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History of Critical Thinking in Clinical Medicine

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Abstract

Starting from the famous scholars, writings and important events that have played an important role in the development of clinical medicine, this paper systematically combs through the whole process of critical thinking in clinical medicine from its germination to its eventual disciplining and institutionalisation, with the aim of revealing the important role that critical thinking has played in breaking down the authority and pushing forward the advancement of medical sciences, as well as providing historical references for medical education and clinical practice.

Keywords

Critical Thinking; History of Development; Clinical Medicine; History of Medicine.

1. Introduction

Clinical decision-making environment is very complex, how to filter out the correct and effective from the patient's oral, examination of a large amount of information obtained, and based on this to carry out analysis and reasoning, and ultimately make a reasonable decision, is a doctor must have the ability, and in this process critical thinking plays an important role. Critical thinking is a conscious and reflective way of thinking, and the systematic cultivation of critical thinking among medical students and workers will help them to better master the scientific clinical reasoning model, improve the quality of medical care, promote the development of medicine, and bring greater benefits to patients.

2. History of Development

2.1. The Germination of Critical Thinking

In the early stages of medical development, clinical practice was mainly based on personal experience and intuition, and it was difficult to break this limitation due to the great confinement by authoritative dogma, until the emergence of the germ of critical thinking, this phenomenon has gradually changed. The ancient Chinese and Greek civilisations, although in different cultural backgrounds, both embodied the germ of critical thinking to varying degrees. The origin of critical thinking can be traced as far back as Socrates, a thinker 2500 years ago [1], and has since been modified and supplemented by generations of scholars. During the same period, Hippocrates emphasised observation, and his writings, such as The Hippocratic Corpus, laid the foundation for clinical observation by providing detailed accounts and rational analysis of cases. As a doctor, Galen's research on the body was extremely rich, whether from the physiological, pathological or therapeutic point of view, Galen made a lot of investigations on the body [2], and tried to reveal the relationship between the structure of the human body and diseases through anatomical observation of animals, and his writings involved various fields of

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medicine. Because the Roman law in Galen's time prohibited human dissection, Galen could only make anatomical observations on cows, pigs and monkeys [3], which caused more errors in his theories, but Galen's research still embodied the questioning of the traditional concepts of medicine and the exploration of the unknown, which laid the foundation for the development of critical thinking in medicine later on.

In ancient China, the Huangdi Neijing, written in the Warring States period, reasoned inductively about the understanding of human physiology and pathology, and although it did not form a complete logical system, it initially embodied the analysis of medical phenomena and thinking, reflecting the dialectical thinking inherited from the pre-Qin Dynasty [4]. Zhang Zhongjing's 'Shanghan Zabing Lun' in the Han Dynasty put forward 'Syndrome Differentiation and Treatment' and 'Six Meridians Syndrome Differentiation', reflecting the application of classification, comparison, induction and other methods in medicine. The theoretical roots of the idea of 'Syndrome Differentiation and Treatment' can be traced back to the 'Huangdi Neijing', and has become an important part of Chinese medicine under the development and improvement of generations [5]. This is an important breakthrough in ancient Chinese medicine, an early embodiment of critical thinking in the field of Chinese medicine, which effectively guided the clinical practice of Chinese medicine.

2.2. The Rise of Scientific Experiments to Promote Changes in Thinking

In the 16th century, Andreas Vesalius carried out a large number of human anatomy experiments as a basis for discovering where Galen was wrong, pointing out that Galen's conclusions were based on dissections of animals, so it was not surprising that they did not match up with the human anatomical situation in some places [3]. Convinced that truth comes from direct dissection and observation of the things in front of him, not from great predecessors or their classical literature [6], Vesalius' magnum opus, De Humani Corporis Fabrica, broke the misconception that had lasted for millennia by virtue of its precise diagrams; closely followed by William Harvey's De Motu Cordis, which systematically expounded the theory of the circulation of the blood through experiments and quantitative calculations, published in 1628, physiologically Challenging Galen's 'tidal theory', which had ruled the medical world for more than 1500 years, empirical evidence and criticism began to replace authority and dogma as the new driving force for the advancement of medicine.

Morgagni used cadaveric anatomy to carry out disease research, and in 1761 published 'De Sedibus et Causis Morborum per Anatomiam Indagatis', which systematically established the correspondence between clinical symptoms and organ lesions, and created pathological anatomy, which laid the foundation for the idea of disease location, and showed the germ of early evidence-based thinking. The concept of evidence-based medicine slowly matured in the 19th century, and the formation of this concept is a concrete presentation of critical thinking in clinical medicine, which can fully mobilise the enthusiasm and initiative of students' learning and enhance the critical thinking ability of medical students [7].

2.3. The Scientificisation of Modern Medicine and the Deepening of Critical Thinking

Into the 19th century, clinical medicine began a profound scientific transformation. With the systematic introduction of natural science methods, critical thinking also gradually evolved from the observation of individual medical records to the analysis of group evidence in conjunction with epidemiology, statistics and experimental science.

The development of critical thinking in clinical medicine during this period was characterised by the systematic evaluation and innovation of traditional treatments. Pierre Charles Alexandre Louis, a French physician, systematically recorded and compared patient data under different treatments, and for the first time applied statistics rigorously to clinical decision-making in

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order to assess the effectiveness of treatments. Louis is best known for his work on evaluating the efficacy of bloodletting in medicine [8]. He published his observations of 2,000 patients in 1840 and based on these he questioned the prevalence of bloodletting. He advocated an approach to clinical assessment based on group data, which led to a gradual change in the basis for clinical decision-making from individual subjective experience to systematic and objective group evidence.

Joseph Skoda, a representative of the Vienna Circle, systematically correlated physical diagnostic techniques with pathological findings, using physics and mathematics to interpret the pathophysiology of the sounds of percussion and auscultation and to correlate them with the physical conditions of the organs in the body. He opened up modern physical diagnostics and made a historic contribution to the diagnosis of heart and lung diseases. Skoda believed that in the natural sciences, truth could not be found by speculation, but only by rigorous observation [9]. Skoda's approach embodies the scientific and objective nature of the diagnostic process and is a key example of how critical thinking has driven the progress of diagnostics.

Robert Koch, a German physician, was the founder and pioneer of pathogenic bacteriology in the world, as well as a visionary of epidemiological etiological inference [10], who carried out a series of rigorous experimental studies, proved that Bacillus anthracis triggered anthrax in 1876, established for the first time the correspondence between a specific microorganism and a specific disease, and created Koch's law, which became the gold standard of infectious disease research. His search for the causes of diseases was based on verifiable and reproducible experimental evidence and methods, free from conjecture and vague theories of etiology, and it was on this basis that Koch was able to discover the relationship between pathogenic microorganisms and their corresponding diseases time and again, which is a vivid reflection of critical thinking in medical research.

2.4. Disciplining Critical Thinking in the 20th Century

Into the 20th century, critical thinking took on a disciplinary and institutionalised trend. World War II and beyond saw an explosion of medical technology and the emergence of new drugs and treatments. in 1928 Alexander Fleming discovered the bacteriostatic phenomenon of penicillin and did initial experimental verification. Afterwards, Howard Florey and Ernst Chain's team carried out a more systematic study and successfully isolated and purified penicillin [11] and proved its efficacy through rigorous clinical trials. From Fleming's initial discovery of penicillin to the success of Florey and Chain's team in purifying and translating it into the clinic, this whole process clearly presents the observation, analysis, verification and reflection of the role of observation, analysis, validation and reflection in the development of medicine. The role of observation, analysis, validation and reflection in the development of medicine.

As the importance of critical thinking has been widely recognised, it has begun to emerge from an implicit quality of thinking into a series of teachable and evaluable methods and tools for teaching and learning. In the 1970s, critical thinking began to be used in teaching and learning, which essentially aims to cultivate students' ability to reflect and constructive criticism. Since the 1980s, it has been adopted by a number of countries as a part of the content of higher education [1]. In 1991, the U.S. National Education Goals Report explicitly required that all kinds of schools 'should cultivate a large number of students with high critical thinking skills' [12], and the U.S. National Education Goals Report emphasised that in the knowledge society and the information age, the comprehensive ability of students to raise, analyse and solve problems should have higher requirements, and that critical thinking should be used as a tool for students to learn to think critically and to develop their critical thinking skills. Higher requirements, critical thinking as a teaching experiment reform course formally entered the U.S. National Education Programme. 1998, 'Declaration on Higher Education for the Twenty-First

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Century', explicitly cultivate students' criticality as one of the important missions of education [13].

In the field of medicine, critical thinking has also been gradually valued. in the early 1980s, the theory of critical thinking was introduced into the field of nursing, and in 1989, the national League for Nursing (the NLN) included critical thinking skills as an important indicator of the level of nursing education in its undergraduate nursing accreditation guidelines [14]. The cultivation of critical thinking has also been increasingly emphasised in clinical medical education, where medical students need to learn to analyse and question medical knowledge and clinical cases, rather than blindly accepting existing knowledge and opinions.

2.5. Modern Medical Education and Critical Thinking

Since the 21st century, critical thinking has been formally established by the global medical education community as one of the core competencies that medical students must master, and in 2001, the Institute for International Medical Education (IIME) developed the Global Minimum Essential Requirements in Medial Education (GMER), which lists 'critical thinking and research' as one of the most basic and core competencies that medical graduates should possess. In 2001, the Institute for International Medical Education (IIME) formulated the 'Global Minimum Essential Requirements in Medial Education' (GMER), listing 'critical thinking and research' as one of the most basic and core competencies that medical graduates should possess. In 2002, the Ministry of Education and the Ministry of Health of China jointly issued the 'Standards for Undergraduate Medical Education(Clinical Medicine Speciality) - Pilot Implementation', in which 'having a scientific attitude, innovation, and an analytical and critical spirit' was proposed as one of the basic requirements to be fulfilled by graduates of undergraduate clinical medicine specialities [13]. Nowadays, different organisations and countries have actively introduced policies to cultivate critical thinking in medical students and written it into the corresponding systems, which all reflect the importance of critical thinking in today's medical profession and medical education, as well as a deep understanding of its importance.

The medical education sector is actively exploring effective ways to cultivate critical thinking, and teaching methods such as problem-based learning (PBL) and Socratic Method are gradually becoming mainstream teaching methods. These methods exercise students' critical thinking skills by guiding them to continually ask questions, identify, reflect and make decisions through more realistic clinical problems. Of course, in this process, not only does it require the efforts of students, but it is also indispensable for teachers, as the guides of medical students, to strengthen the cultivation of their critical teaching attitudes and enable them to use more teaching methods that can enhance the critical thinking of medical students, and to encourage students to go boldly to reflect on the questioning [15].

3. Conclusion

The development of critical thinking in clinical medicine is an evolutionary process from obscurantism to science, from experience to evidence, and from personal reflection to systematic discipline, which is the guarantee of the scientific nature of medicine. Looking ahead, the rapid development of artificial intelligence, big data and precision medicine, as well as the transformation of the medical model to a 'biopsychosocial' medical model [15], will lead to the complexity of clinical decision-making, and medical education in the future needs to place the cultivation of critical thinking in a more central position, so that it can become the habit of mind of medical students and medical workers, and truly guarantee the scientific nature of medicine. The future medical education needs to put the cultivation of critical thinking in a more central position, so that it can become the habit of mind of medical students and medical workers, and be truly applied to clinical practice.

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