pricing pressure by centralized procurement and the attractiveness of global markets are accelerating the overseas expansion of Chinese medical device manufacturers. Intense pricing pressure under centralized procurement has created immense financial pressure for domestic device companies. For example, following the 2020 national procurement program, the average price of coronary stents plummeted from RMB 13,000 to RMB 700—a staggering 94.6% reduction. In contrast, overseas markets—particularly in developed economies with strong healthcare spending—offer more favorable

pricing environments and predictable reimbursement systems. These conditions serve as a key catalyst for global expansion among Chinese firms.

According to Statista, the global medical device market reached $566.2 billion in 2023, exceeding the size of China's domestic market by more than tenfold, with an estimated CAGR approaching 5% from 2023 to 2029. Attracted by this market scale and driven by intensifying domestic competition, Chinese medical device companies are accelerating their overseas expansion strategies.

- **Structural imbalances within China's domestic medical device market are driving the need for international validation of technological capabilities.**

The low-end segment of the domestic market is plagued by intense, homogenized competition, with manufacturers trapped in prolonged price wars. In contrast, technically sophisticated products remain dominated by foreign imports, with minimal localization. For example, femtosecond laser systems continue to rely entirely on imported technology. As a result, domestic enterprises are urgently seeking to validate their technological capabilities in international markets—either to bolster their competitive positioning at home or to acquire foreign innovations that enable generational product upgrades and secure future market advantages.

- **The NewCo model warrants proactive exploration in the medical device sector, particularly for technology-intensive products global patent portfolios.**

While the model has gained maturity in the novel drug industry—where independent subsidiaries are created to operate new projects, attract international capital, and focus on R&D, production, and commercialization—it remains underutilized in medtech. This structure effectively avoids reputation biases against China and allows for stronger integration with overseas resources and ecosystems.

In the broader medical device landscape, where cost competitiveness in production still outweighs R&D intensity, widespread adoption of the NewCo approach may be limited in the near term. However, for high-end devices and emerging technologies, the model holds clear potential. It facilitates the formation of dedicated R&D teams, reduces internal resource conflicts and integration complexity, and allows independent structures to enhance external investment access and market responsiveness.

We expect that as Chinese medical device companies pursue globalization strategies—particularly in high-value, IP-driven categories—the NewCo structures will increasingly become an essential tool for facilitating international expansion, mitigating geopolitical risk, and enhancing long-term enterprise value.

4. Biomanufacturing is emerging as a foundational "platform industry," catalyzing disruptive transformations across multiple sectors essential to everyday life. China is rapidly positioning itself as a key global player—emerging into a catalyst and leader in this field.

1) China's biomanufacturing industry is poised to reach RMB 476.2 billion in 2024, with growth exceeding 15%, underscoring the country's rising prominence in foundational technologies and industrial infrastructure.

China's biomanufacturing market expanded from RMB 417.6 billion in 2023 to RMB 476.2 billion in 2024, achieving year-on-year growth of over 15%. By 2030, the sector is projected to approach RMB 1.8 trillion. Globally, the industry is expected to reach $1.1 trillion (approximately RMB 8 trillion), with China accounting for nearly 23% of the total.

Looking ahead, we expect China to harness its economies of scale and cost advantages to drive breakthroughs in core technologies, strengthen industrial ecosystems, and deepen global partnerships. Over the next five years, China is positioned to lead the Asia-Pacific market and shape global biomanufacturing standards—evolving from a contributor to a driver, and ultimately, a global leader in the sector.

2) Biomanufacturing is emerging as a global "platform technology"—akin to artificial intelligence—with foundational infrastructure characteristics that are set to drive disruptive transformations across multiple sectors over the next decade.

According to our 2024 White Paper, up to 60% of global material production could be powered by biomanufacturing within the next 5–10 years, underscoring its potential to fundamentally reshape manufacturing processes and product ecosystems worldwide. Our observations confirm that biomanufacturing is accelerating transformation across industries at a pace exceeding expectations. The technology is currently driving disruption across six critical sectors: healthcare, industrial chemicals, functional foods and supplements, cosmetic and personal care products, agricultural and livestock, and bioenergy. The broad and accelerating penetration across these subsectors affirms biomanufacturing's strategic significance as a global platform technology.

3) China and the United States are poised to become the two global hubs of biomanufacturing, each advancing along distinct development paradigms shaped by differing market demands, regional strengths, and historical trajectories.

As biomanufacturing emerges as a key driver of technological innovation, industrial transformation, and economic growth, the two countries are charting fundamentally different development paths.

The U.S. leads in breakthrough technologies such as synthetic biology and gene editing, supported by government initiatives like the National Bioeconomy Blueprint and a robust venture capital ecosystem.

China, though a relative latecomer, has established global leadership in industrial infrastructure—accounting for over 70% of global fermentation capacity. The 2025 State Council Government Work Report identified biomanufacturing as a strategic industry, reinforcing national-level commitment. With a domestic market of 1.4 billion people, China benefits from unparalleled demand fundamentals. China is pursuinng a product-demand-driven development model that is proving both faster to scale and more sustainable than the U.S. approach. This evolving dynamic of long-term “coopetition” between China and the United States is set to catalye the next wave of global bioeconomic advancement.

4) In China, biomanufacturing is already deeply integrated across multiple industries, driven by both technological bottlenecks and an urgent need for innovation. We anticipate broader substitution effects in industrial chemicals and accelerated transformation in the food and nutraceutical sectors.

In industrial chemicals, the substitution impact of biomanufacturing is proving significantly more disruptive than initially projected. This shift is not merely about adopting new technologies—it is fundamentally reshaping supply chains, regulatory frameworks, and the global competitive landscape. Key trends include the large-scale replacement of petrochemical plastics with bio-based alternatives, biosynthetic production of high-value chemicals, diversification of feedstocks, and carbon cycling. By 2030, bio-based polymers are expected to meet 85% of conventional plastic demand, while biodiesel substitution rates are projected to exceed 20%.

In the food and nutraceutical sectors, biotechnology-driven transformation is rapidly accelerating. The National Health Commission’s October 2024 approval of Human Milk Oligosaccharides (HMOs) marks a pivotal step toward broader regulatory acceptance of fermentation-based ingredient production. Coupled with advances in regulatory review and core biotechnologies, the displacement of traditional production methods is occurring faster than previously anticipated.

5) “Global expansion” and “industry convergence” are reshaping the biomanufacturing landscape. Chinese companies are accelerating their international footprint, while multinationals are deepening their presence in China. At the same time, global leaders across diverse sectors are strategically entering the biomanufacturing space.

International markets offer not only greater pricing advantages but also capacity expansion opportunities. Shifting from a “1.4 billion domestic market” to an “8 billion global market” has become a strategic imperative. Overseas clients typically exhibit stronger purchasing power, enabling Chinese firms to realize higher margins. Meanwhile, China’s global leadership in operational efficiency and cost competitiveness continues to attract multinationals aiming to boost profitability and performance through localized operations.

An increasing number of enterprises are embedding biomanufacturing into their core growth strategies. By leveraging synthetic biology and cross-sector convergence, companies are positioning biomanufacturing as a key engine for long-term growth—one that mitigates cyclical risk and stabilizes demand across volatile markets.

We believe biomanufacturing is exceptionally well suited to adopt the NewCo transaction model, which has proven successful in novel drug development. The biomanufacturing value chain—from raw material sourcing to global commercialization—requires cross-border coordination and integrated development. In this context, NewCo structures offer a strategic pathway to build scalable, sustainable, and globally competitive biomanufacturing operations.

6) As anticipated, state-owned investment funds and local governments took a lead role in biomanufacturing in 2024, pursuing “ecosystem-based” strategic deployments. In contrast, listed companies and large corporations adopted a more cautious stance.

Our 2024 White Paper underscored the critical role of state capital in advancing biomanufacturing. Regional governments are facilitating implementation across industries through dedicated investment funds and "investment-attraction linkage" models, while actively using policy levers to shape distinctive local industry clusters.

In a cooling capital market environment, listed companies and large conglomerates are adopting a more selective and risk-aware approach. They are prioritizing investment targets that demonstrate strong industrial synergies, technological maturity, production capacity exceeding 10,000 tons, and solid financial fundamentals. As a result, due diligence cycles have lengthened, with buyers increasingly pursuing a “must-have-all” strategy to mitigate risk and optimize returns.

5.China’s healthcare industry is entering an era of large-scale consolidation, with M&A activity shifting from capital-driven expansion to a focus on industrial synergy. Amid constrained IPO exits and ongoing valuation system restructuring, A-share listed companies are accelerating supply chain integration. A clear buyer’s market has emerged, characterized by innovative deal structures and increasing localization requirements— reshaping the blueprint for the upgrading of industries.

1) The normalization of M&A activity is a key indicator of industry development and capital market maturity, as consistently validated by trends in developed economies.

Empirical evidence from developed economies shows that M&A is an inevitable and necessary phase in both industrial consolidation and capital market maturation. The experiences of the U.S. and Europe clearly demonstrate M&A's critical role in optimizing industry structures, improving operational efficiency, and reshaping competitive landscapes. China's healthcare sector is following a similar trajectory. M&A activity is becoming increasingly normalized, with steady growth in both deal volume and transaction value. This momentum is driving corporate expansion, strengthening sector-wide competitiveness, improving risk resilience, and enabling more efficient resource allocation. As such, M&A is emerging as a key engine powering the next phase of development in China's healthcare industry.

2) With IPO exits tighten and the previous wave of capital exuberance fades, M&A has become the primary vehicle for stock optimization and industry consolidation.

China's primary healthcare market experienced a period of rapid expansion in recent years, fueled by abundant capital inflows. Now, amid cooling investor sentiment and narrowing IPO channels, many existing assets face rising exit pressures. With new funding increasingly scarce, M&A has emerged as the key mechanism for unlocking liquidity—signaling a shift toward consolidation of existing assets.

In this new phase, investors are adopting more disciplined and pragmatic strategies. The focus is shifting from scale and inflated valuations to strategic fit, intrinsic value, and sustainable cash flow. Through targeted integration and smarter resource allocation, enterprises are better equipped to navigate market uncertainty, reduce risk, and pursue long-term, resilient growth.

3) A-share listed companies are emerging as the primary drivers of healthcare M&A, transitioning from early-stage market capitalization strategies to a more mature focus on industrial consolidation.

Over the past decade, A-share listed firms have taken a leading role in China's healthcare M&A landscape. As USD-denominated financial investors scaled back and gradually exited the market, listed companies stepped in—leveraging their capital resources, industry expertise, and operational synergies to fill the gap. This leadership role is expected to continue in the years ahead.

The M&A strategies of these companies have evolved significantly. What began as efforts to boost market capitalization has shifted toward industrial logic, with a clear emphasis on

strategic fit and long-term value creation. This more disciplined and development-oriented approach is driving higher-quality consolidation and positioning A-share listed companies as central to the sector's next phase of growth.

4) The deepening capital winter is amplifying buyer's market dynamics, with valuation resets bringing quality assets to the forefront.

Amid the ongoing capital winter, buyer leverage has strengthened, and valuation recalibrations are revealing high-quality assets at more favorable prices—creating timely acquisition opportunities for strategic investors.

This environment is prompting sellers to adopt more rational expectations, aligning valuations with intrinsic business value and long-term growth potential. Across the market, stakeholders are demonstrating greater pragmatism, navigating valuation shifts in pursuit of outcomes that balance buyer advantage with sustainable value realization for sellers.

5) M&A models are evolving in response to industry transformation and local market dynamics, with innovative transaction structures emerging.

Amid tightening capital markets, constrained financing options, and stricter regulatory oversight, traditional M&A models are proving insufficient to address companies' increasingly complex and diversified strategic objectives. As a result, enterprises are turning to more creative and adaptable deal structures to drive efficient resource integration, manage risk, and unlock long-term value.

Innovative approaches—such as stock-for-stock transactions, asset swaps, NewCo formations, financial capital participation, and majority acquisitions by local state-owned investors—are enhancing transaction flexibility and execution efficiency. These models also promote broader stakeholder engagement and greater strategic alignment across value chains, enabling optimal resource allocation and deeper industrial synergies. Collectively, such innovations are reinforcing industry competitiveness and laying the groundwork for more resilient and sustainable growth.

6) Geopolitical tensions are reshaping M&A trends, accelerating supply chain localization and the global expansion of Chinese technology IP.

Amid rising geopolitical friction and growing uncertainty in global supply chains, Chinese healthcare companies are realigning their international strategies. M&A has emerged as a high-impact tool for advancing two parallel goals: strengthening autonomous control and enabling international expansion.

Domestically, companies are pursuing supply chain localization through targeted acquisitions of critical upstream and downstream assets. These moves enhance supply chain resilience, reduce dependency risks, and create asymmetric competitive advantages. Simultaneously, shifting geopolitical dynamics are opening new channels for Chinese firms to access global markets and export proprietary technologies and IP through cross-border M&A.

This dual-track approach allows Chinese healthcare companies to both hedge against geopolitical risk and accelerate their international footprint—positioning them as more competitive and resilient players in a rapidly evolving global landscape.