

An International Comparative Study on the Definition of Medical Specialty Catalogue and Countermeasures

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Abstract: Medical specialties catalogues play a highly significant role when promoting the development of medical disciplines and cultivating qualified medical talents; therefore, a comprehensive and scientific medical specialties catalogue is all the more important in the context of constructing first-class disciplines in colleges and universities. To promote the progressive development of medical disciplines in China, this research sorted medical specialty categories based on a literature analysis and systematically compared the features and categories of medical specialties among the United States, the UK, and China. Several major problems were raised, as follows: non-uniform medical specialty and sub-specialty categories; outdated arrangements of specialties, in terms of quantity and content; premature entry into sub-specialty training; inconsistent categories with standardized residential training. To tackle such problems, this research suggests that medical specialty categories be aligned with global standards and unified through an interdisciplinary approach. Furthermore, standardized admission and exit criteria should be established, to prepare future qualified health professionals and promote the advancement of medical disciplines.

Keywords: medicine; specialties catalogue; clinical medicine; comparative analysis

1 Introduction

Discipline classification and specialties catalogues serve as guidance for and cornerstones of discipline advancement, department setting, and teaching. Complete, scientific classification of disciplines and specialties is an important foundation for the development of world first-class disciplines in higher education institutions in China. The specialties catalogues of China's higher education institutions, based on discipline characteristics and research fields, are divided into three levels: the *Higher Vocational Education Specialties Catalogue (Junior Colleges) in Higher Education (2015)* (hereinafter referred to as the higher vocational specialties catalogue); the *Undergraduate Specialties Catalogue in Higher Education (2012)* (hereinafter referred to as the undergraduate specialties catalogue); and the *Catalogue of Degree Awarding and Talent Training (2011) for Master's/Doctoral Education* (hereinafter referred to as the master's/doctoral specialties catalogue). The three specialties catalogue levels have played a positive role in the standardization and promotion of higher education in China. However, these three levels represent separate systems and lack coordination with one another, and parts of the catalogues are outdated and fail to capture

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the essence of the characteristics of higher education [1].

Within the field of medicine, clinical medicine is a highly practical discipline. Medical education also involves lengthy training, high degree requirements, and rapid updating of knowledge. The changing situation and challenges of global health have led to the setting of new goals and directions for the advancement of medicine; meanwhile, medical education is undergoing a new round of revolution worldwide, which inevitably demands new modules and curricula [2–3]. Proper understanding of the nature of education and organization of specialties catalogues is highly significant to the fostering of excellence in disciplines and the cultivation of outstanding medical professionals [4]. This research focused on medical specialties catalogues in China, the United States, and the UK, conducted a comparative study of the classification and characteristics of medical specialties in these three countries, determined deficiencies in medical specialty definition in China, and proposed reform proposals.

2 Status quo of global medical specialties catalogues

2.1 Overview of discipline and specialty definition

China's specialties catalogue is formulated by the Ministry of Education. It classifies higher vocational education into 19 discipline groups, 99 disciplines, and 748 specialties, and undergraduate education into 12 discipline groups, 92 disciplines, and 506 specialties. The classification of master's/doctoral education has been adjusted four times, and currently, there are 13 discipline groups, 110 first-level disciplines, and 386 second-level disciplines.

The management system of disciplines and specialties in the United States is quite mature, and there is a relatively complete classification system of disciplines and specialties. Government administrators, members of medical associations, and university administrators jointly participate in the formulation of the Classification of Instructional Programs (CIP). The final version of CIP is proposed by the National Center for Education Statistics (NCES) and officially promulgated by the Department of Education (ED). The current CIP (CIP-2000) was finalized in April 2002 and applies to graduate, undergraduate, and vocational education. There are a total of 38 discipline groups and 362 disciplines, and specialties in each discipline are dynamically adjusted [5–7].

Higher education institutions in the UK set majors and curricula based on teaching capacity and societal demand, and discipline and the definition of disciplines and specialties has its own system. In 2002, the British Higher Education Statistics Agency (HESA) and the Universities and Colleges Admissions Service (UCAS) jointly proposed the *Joint Academic Coding System* (JASC), a discipline and specialties catalogue with general applicability, which has been revised twice in 2007 and 2012 [8–9].

2.2 Definition of medical disciplines

China's higher vocational education catalogue defines the Medicine and Health discipline as comprising eight first-level disciplines: Clinical Medicine, Nursing, Pharmacy, Medical Technology, Rehabilitation Treatment, Public Health and Management, Population and Family Planning, and Health Management and Promotion. Under the umbrella of these disciplines are 46 specialties (including state-controlled specialties).

China's undergraduate education catalogue defines the Medicine discipline as comprising 11 first-level disciplines: Basic Medicine, Clinical Medicine, Stomatology, Public Health and Preventive Medicine, Traditional Chinese Medicine, Integrated Chinese and Western medicine, Pharmacy, Chinese Materia Medica, Forensic Medicine, Medical Technology, and Nursing. Under the umbrella of these disciplines are 44 specialties (including specialties established for specific purposes).

China's master's/doctoral education catalogue defines the Medicine discipline as comprising 11 first-level disciplines: Basic Medicine, Clinical Medicine, Stomatology, Public Health and Preventive Medicine, Traditional Chinese Medicine, Integrated Traditional Chinese and Western Medicine, Pharmacy, Chinese Materia Medica, Medicine in Specific Environments, Medical Technology, and Nursing. Under the umbrella of these disciplines are 54 second-level disciplines. Moreover, an education catalogue for professional degree is set in specialties such as Clinical Medicine, Stomatology, Public Health, Nursing, Pharmacy, Chinese Materia Medica.

In the US CIP-2000, Health Professions and Related Clinical Sciences comprise 34 disciplines (excluding disciplines in Biological and Biomedical Sciences) and 207 specialties. Medical subject areas in the British JACS3.0 are mainly distributed among Medicine and Dentistry and subjects allied with Medicine. There are 15 first-level disciplines and 78 specialties.

In comparison (Table 1), the number of medical disciplines in China is low. In terms of disciplines, the United States and the UK have additionally developed Allied Health and Medical Assisting Services, Communication Disorders Sciences and Services, Medical Clinical Sciences, Medical Ethics, Ophthalmology, and Nutrition, among

others. However, there are no similar definitions in China's three-level educational catalogue (first-level disciplines).

Table 1. Comparison of medical discipline and specialty definition (first-level disciplines) in China, the United States, and UK.

China's higher vocational catalogue	China's undergraduate catalogue	China's master's/doctoral catalogue	US CIP-2000	UK JACS 3.0
6201 Clinical Medicine	1001 Basic Science of Medicine	1001 Basic Science of Medicine	51.10 Clinical/Medical Laboratory Science and Allied Professions	A100 Pre-clinical Medicine A200 Pre-clinical Dentistry
	1002 Clinical Medicine	1002 Clinical Medicine 1051 Clinical Medicine (Professional Track)	51.12 Medicine (MD)	A300 Clinical Medicine
	1003 Dentistry	1003 Dentistry 1052 Dentistry (Professional Track)	51.04 Dentistry (DDS, DMD) 51.05 Advanced/Graduate Dentistry and Oral Sciences (Cert., MS, PhD) 51.06 Dental Support Services and Allied Professions	A400 Clinical Dentistry A900 Others in Medicine and Dentistry A990 Medicine and Dentistry not Elsewhere Classified
6206 Public Health and Health Management	1004 Public Health and Preventive Medicine	1004 Public Health and Preventive Medicine 1053 Public Health (Professional Track)	51.22 Public Health	
	1005 Traditional Chinese Medicine	1005 Traditional Chinese Medicine		
	1006 Integrated Chinese and Western Medicine	1006 Integrated Chinese and Western Medicine		
6203 Pharmacy	1007 Pharmacy	1007 Pharmacy 1055 Pharmacy (Professional Track)	51.20 Pharmacy, Pharmaceutical Sciences, and Administration	
	1008 Chinese Materia Medica	1008 Chinese Materia Medica 1056 Chinese Materia Medica (Professional Track)		
6204 Medical Technology	1009 Forensic Medicine	1009 Medicine in Specific Environments		
	1010 Medical Technology	1010 Medical Technology	51.09 Allied Health Diagnostic, Intervention, and Treatment Professions	B800 Medical Technology
6202 Nursing	1011 Nursing	1011 Nursing 1054 Nursing (Professional Track)	51.16 Nursing	B700 Nursing
6205 Rehabilitation and Physical Therapy			51.23 Rehabilitation and Therapeutic Professions	
6207 Population and Family Planning			51.00 Health Services/Allied Health/Health Sciences, General (NEW)	
6208 Health Management and Promotion			51.01 Chiropractic (DC)	B100 Anatomy, Physiology and Pathology

Table 1 (continued)

51.02 Communication Disorders Sciences and Services	B200 Pharmacology, Toxicology, and Pharmacy
51.07 Health and Medical Administrative Services	B300 Complementary Medicines, Therapies, and Well-being
51.08 Allied Health and Medical Assisting Services	B400 Nutrition
51.11 Health/Medical Preparatory Programs	B500 Ophthalmics
51.14 Medical Clinical Sciences/Graduate Medical Studies	B600 Aural and Oral Sciences
51.15 Mental and Social Health Services and Allied Professions	B900 Others in Subjects Allied with Medicine
51.17 Optometry (OD)	
51.18 Ophthalmic and Optometric Support Services and Allied Professions	
51.19 Osteopathic Medicine/Osteopathy (DO)	
51.21 Podiatric Medicine/Podiatry (DPM)	
51.24 Veterinary Medicine (DVM)	
51.25 Veterinary Biomedical and Clinical Sciences (Cert., MS, PhD)	
51.26 Health Aides/Attendants/Orderlies	
51.27 Medical Illustration and Informatics	
51.31 Dietetics and Clinical Nutrition Services (NEW)	
51.32 Bioethics/Medical Ethics (NEW)	
51.33 Alternative and Complementary Medicine and Medical Systems (NEW)	
51.34 Alternative and Complementary Medical Support Services (NEW)	
51.35 Somatic Bodywork and Related Therapeutic Services (NEW)	
51.36 Movement and Mind-Body Therapies and Education (NEW)	
51.37 Energy and Biologically Based Therapies (NEW)	
51.99 Health Professions and Related Clinical Sciences, Other	

2.3 Definition of specialties in clinical medicine

In China, a clinical medicine discipline is defined in the higher vocational education catalogue. The undergraduate catalogue defines the clinical medicine discipline (core discipline) and anesthesiology, medical imaging, ophthalmology, psychiatry, radiology, and other disciplines for specific purposes and state-controlled disciplines. There are 18 specialties in the master's/doctoral clinical medicine catalogue, including internal medicine, pediatrics, geriatric medicine, and neurology, among others.

Conversely, in developed countries, represented by the United States and the UK, there are no second-level disciplines in clinical medicine or premature sub-classifications of specialties in medical education. The second-level disciplines of clinical medicine in the graduate education catalogue in China are comparable to medical specialties in post-graduate training in the United States. Table 2 lists the second-level disciplines in clinical medicine.

Table 2. Comparison of medical disciplines and specialty definition (second-level disciplines) in China, the United States, and the UK.

China's higher vocational catalogue	China's undergraduate catalogue	China's master's/doctoral catalogue	US CIP-2000	UK JACS 3.0
620101K Clinical Medicine	100201K Clinical Medicine	100201 Internal Medicine	51.1201 Medicine (MD)	A300 Clinical Medicine
	100202TK Anesthesiology	100202 Pediatrics		
	100203TK Medical Imaging	100203 Geriatric Medicine		
	100204TK Optometry	100204 Neurology		
	100205TK Psychiatry	100205 Psychiatry and Mental Health		
	100206TK Radiology	100206 Dermatology and Venereology		
		100207 Imaging and Nuclear Medicine		
		100208 Clinical Laboratory		
		100209 Nursing		
		100210 Surgery		
		100211 Obstetrics and Gynecology		
		100212 Ophthalmology		
		100213 Otolaryngology		
		100214 Oncology		
		100215 Rehabilitation Medicine and Physical Therapy		
		100216 Sports Medicine		
		100217 Anesthesiology		
		100218 Emergency Medicine		
		105127 Family Medicine*		

Note: T, K separately stand for specialties for specific purposes and state-controlled specialties.

*Family Medicine was newly defined in 2012 by the Office of the State Council Academic Degrees Committee.

2 Problems with defining medical specialties catalogues in China

2.1 Catalogues are not uniform

China's higher vocational, undergraduate, and master's/doctoral education all define their specialties catalogues separately, leading to poor coordination between the three levels and deterioration of the overall planning and scientific development of higher education in China. By contrast, the United States and the UK each define a single catalogue across all stages of medical education, covering the full range. For example, the CIP-2000 (United States) has a corresponding, consistent, and coordinated subject catalogue for graduate, undergraduate, and vocational education.

2.2 Lags in content and quantity in catalogues

Modern medicine is evolving rapidly, and the number of disciplines and sub-disciplines is expanding significantly and is more interconnected. The shift from a "biomedical" to a "biological-psychological-social" paradigm and changes in the disease spectrum require that doctors possess humanistic qualities and comprehensive competencies beyond professionalism in knowledge and skills. However, the current specialties catalogues do not reflect many of these interdisciplinary aspects or cutting-edge medicine and the medical paradigm shift. Proposals to define

specialties such as medical humanities are not considered important or popularized, which could potentially impede the development of medicine and the cultivation of medical professionals in China.

In terms of the number of specialties, there are 34 disciplines and 207 specialties in medicine in the United States, while the range of medical disciplines and specialties in China is relatively small. There are only 11 disciplines and 54 specialties in master's/doctoral-level medical education. In terms of the range of disciplines, China's definitions lack humanity and interdisciplinary features among disciplines such as Allied Health and Medical Assisting Services, Communication Disorders Sciences and Services, Medical Clinical Sciences, and Medical Ethics.

2.3 Clinical medicine is prematurely subdivided and specialized

The clinical medicine discipline is a field with broad coverage. The United States and the UK define the clinical medicine program only as medical school, rather than as pediatrics, psychiatry, or preventive medicine. In general, education in medical school should cover a broad range of disciplines. Doctors can only diagnose in their specific specialties after first gaining a general background in medical practice and systematic knowledge of human life and health. However, China's current specialty definitions in master's/doctoral medical education are prematurely subdivided, as 18 sub-specialties have been defined in clinical medicine. This leads medical students to develop narrow clinical knowledge, with less adaptability in practice, degrading the outcomes of medical education.

2.4 The master's/doctoral medical specialties catalogue is not coordinated with the residential training specialties catalogue

After completing education in medical school, the medical student begins post-graduate training. At present, China's graduate medical education (professional track) coexists with standardized residential training, and specialty definitions are disproportionate (Table 3), which results in many contradictions and problems in the training process. Sorting out the specialties catalogues to be coordinated should be prioritized for improvement.

Table 3. Comparison of medical specialties definition in master's/doctoral education and standardized residential training in China.

Master's/doctoral specialties catalogue	Standardized residential training specialties catalogue
100201 Internal Medicine	100 Internal Medicine
100202 Pediatrics	200 Pediatrics 1500 Pediatric Surgery
100203 Geriatric Medicine	
100204 Neurology	600 Neurology
100205 Psychiatry and Mental Health	500 Psychiatry
100206 Dermatology and Venereology	400 Dermatology
100207 Imaging and Nuclear Medicine	2400 Nuclear Medicine
100208 Clinical Laboratory	2000 Clinical Laboratory
100209 Nursing	
100210 Surgery	900 Surgery 1000 Surgery (Neurosurgery) 1100 Surgery (Cardiothoracic Surgery) 1200 Surgery (Urology) 1300 Surgery (Plastic Surgery)
100211 Obstetrics and Gynecology	1600 Obstetrics and Gynecology
100212 Ophthalmology	1700 Ophthalmology
100213 Otolaryngology	1800 Otolaryngology
100214 Oncology	
100215 Rehabilitation Medicine and Physical Therapy	800 Rehabilitation
100216 Sports Medicine	
100217 Anesthesiology	71900 Anesthesiology
100218 Emergency Medicine	300 Emergency Medicine
105127 Family Medicine	700 Family Medicine* 2100 Clinical Pathology 1400 Orthopaedic Surgery 2200 Radiology 2300 Ultrasonic Medicine 2500 Radiation Oncology 2600 Medical Genetics 2700 Preventive Medicine

3 Suggestions for defining medical catalogues in China

3.1 Medical specialties definition should be based on the current situation and gradually aligned with global standards.

To address incompatibilities between China's medical specialties definition and international standards, it is suggested that specialties definition be based on the national situation and international experiences. Then, our medical specialties definition should be gradually synchronized with advances in modern medicine and aligned with internationally accepted medical specialties catalogues.

First, a unified specialties catalogue should be established. The specialties catalogue definition practices of CIP (United States) and JACS (UK), among others, could be consulted for the overall planning of specialty definition for different discipline levels and to ensure the logicity and continuity of medical specialties catalogues at the junior college, undergraduate, and graduate education phases and provide smooth coordination that is conducive to the overall development of higher education in China.

Second, medical specialties catalogues should be updated dynamically. Based on demands of social development and international experiences in defining emergent and interdisciplinary aspects of disciplines, it is suggested to optimize the catalogues by defining new specialties such as Allied Health and Medical Assisting Services, Communication Disorders Sciences and Services, Medical Clinical Sciences, Medical Ethics, and so on.

Third, the discipline system should be enriched to match international standards. For example, currently, the medical discipline of pharmacy in China comprises only: Medicinal Chemistry, Pharmaceutics, Pharmacognosy, Pharmaceutical Analysis, Microbiology and Biochemical Pharmacy, Pharmacology, and so on. Specialties such as Pharmacoeconomics, Pharmacy Management, and Pharmacy Policy should also be established to enrich the pharmacy discipline in China.

3.2 Establishing a standardized mechanism of inclusion and exclusion among medical specialties

The establishment of a scientific and standardized mechanism of inclusion and exclusion among medical specialties in China is conducive to the standardized management of discipline and specialty definition and the proper updating, adjustment, and long-term development of disciplines and majors. It is suggested that a dynamic updating mechanism for medical specialties be established and adjusted every five years, according to the *Degree Awarding and Talent Training Specialty Catalogue Definition and Management Measures*. Thus, the catalogue would represent the opinions of stakeholders and enable educational institutions to achieve greater autonomy. Moreover, this would allow government, society, and universities to unleash their potential in the definition and management of specialties catalogues [10].

3.3 Medical specialties catalogues should be cohesive and coordinated.

Medical education, as a comprehensive and multi-level educational system, must obtain a unified set of specialties catalogues with clarity across different phases. Moreover, teaching priorities should be clearly emphasized in undergraduate and graduate studies, to prevent misalignment and inefficiency in medical education [1]. Clinical medicine in medical school, especially, features a wide range of specialties, and this premature subdivision and specialization is inappropriate and can affect the growth of medical talents. Furthermore, the definition of clinical medicine specialties catalogues should not only be coordinated within undergraduate and graduate studies but also consider coordination with specialties catalogues of standardized residential training. Through joint efforts of medical schools and hospitals, a continuum of education could be provided to medical students, so that they can transition smoothly, in an orderly manner, from graduate medical studies to post-graduate medical training, which is conducive to the cultivation of qualified and standardized medical talents.

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