Scientific Research Publishing

International Journal of Clinical Medicine, 2020, 11, 474-481
https://www.scirp.org/journal/ijcm
ISSN Online: 2158-2882
ISSN Print: 2158-284X

Uncertainty of Clinical Thinking and Patient Safety

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How to cite this paper: Zhao, Q., Shen, Z.S., Guo, H. and Li, J.G. (2020) Uncertainty of Clinical Thinking and Patient Safety. *International Journal of Clinical Medicine*, **11**, 474-481.
https://doi.org/10.4236/ijcm.2020.118040

Received: July 6, 2020
Accepted: August 4, 2020
Published: August 7, 2020

Abstract

Clinical thinking have the uncertainty, by which there are not a few mistakes caused. So it is necessary to discuss how to deal with the uncertainty of clinical thinking, which originates from the uncertainty of the objective world, social world and medicine knowledge, and can be seen all over clinical activities; Critical thinking which cautious about the interpretation and prediction of scientific theory is the best practice to explore the uncertainty. The essential purpose of medicine is rescuing people, So it is necessary and scientific to take "excluding life-threatening symptoms first" as the first principle of clinical thinking, which is also the primary method to deal with the uncertainty of clinical thinking; By the limited certainty of clinical thinking, procedural thinking is conducive to building a safer health system that is "easy to do right and difficult to do wrong".

Keywords

Clinical Thinking, Uncertainty, Critical Thinking, Step-Down Thinking, Procedural Thinking

1. Introduction

Medicine is not only "science", but also like "art", with uncertainty and a certain degree of fuzziness. In the past, our understanding of the uncertainty of medicine was insufficient, and the uncertainty of clinical thinking was superficial. There are not a few mistakes caused by this. Research into medical practices at Harvard Medical School reported in 1991 that 3% - 4% of adverse events were related to hospitalization [1]. The book, *To Err Is Human*, published in 1999, showed that in that year more people died of medical errors than from traffic accidents in the United States, and the adverse events related to medical interventions were reported to be the third leading cause of death among citizens of the

United States [2]. The World Health Organization (WHO) reported on its website in September 2019 that the "occurrence of adverse events due to unsafe care is likely one of the 10 leading causes of death and disability in the world," and up to 80% of these injuries could be prevented [3]. These findings have sounded an alarm to physicians. In any field where we need to master complex and large amount of knowledge, it is difficult to avoid the "fault of incompetence" [4]. Only by deeply understanding the uncertainty of clinical thinking, can we deal with the uncertainty of clinical thinking with a more cautious attitude in clinical practice.

2. The Uncertainty of Clinical Thinking

We live in a world full of uncertainty, whether the objective world, the social world, or the knowledge formed in the process of exploring the world are full of uncertainty [5]. So is medicine. The uncertainty of medicine comes from the uncertainty of objective world, social world and knowledge, which determines the uncertainty of clinical thinking guiding our clinical practice, which is reflected in all aspects of clinical practice. The medical knowledge formed in the process of exploring the objective and social world of medicine is also full of uncertainty, which is not only caused by the limitation of human cognitive activities, but also the growth of medical knowledge in the future is unpredictable [6]. According to the records of classic medical books, there are as many as 40,000 kinds of diseases. Because there are variants in different populations, and different diseases have different stages and types and clinical manifestation, which makes medicine more complex [7]. Academician Daiming Fan mentioned in his article [7] "medicine and science" that Cochrane Collaboration Network is recognized as the most reliable evidence-based medical evidence website in the world. Of the 2435 systematic reviews of evidence-based medicine published by the website as of August 2005, only 30% of the evidence can give positive or negative answers, and the remaining 70% are ambiguous. In 2014, JAMA compared the published randomized clinical data with meta-analysis, and found that 35% of the meta-analysis conclusions were different from the original research, and the results directly affected the evaluation of clinical trials. 20 years ago, in order to prevent the occurrence of stress ulcer, the principle of treatment for large area burn was fasting water and only giving "intravenous high nutrition". With the developing of nutrition, people began to realize the importance of enteral nutrition. However, at that time, the "fasting water" treatment method, which seems to be wrong now, was the correct knowledge of certainty and the standard treatment to be strictly implemented. So a large number of uncertain medical knowledge leads to incomplete information, which also leads to the uncertainty of clinical thinking.

In clinical practice, there are uncertainties in the occurrence and development of diseases, the changes of patients' physical conditions and diseased organs. No matter how perfect the general law of medicine is, performance of disease will be different in each patient, and the general law cannot cover every individual. At

present, with the rapid development of medicine and the innovation of various inspection technologies, the clinical diagnosis level is undoubtedly improved. However, how to evaluate the numerous examination results, clinicians need to make a comprehensive judgment. The "normal value" of various tests covers 95% of the population, and 5% of the normal value may be the "abnormal value" [8]. For the same disease, due to differences of the patient's temperament, ersonality, psychology, family environment and social environment, the patient's feelings are also different, and the diagnosis and treatment results will be different. The uncertainty of clinical thinking is reflected in all aspects of clinical activities, such as the uncertainty of patient data collection and disease judgment and prognosis; every doctor cannot give a full grasp of the correctness of the patient's diagnosis; the effect of treatment or operation according to the diagnosis is not necessarily satisfactory, or there is bad effect or even the opposite outcome, resulting in misdiagnosis or errors. Even if there is no misdiagnosis or mistreatment, there may be many new situations unexpected. Therefore, there is no absolute objective, universal and pure medical knowledge. Doctors can cure the disease and save people, most of them rely on the confirmed medical knowledge, but there is still uncertainty in the definite knowledge. The so-called deterministic knowledge only means the knowledge of "maximum probability event" within a certain space-time range and under certain conditions, and is the knowledge "not yet falsified" in the process of human cognition, which is also the "uncertainty of deterministic knowledge" [6].

3. How to Deal with the Uncertainty of Clinical Thinking

Physicians encounter decision-making in clinical practice every day and constantly use clinical thinking to provide patients with diagnostic and treatment decisions. Sometimes they need to make important decisions about life and death under insufficient information. For a long time, people have tried to find certainty in medical theory and practice, so as to improve diagnostic and therapeutic efficacy, but that uncertainty remains, and new uncertainties are sure to emerge as some certainties are hammered down.

As an emergency doctor, we feel deeply that our knowledge in clinical practice is overshadowed by what we don't yet know. For example, we don't know what illness the next patient will suffer from. We don't know if it will be a common disease or a rare one, if it will be life-threatening, or how the patient's condition will evolve. "I don't know" are perhaps the most important three words in medicine [9]. How to deal with the uncertainty of clinical thinking is more worthy of discussion.

3.1. Critical Thinking

Critical thinking is an effective way to solve the problem of uncertainty. It takes a cautious attitude towards the universal knowledge and objective laws found for a long time, and give a new interpretation and prediction for old scientific theo-

ries [10]. The core of critical thinking is "doubt", which doubts everything, so as to constantly verify the existing conclusions. In the view of medical uncertainty, we should keep a clear mind on the conclusion that clinical thinking is "universal, objective and inevitable"; whether clinical conclusion is truth does not depend on which doctor it comes from, but whether it can withstand falsification test. The most essential feature of critical thinking is to go to the bottom of the matter, to find by hard and thorough search, and to get reasonable and mature thinking for guiding the thinking process and laying the foundation for rigorous reasoning, and finally obtain the best effect [11].

The development of disease is a process, which is in dynamic evolution. The state of the patient changes with time, and the changes of any disease are the accumulation of quantity. The data collected in the early stage of the disease for diagnosis are not necessarily complete, or because the characteristics of the disease itself have not been fully demonstrated, the preliminary diagnosis may be imperfect or even wrong. Any preliminary diagnosis must be continuously observed, verified, supplemented in time in the process of medical practice, and differential diagnosis must be repeated and screened on the basis of new disease data, so that the correct diagnosis can be obtained [12], this cycle is the best practice of critical thinking.

Case 1: a woman, 32 years old, was injured in a traffic accident on her right foot with local swelling. Physical examination and CT showed no fracture. The patient worried about that and asked the doctor to confirm no fracture, the doctor replied: no fracture. The patient reconciled with the perpetrator on the same day and notarized and signed. Three days later, the local swelling of the patient's right foot did not subside, and the pain did not reduce when bearing weight. He came back to the hospital for further consultation. The doctor replied: if you hurt your muscles, it's OK to raise them slowly for more than 100 days. Ten days later, the patient's symptoms did not abate, and he went to another orthopedic hospital for consultation. Radiologic examination showed obvious foot bone fracture, which required a long time of plaster fixation, and lost work. However, it was difficult to continue to obtain compensation from the perpetrator, so he complained to the first hospital.

This case once again reveals the uncertainty of clinical thinking. The first doctor should not arbitrarily think that there is no fracture. Yes, there is no fracture at that time, but critical thinking and dynamic observation is needed all the time for patient's condition, Even after high-end imaging examinations. Dynamic observation is not so much experience as the concrete practice of clinical thinking uncertainty and critical thinking. American scholar Peter Facione said that "one of the reasons why American high education is favored by the world is that it has the potential to teach critical thinking". The Institute for International Medical Education (IIME) has listed critical thinking as one of the seven aspects of the "minimum basic requirements for global medical education" [10]. It can be seen that the cultivation of critical thinking is important for medical professional

competence.

3.2. Excluding Life-Threatening Condition First

The ancient medicine developed through practice, its task is to resist fatal diseases and relieve the suffering of patients, which is the essential purpose of medicine [13] [14]. The famous Hippocratic Oath, with its "first do no harm" put to words the priority of patient safety more than 2000 years ago [15]. Even if one cannot cure the disease, the absolute need is to not harm the patient. Therefore, following the essential purpose of medicine, the first principle of clinical thinking is to ensure the life safety of patients.

Thinking has integrity and inertia, which is the guide of action. Thinking in an inherent way will always affect its behavior. Once the mode of thinking is formed, it will form inertia thinking. Respect for life is the origin of medicine, and clinical thinking of respecting for life is the safe thinking. Therefore, the first principle of clinical thinking is to rule out the possibility of life-threatening **condition** first during diagnosis, which is also the primary method to deal with the uncertainty of clinical thinking [8].

To practice clinical thinking by first ruling out the possibility of life-threatening **condition** during diagnosis is also a basic tenet of medical humanities, the core of which is to first respect life and to protect patients' safety [16]. To integrate medical humanities into clinical practice, it is first necessary to integrate medical humanities into clinical thinking. They complement each other, share the same root and serve the purpose of medicine. The biggest difference between medical humanities and general humanities is the practical characteristic. Whether in the field of education or research, medical humanities are reflected in the specific practice. Medical humanities should be integrated into clinical practice, first of all, clinical thinking should be integrated in it, and the clinical thinking guided by medical humanities should be advocated.

Ruling out the possibility of life-threatening conditions first during diagnosis requires to abandon the utilitarian. Utilitarianism often considers life-threatening **condition** rare, more than 80% **condition** are common diseases and frequently occurring diseases, and the focus of doctor's work should not be on diseases with 20% or even less probability, thus the principle of ruling out the possibility of life-threatening **condition** during diagnosis may lead to overtreatment. However, each life is unique and valuable. Life is of infinite value to everyone himself, and the value of life cannot be measured by utilitarianism [17].

Step-down Thinking was first put forward by the famous Chinese emergency Professor Wang Peiyan, in the emergency field. It has been more than ten years now. It refers to the exclusion of the patients' diseases in accordance with certain methods, from life-threatening diseases to general diseases, from rapid progress ones to the slow, from organic to functional diseases. Facing the uncertainty of clinical thinking, doctors' responsibility is to use scientific methods to reduce the impact of uncertainty on clinical practice and avoid damage to patients, and strive for better clinical effect.

There are more and more kinds of clinical specialties with different characteristics, but the goal of resisting fatal diseases and relieve the suffering of patients is the same in medical practice .Objects and goals is the same and only the means are different for all medical workers. Therefore, "first of all, excluding life-threatening diseases" should be the thinking principle of all medical workers. diagnostic strategy of common diseases and frequently occurring are also based on "ensuring patient safety". John Murtagh, a famous Australian general practice Professor, has put this principle into his "safe diagnostic strategy" as a general practitioner's mode of thinking. Only by respecting life and reverence can we practice the essence and goal of Medicine [16], and strive to avoid the harm to patients' lives caused by the uncertainty of clinical thinking. Therefore, the principle of "descending step thinking" to exclude life-threatening condition is the general requirement to deal with the uncertainty of clinical thinking, and is the ultimate goal of medicine and the foundation of medical humanities [13].

3.3. Process Thinking

Process thinking has not been seen much emphasis or recognition valued and recognized in the past. Diagnostics has focused excessively on common diseases [12]. Admittedly, experienced physicians may arrive at correct diagnoses immediately. However, experience does not guarantee patient safety. Regardless of how experienced and skillful a physician becomes, he or she still cannot guarantee that they will always be at their best. In the other hand, accumulation of experience requires time, maybe it is a long time, and Patients will be hurt during this period.

The uncertainty of clinical thinking is more reflected in the uncertainty of clinical decision-making. Doctor's thinking is affected by many factors, such as doctor's state, mood, culture, knowledge and so on. So we can't always repeat a good way of clinical decision-making, and have the possibility of mistakes, even in common diseases. In the medical community, there is a story that the more familiar people are, the more likely mistakes they make (the more familiar, the more mistaken) .This is because people are familiar and omit the process that should be. An example: a 45 years old successful man suffered from thyroid nodules because of his busy work and no time to hospital, he turned to his classmate who was a surgeon. His classmate thought that the thyroid nodule could be cut off, so he underwent surgery on the same day. As a result, the patient appeared "hyperthyroidism crisis" and died in the evening. According to analysis of the case, the patient had not been given any necessary examination before the operation, even blood routine.

Process thinking tells us what to do first, what must be done and what is not necessary to do. We should sort out the key links, grasp the most critical elements, and carry out clinical decision orderly. More than 10 years ago, the American Institute of medicine submitted a report on the statistical analysis of medical errors. The title of the report is "To err is human: building a safer health sys-

tem" [2]. It said the only way to deal with this problem is to establish a safety concept and workflow with "easy to do right and difficult to do wrong". This is the fundamental solution.

Process thinking is not only the workflow of operation, but also a kind of thoughts or ideas. It is because of the complexity of medicine and the diversity of clinical symptoms, not all workflow of medical links can be established. Therefore, Within the limited certainty of clinical thinking, process is a kind of thinking mode, doctors have a same thinking path, instead of different people having different opinions, and each of them will make diagnosis and decision according to their own experience. Process thinking carries out the basic principles of clinical thinking and critical thinking method, so as to ensure the safety of patients.

4. Summary

Doctors encounter medical uncertainty and deal with patients' vibrant lives, they should consciously use critical thinking, and respectfully question and revisit our clinical decisions and therapeutic regimens with the aim of putting patients' safety first. From the perspective of clinical thinking, practice the essence of medicine, face up to and awe the uncertainty of medicine and clinical thinking, put patient safety in the first place, and let uncertainty become the starting point and driving force for continuous pursuit of "ensuring patient safety".

Authors' Contributions

Jianguo Li had the idea for the article, Zhangshun Shen performed the literature search, Qian Zhao, Hui Guo wrote the article, and Jianguo Li is the guarantor.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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