Implications of Australian Exercise Referral for China's Exploration of a Responsibility-Sharing Mechanism Between General Practice and Exercise Co-Treatment: Postprint

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Abstract

With accelerating urbanization and population aging trends in China, the incidence of various chronic diseases among residents is rising, rendering chronic disease prevention and treatment in the medical and public health sectors increasingly challenging. In response, this study comprehensively reviews the development practices and implementation experience of the Physical Activity Referral Scheme (PARS) in Australian general practice to explore sharing and interaction mechanisms between general practice and exercise therapy in China. The findings indicate that, drawing upon Australia's PARS implementation experience in general practice and considering the current development status of healthcare and exercise rehabilitation in China, such mechanisms can be explored and constructed through several dimensions: establishing a referral framework centered on general practice medicine to promote collaborative governance between general practice and exercise therapy; improving the talent cultivation system for general practice medicine and exercise physiology to accelerate training of medical exercise and health coaches; advancing service institutional system innovation to expedite construction of scientific processes for general practice and exercise therapy; and vigorously leveraging internet advantages to build a data information platform for general practice and exercise therapy.

Full Text

Preamble

Inspiration of Australian Sports Referral to Explore the Sharing Mechanism of General Practice and Sports Co-treatment in China

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Abstract

As China's urbanization and population aging accelerate, the incidence of various chronic diseases among residents is rising, presenting increasingly severe challenges for chronic disease prevention and treatment in medical and public health fields. This study comprehensively reviews the development practices and implementation experiences of Physical Activity Referral Schemes (PARS) in Australian general practice to explore a sharing and interaction mechanism between general practice and exercise co-treatment in China. Based on Australia's PARS implementation experience and combined with the current state of medical and sports rehabilitation development in China, we propose exploring the construction of a sharing and interaction mechanism between general practice and exercise co-treatment through: (1) building a referral structure centered on general practice to promote collaborative governance; (2) improving the talent training system for general practice and exercise physiology to accelerate the cultivation of medical exercise and health coaches; (3) advancing institutional system innovation to accelerate the scientific process construction of general practice diagnosis and exercise co-treatment; and (4) leveraging internet advantages to build a data information platform integrating general practice and exercise co-treatment.

Keywords: Australia; Sports referral; General practice; Sports co-treatment; Insights

Introduction

With continuous economic development and improving medical standards, China's average life expectancy has significantly increased. However, against the backdrop of industrialization, urbanization, and population aging, lifestyle changes have increased behavioral risk factors, altered disease patterns, and led to rapidly growing chronic disease burdens and health risks. Chronic

diseases now account for an increasing proportion of deaths and disabilities [**?**, **?**]. According to the *Report on Chinese Residents' Nutrition and Chronic Diseases Status (2020)*, in 2019 alone, the number of chronic disease patients in China exceeded 2.6 billion, with chronic diseases causing 88.5% of total deaths. Cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases accounted for 80.7% of these deaths [**?**]. Global Burden of Disease data further shows that in 2013, medical expenses related to physical inactivity among Chinese residents reached US$4.86 billion, representing 10% of the global total [**?**]. Overall, China faces enormous challenges in chronic disease prevention and control. As early as 2016, the State Council issued the *"Healthy China 2030" Planning Outline*, proposing to "develop new health service formats and optimize the diversified medical pattern" [**?**]. In April 2022, the General Office of the State Council issued the *"14th Five-Year Plan" for National Health*, explicitly stating that during the 14th Five-Year Plan period, China should promote integrated development of health-related formats, accelerate the construction of a tiered diagnosis and treatment system, and optimize medical service models [**?**]. Against this background, promoting the construction of a new diagnosis and treatment system in this new development environment represents a beneficial attempt to address the health risks facing China.

Physical Activity Referral Schemes (PARS), also known as Exercise Referral Schemes (ERS), involve General Practitioners (GPs) referring physically inactive individuals with increased health risks to professional Exercise Physiologists (EPs), who develop personalized exercise plans and guide these patients through a period of physical activity [**?**]. PARS was designed in the UK in the 1990s and introduced to Australia in the early 21st century. Australia has promoted the integration of physical activity assessment and promotion into routine healthcare and clinical practice, and by leveraging its well-developed medical system, has facilitated the respective strengths of medical diagnosis and exercise co-treatment services, becoming a model of "diagnosis + co-treatment" [**?**, **?**]. Summarizing Australia's PARS implementation experience can help China optimize its diversified medical pattern and provides important insights for exploring a sharing and interaction mechanism between general practice and exercise co-treatment.

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1. Research Methods

First, we employed the literature review method to comprehensively collect and organize implementation documents, research materials, and policy documents on PARS in Australian general practice, while summarizing the current state of development and research on general practice and co-treatment in China. Second, we used comparative induction to systematically summarize the practical experiences of PARS in Australian general practice. Finally, we applied logical analysis to propose relevant insights for exploring the construction of a sharing and interaction mechanism between general practice and exercise co-treatment in China, considering the current state of medical and sports rehabilitation de-

velopment.

2.1 Formation of Australian Physical Activity Referral Schemes

As lifestyles and disease patterns changed, an increasing number of people recognized that increasing physical activity and adopting healthy lifestyles are important ways to actively reduce chronic disease incidence and mortality beyond direct medical treatment. This recognition has been confirmed in numerous studies and endorsed by authoritative bodies such as the Council of the European Union and the World Health Assembly [**?**, **?**, **?**]. Against this background, actions to promote physical activity for health rapidly unfolded in Western countries. In 1996, the UK Department of Health released the *Physical Activity Guidelines for the UK Population*, providing specific recommendations for scientifically increasing physical activity, but the effect was unsatisfactory [**?**]. However, data showed that approximately 85% of British people visited their GP annually. Given this reality, integrating physical activity into primary care settings became the optimal choice for promoting national health in the UK [**?**]. Consequently, PARS, led by GPs and primary care physicians for diagnosis while professional exercise instructors shared co-treatment responsibilities, was formally established in the UK.

Similarly, since the late 20th century, Australia has experienced rising incidence rates of chronic diseases such as obesity, diabetes, and cardiovascular disease [**?**]. The Australian Institute of Health and Welfare (AIHW) 2003 National Physical Activity Annual Report indicated that 2.6% of diseases among Australians were attributable to physical inactivity, including diabetes, colorectal cancer, uterine cancer, dementia, breast cancer, coronary heart disease, and stroke [**?**]. Additionally, approximately 7.5% of people aged 25 and above were at risk of being diagnosed with type 2 diabetes [**?**]. Integrating PARS into the diagnosis and treatment of various chronic diseases became a necessary strategy for Australia to alleviate health problems caused by physical inactivity and promote national physical activity participation.

2.2 Practice of Australian Physical Activity Referral Schemes

Since the beginning of the 21st century, PARS has been implemented across multiple regions in Australia as a program to support and promote patient physical activity through interprofessional collaboration among health professionals [**?**, **?**, **?**]. This initiative opened new avenues for GP consultations and resident physical activity referral services. First, Australia gradually integrated PARS into its general practice system, meaning that participating in PARS also

qualified for Australia's universal health insurance (Medicare) [**?**]. This measure undoubtedly greatly promoted the expansion of referral services. Second, the Department of Health and Ageing (DoHA) incorporated referral services into its scope of work, delegated referral certification authority to the Australian Health Practitioner Regulation Agency (AHPRA) and Exercise & Sports Science Australia (ESSA), and integrated referral nutrition management training into the responsibilities of Sports Dietitians Australia (SDA), while also considering and coordinating the interests of multiple stakeholders in referral participation [**?**]. Additionally, Australia's Department of Health formulated and revised the *Physical Activity Referral Framework* and gradually released guidance documents such as the *Physical Activity Referral Framework* and the *Physical Activity Referral Scheme Design, Implementation, and Evaluation Toolkit* [**?**]. These measures promoted PARS as a model where Australian GPs lead diagnosis while EPs co-treat to promote physical activity, improving the sharing mechanism between general practice and exercise co-treatment and achieving remarkable results in preventing and treating various chronic diseases. In terms of implementation outcomes, by 2015, 88.9% of primary care institutions in Australia had participated in PARS [**?**]. A recent survey showed that 91% of patients with various chronic diseases reported participating in physical activity to varying degrees through referrals, with further assessments indicating that 82% of GPs and 99% of EPs played important facilitating roles in this process [**?**]. Evidently, the implementation of Australia's PARS has greatly promoted national physical activity participation and achieved favorable practical results.

3.1 Construction of a Rational Referral Service Institutional Framework

Australia has a relatively comprehensive medical service system. After integrating PARS into its medical service system, it simultaneously utilized and improved a series of supporting institutions. First, Australia fully leveraged its GP first-contact system. In Australia's medical system, GPs are the first point of contact for patients. When residents need medical care, they must first visit a GP, which is a prerequisite for accessing health insurance [**?**]. GPs provide optimal recommendations based on patient conditions, diagnostic results, and insurance status. When encountering patients with chronic diseases caused by physical inactivity, such as sedentary behavior, diabetes, or stroke, GPs first consider referring them to EPs (who operate in their own premises rather than GP clinics). EPs then guide patients in appropriate physical activity and exercise based on assessment results. Typically, a GP consultation lasts 15-20 minutes, while an EP training session lasts 45 minutes. This arrangement allows both GPs and EPs to perform their respective roles, improving efficiency. Through referral relationships, they coordinate care, each receiving government subsidies. By incorporating the interests of both GPs and EPs into the PARS framework, the system promotes benefit-sharing and shared responsibility among stakehold-

ers [**?**].

Second, Australia has a robust universal health insurance system. As one of the early adopters of universal health insurance, Australia provides basic coverage through its universal health insurance system and offers private health insurance for those with greater economic capacity and special needs. PARS was introduced into the health insurance system in 2006, accompanied by the release of the Medicare-funded Chronic Disease Management (CDM) plan, which ensures that chronic disease patients can receive reimbursements annually through any Allied Health Professional (AHP) of their choice, including EPs [**?**]. Third, Australia established a referral agency guarantee system. In 2013, the Australian government established a specialized referral agency, the Central Referral Service (CRS) [**?**], where part-time doctors and nurses collaborate with GPs to implement targeted referrals for patients with different conditions. This measure both improves referral implementation efficiency and provides institutional safeguards for the referral process. Overall, based on its mature general practice system and using GPs as the entry point, Australia has achieved stakeholder interest coordination and collaborative governance by utilizing the GP first-contact system, improving the universal health insurance system, and establishing the CRS, providing institutional guarantees for PARS implementation ([Figure 1: see original paper]).

3.2 Sound Talent Training and Development System

Australia's health system is structured around "general practice" as its core, with GPs serving as coordinators of all medical services and providers of basic medical services. Hospital services, specialist services, co-treatment services, and social care services all revolve around GPs as the "gatekeepers" of healthcare. Therefore, the education, training, and development of general practice talent (i.e., GPs) are extremely important. Analysis of Australian general practice education and GP career development reveals that it is primarily completed through connecting different stages of student development [**?**]. The first stage is undergraduate study. Students enter university through state college entrance examinations, medical entrance qualification tests, and interviews. They complete 2-3 years of general education and study of general practice and community knowledge, followed by no less than 9 weeks of general practice training in year 4 to obtain a Bachelor of Medicine degree [**?**]. The second stage is hospital rotation. Through rotations in hospital clinical departments, students acquire basic clinical knowledge and essential skills. After typically one year of rotation, they obtain a medical license issued by AHPRA [**?**]. The third stage is vocational general practice training. Through approximately three years of vocational training in general practice, students comprehensively learn general practice knowledge and engage in medical practice [**?**]. The fourth stage is qualification acquisition and continuing development. By passing the Royal Australian College of General Practitioners (RACGP) qualification examination, they formally obtain

RACGP membership. Finally, through assessments conducted approximately every three years, they ensure continuing professional development and quality improvement (CPD/QI) to qualify for Medicare reimbursement for their general practice services [**?**].

Furthermore, the RACGP Curriculum for Australian General Practice 2011 emphasizes cultivating "GP stars" who master population health and general practice knowledge [**?**]. Throughout this process, institutions such as the Sports Dietitians Australia Committee (SDAC) and Exercise & Sports Science Australia (ESSA) play active roles in training and supporting EPs. This systematic approach ensures the quality of Australian general practice talent cultivation and provides important human resource guarantees for the long-term development process ([Figure 2: see original paper]).

3.3 Clear Referral Service Process Design

Patient Journey refers to the stages and steps patients experience during medical visits. Clear and concise journey design helps improve medical efficiency and patient experience [**?**]. Australia has been a world leader in designing patient journeys in the referral service domain [**?**]. In PARS, patients primarily experience five steps [**?**]: (1) The GP consultation identifies the patient's need for exercise guidance, such as pre-diabetic or borderline diabetic patients needing exercise to control blood sugar, post-stroke patients requiring exercise to restore functional capacity, or sedentary patients unaware of appropriate exercise strategies for their condition. (2) The GP discusses with the patient whether referral to an EP is needed. If confirmed, the GP arranges the referral (with CRS assistance) and asks the patient to return to the GP clinic for evaluation after a period (typically three months). (3) The patient contacts and schedules an appointment with the EP, then visits the EP's co-treatment facility to receive specific services including exercise assessment, exercise plan development (exercise prescription), and exercise guidance (explanation and Q&A). (4) The patient returns home to perform self-directed exercise according to the prescription, while the EP maintains regular contact via email or phone and asks the patient to return periodically (typically monthly) to the EP's facility for further assessment and guidance. (5) The patient returns to the GP clinic, where the GP evaluates the referral outcome and decides whether to continue EP services. Australia's clear and scientific referral process design enables GPs and EPs to have both distinct division of labor and mutual cooperation during service delivery, achieving sharing and interaction between general practice diagnosis and exercise co-treatment while maximizing their respective strengths ([Figure 3: see original paper]).

3.4 Comprehensive Referral Information Services and Evaluation Framework

PARS involves multi-party, cross-disciplinary collaboration among GPs, EPs, and patients, assisted by the CRS, requiring information exchange and joint participation among multiple stakeholders. For instance, the interaction between general practice and exercise physiology only occurs for specific disease groups. For GPs, EPs, and patients, information about which conditions are most suitable for this referral direction is extremely useful. Australia addresses this through GPs serving as consultation "gatekeepers" for initial diagnosis, while simultaneously releasing relevant information through network platforms of multiple related departments (), providing first-hand information to all PARS participants [**?**] and promoting information exchange between general practice and exercise co-treatment.

Table 1. Overview of Information Platforms and Functions of Australian General Practice and Exercise Co-treatment Departments

Website Link	Role and Function Description
Royal Australian College of General Practitioners (RACGP) www.racgp.org.au	Supporting institution for GP assessment, training, and development; advocates for general practice to other stakeholders; ensures patient safety, high-quality service, service coordination, and GP incentives
Department of Health and Ageing (DOHA) www.health.gov.au	Releases chronic disease data and related health information for elderly populations, while providing policy recommendations and management assistance
Australian Health Practitioner Regulation Agency (AHPRA) www.ahpra.gov.au	Manages professional qualifications for health and other specialists; releases relevant medical knowledge and some research findings
Australian Medicare Local Alliance (AMLA) www.amlalliance.com.au	Government-funded healthcare organization providing insurance coverage services for patients in general practice and co-treatment
Exercise & Sports Science Australia (ESSA) www.essa.org.au	One of the institutions composed of exercise professionals; provides professional knowledge and learning opportunities for EPs
Australian Sports Commission (ASC) www.ausport.gov.au	Primarily responsible for managing professional athletes; can assist in providing some services in sports healthcare

Furthermore, evaluation is another crucial component of medical services. The World Health Organization (WHO) provided guidance in the early 21st century on combining "process evaluation" and "outcome evaluation" for referral assessment [**?**]. In Australia, evaluation subjects and methods for general practice and exercise co-treatment are integrated throughout the entire referral service process through mutual coordination ([Figure 4: see original paper]). From STAGE:1 to STAGE:2, GPs and patients primarily participate in determining and discussing referral directions and specific recommendations through a combination of process evaluation, quantitative evaluation, and qualitative evaluation. STAGE:3 mainly involves EPs guiding patients in exercise activities, with process evaluation and quantitative evaluation as the primary methods. In STAGE:4 and STAGE:5, all three referral stakeholders participate in determining the patient's next treatment and health measures through comprehensive application of all three evaluation methods [**?**, **?**]. Evidently, multi-party participation and multiple evaluation measures are essential for ensuring the effectiveness of general practice and co-treatment services.

4.1 Building a General Practice-Centered Referral Structure to Promote Collaborative Governance

The referral institutional framework in a healthcare system is the most critical factor determining medical efficiency [**?**]. The core concept of Australia's health service system is establishing a general practice-centered medical system architecture that achieves simultaneous development of "efficiency" and "quality" through GP services and coordination. The relationship between general practice diagnosis and exercise co-treatment represents a practice of health promotion sharing services under a GP-led institutional framework. In China, the functional boundaries of the tiered diagnosis and treatment system remain unclear in actual medical environments, with initial consultations possible at any level of tertiary hospitals [**?**]. Given China's evident population aging trend, various chronic diseases will continue to increase as health risk factors [**?**]. To actively respond to the national chronic disease crisis, building a diagnosis and treatment system centered on general practice and promoting collaborative functioning between general practice and co-treatment represents an important direction for addressing this social issue. This can primarily rely on the existing medical consultation architecture, innovating diagnosis and treatment mechanisms through "GP first-contact" and "diversion consultation" innovations. After registration, patients would receive initial diagnosis from a GP who determines which specialist department they should be referred to, rather than the current practice where patients "self-diagnose and self-select departments" at initial consultation. This approach would provide convenient services for patients while improving medical efficiency, ensure identification of physically inactive patients through the hospital system, and provide timely exercise promotion and health intervention recommendations through this "authoritative"

institution, thereby promoting collaborative governance between general practice diagnosis and exercise co-treatment.

4.2 Improving the General Practice and Exercise Physiology Talent Training System to Accelerate the Cultivation of Medical Exercise and Health Coaches

Professional talent is the fundamental guarantee for system development, particularly for general practice [**?**]. While advanced medical equipment and methods are important, their effective implementation and real benefits for patients primarily depend on healthcare professionals' expertise and operational competence. Australia's general practice development system places great emphasis on GP talent cultivation and lifelong development planning, while simultaneously promoting EP training through multiple departments. The reason China currently lacks such a "general practice diagnosis-exercise referral" model is, from a service architecture perspective, primarily that "doctors have nowhere to refer to." From the hospital perspective, China has almost no professionally trained medical exercise and health coaches. Most doctors in sports rehabilitation hospitals are trained in knowledge systems focusing on major medical accidents and special patient care (such as amputation, paralysis, postoperative recovery, etc.), leaving patients with chronic diseases caused by normal physical inactivity with "no door for referral" and no access to targeted scientific exercise prescriptions.

Improving China's general practice and exercise physiology talent training system requires providing guarantees from the talent source. On one hand, we must improve the general practice talent training system by incorporating systematic knowledge about diseases caused by physical inactivity into training curricula to ensure GPs can identify "which conditions are most suitable for this referral direction." On the other hand, we must accelerate the cultivation of medical exercise and health coaches by recruiting talents with relevant interests, potential, or athletic experience through medical school rehabilitation medicine, sports health, and related majors for systematic training. This training should include rehabilitation knowledge for treatable conditions such as osteoarthritis, osteoporosis, obesity, diabetes, stroke and other neurological diseases, lymphedema, pain management, and post-exercise injury, thereby addressing the shortage of medical exercise and health coaches and ensuring talent supply.

4.3 Advancing Institutional System Innovation to Accelerate Scientific Process Construction for General Practice and Exercise Co-treatment

The institutional system represents the superstructure of medical services. Only by creating medical service processes based on scientific institutional architecture can we bring high efficiency to diagnosis and referral and good experiences to patients [**?**]. Australia's PARS process design fully considers and leverages the initial function of GPs in its overall medical service system, incorporating the referral process and exercise intervention into the entire process through STAGE:1→STAGE:5 step planning. China's current referral service process suffers from low scientific and standardized levels, with numerous chronic disease patients caused by physical inactivity facing situations of "no one to refer, not knowing how to refer, and nowhere to refer" [**?**]. Although China's medical service system differs from Australia's, China can fully absorb its experience in PARS process system construction by using GP consultations as the starting point and setting clear referral service processes based on specific disease types. Initially, we can explore establishing a general practice diagnosis and exercise co-treatment process system using general practice diagnosis and exercise co-treatment as a breakthrough point, where GPs refer patients with diseases caused by physical inactivity to exercise professionals (medical exercise and health coaches) for exercise intervention and promotion, then gradually expand to include other referral types to achieve "from point to surface" and gradual improvement.

4.4 Leveraging Internet Advantages to Build a Data Information Platform for General Practice and Exercise Co-treatment

Scientific and efficient referral service delivery requires deepening understanding of the interactive referral between exercise physiology and general practice, while fully utilizing information and technological resources to facilitate understanding among different participants and ensure process data collection. Analysis shows [**?**, **?**, **?**] that Australia relies on official institutions such as the Royal Australian College of General Practitioners (RACGP), Department of Health and Ageing (DOHA), AHPRA, Australian Medicare Local Alliance (AMLA), and ESSA to release relevant information about GPs and EPs, while achieving collaborative governance among multiple stakeholders through its evaluation framework. China can fully leverage its advantages in big data, cloud computing, and artificial intelligence algorithms to build a general practice referral and exercise co-treatment information platform. This platform would use wearable devices for process monitoring and data collection during exercise interventions, gradually establish a referral information database, and realize an integrated information service platform for "diagnosis-treatment-exercise-storage."

Referral and co-treatment are based on the principle of "maximizing division of labor efficiency," maintaining an intermediate state between integration and separation. Through "sharing," subsystems within the system can intersect while retaining their own characteristics, maximizing the effectiveness of medical and co-treatment services to provide higher-quality services for patients [**?**]. Australia's PARS implementation represents a real-world case of referral and co-treatment. With the aging of society, China will face increasing health risks in the future. Exploring a sharing and interaction mechanism between general practice and co-treatment is of great practical significance for achieving efficient medical governance in China and requires the joint participation of medical, public health, exercise professionals, and their managers to optimize the diversified medical pattern.

Author Contributions

LI Li-qiang proposed the research direction, collected and organized materials, and wrote the paper; WU Jin organized and translated materials and revised the paper; ZHANG Li-qiang was responsible for revision and proofreading; WANG Xiao-zan reviewed the paper and was responsible for overall quality; all authors confirmed the final manuscript.

Conflict of Interest

This article has no conflict of interest.

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Note: Figure translations are in progress. See original paper for figures.