Medical Tort Compensation and Criterion of Liability Using Occupational Psychotherapy

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Abstract

The contradiction between doctors and patients has become a global problem. The medical tort compensation and liability determination involved in it have aroused people's interest. Based on the background and problems of a medical tort, the principles of occupational psychotherapy are introduced into it. Meanwhile, the machine learning algorithm is introduced to assist. A medical accident tort compensation and liability determination system based on the intelligent assistance of occupational psychotherapy is constructed. This intelligent medical tort compensation and liability determination model is analysed. The results show that it can effectively classify medical accident tort cases and improve its liability determination efficiency. The compensation and liability determination system strategy constructed can promote the healthy development of patients' professional psychology and improve the compensation efficiency of medical tort cases.

Keywords: Occupational Psychotherapy, Medical Tort, Medical Accident, Negligence Compensation, the Criterion of Liability, Artificial Intelligence Technology

1. Introduction

Recently, the contradictions between doctors and patients caused by medical tort have become increasingly fierce. Most of these contradictions are caused by the damage compensation for medical tort (Figure 1) (Castiglioni et al., 2021; Panda, Begley, & Daly, 2018). Currently, most people, even legal workers, do not clearly understand the medical accident. It leads to the frequent occurrence of various medical disputes. Therefore, it is extremely necessary to sort out and clarify the legal concept of medical accidents. In this way, it can be concluded whether the current law is suitable for the actual problem of medical accident compensation damage. Then, the law can be applied (Rajula et al., 2020). Therefore, the research on medical tort compensation and criterion of liability has become the focus of scholars in relevant fields.

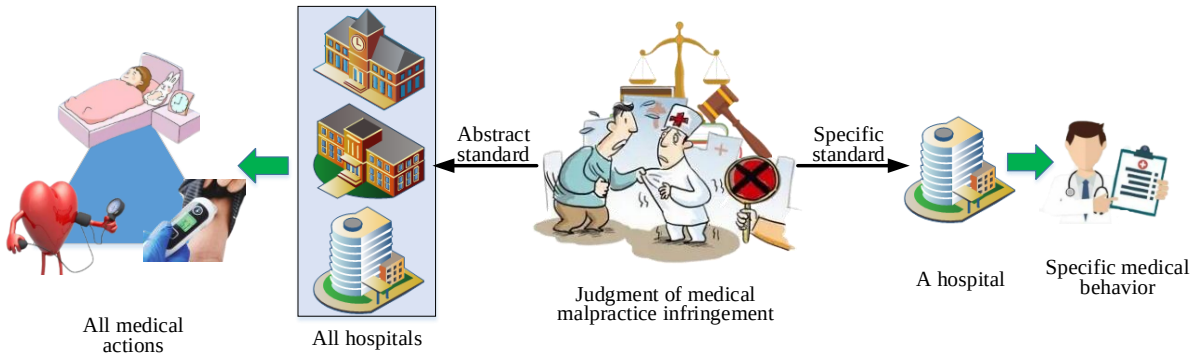

Figure. 1 Diagram of doctor-patient contradiction (the author draws the diagram, and the inspiration is from the literature (Abdullah & Ahmed, 2020; Albro & Hendell, 2020).

Usually, when medical accidents occur, doctors and patients have their own inherent cognition and values. It will lead to the failure of accurate liability determination and compensation for medical accidents between doctors and patients promptly. Occupational psychotherapy is an effective measure of mental health intervention (Kemp et al., 2020; Lamberton & Vaughn, 2022). Many scholars have researched it. Germain (2018) (Barranco, Vallega Bernucci Du Tremoul, & Ventura, 2021) integrated the theory of mutual regulation and disorder of occupational therapy into psychotherapy. The biological influence relationship of parent-child emotional dynamics was analyzed. The research results show that neuropsychiatric thinking and attachment research have laid a foundation for understanding the professional psychological development of parents and children. By understanding how digital technology is adopted to provide compassionate mental health care, Kemp et al. (2020) (Germain, 2018) identified the facilitating factors and barriers for patients and health professionals to use digital technology in providing

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compassionate mental health care. Ultimately, the application of digital technology to mental health care can improve the compassionate care currently provided and create new ways to provide compassionate care. Kotera, Green, and Sheffield (2021) (Cammarota et al., 2020) emphasized the importance of positive psychological structure, especially resilience and self-compassion, in treating students' mental health. The research of the above scholars shows that occupational psychotherapy plays a crucial role in resolving conflicts and disputes. Therefore, the concept, characteristics and legal treatment changes of medical accidents are the basis for medical liability determination and compensation. Meanwhile, it is feasible to carry out occupational psychotherapy on doctors and patients to impute and compensate for medical accidents. However, occupational psychotherapy often has shortcomings, such as low efficiency and strong subjectivity. Machine learning is one of the artificial intelligence (AI) algorithms and plays a vital role in many fields, such as machine translation, speech recognition, image segmentation and natural language processing (Barranco et al., 2021; Vellido, 2020). Machine learning can independently learn the multi-level features in the original data. This process does not require the participation of human experts in related fields. It greatly saves human, material and time costs (Tarkiainen et al., 2021). Applying machine learning to occupational psychotherapy can effectively improve the efficiency and objectivity of solving medical accidents.

In order to ease the doctor-patient relationship and improve the compensation efficiency of medical tort cases, this exploration built an intelligent medical tort compensation and liability determination system. This method systematically analyzes the judgment standards and principles of medical accident tort. Then, it innovatively introduces occupational psychotherapy, and combines it with a machine learning algorithm. In this way, this method achieves the purpose of efficiently solving the compensation and liability determination of medical tort cases (Gergana, Jaime, & Konstantinos, 2022). The overall research structure is as follows. Second 2 describes the theoretical knowledge of medical accident tort standards and compensation. Second 3 describes the machine learning and intelligent medical tort compensation and liability determination system. Second 4 discusses and analyzes the empirical environment setting and research results. Second 5 summarizes the research results, and describes the research limitations and the follow-up prospects.

2. Concept of Medical Accident Tort

2.1 Analysis on the Judgment Standard of Medical Accident Tort

Medical tort refers to the tort of patients by medical institutions or medical personnel in the process of implementing medical acts (Li & Dissanaike, 2022). When a medical accident occurs, this kind of fault in medical accident liability includes both subjective and objective aspects. When subjective negligence or negligence does not cause adverse consequences such as personal injury to the patient, it is difficult to presume that the perpetrator is at fault. Similarly, doctors and nurses only objectively cause personal injury to patients; however, this is not due to negligence or inattention, but due to reasonable and necessary care. Then, this cannot be called negligence (Alsuliman, Humaidan, & Sliman, 2020).

Among the abstract judgment standards of medical infringement, the judgment standard of medical negligence is the duty of care of doctors. It means the benchmark of doctors' duty of care is also the abstract standard of judging medical negligence (Li et al., 2021). However, when judging according to the medical level, it also needs to combine the specificity, regionality, urgency and other factors of medical behavior to make the abstract judgment standard credible (Figure 2).

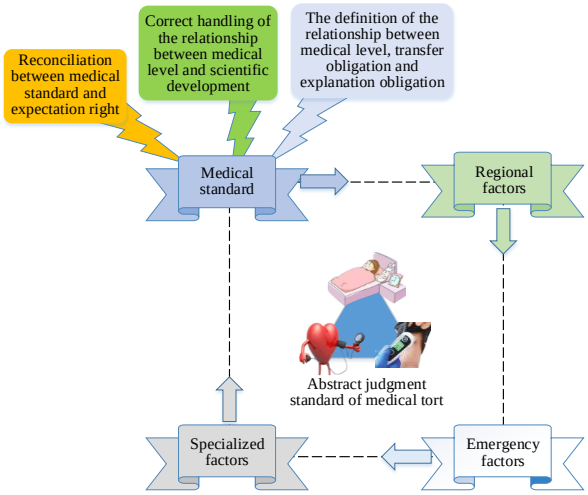

Figure. 2 Schematic diagrams of influencing factors of abstract judgment standard of medical tort (The author draws this figure, inspired by literature (Treglia et al., 2021))

Figure 2 reveals that the factors affecting the abstract judgment standard of medical tort include medical standards, specialization, regionality and urgency of medical acts. The details are as follows:

First, the medical standard establishes a unified standard for medical behavior. It is conducive to the unified regulation of medical behavior by law and can help fairly solve doctor-patient disputes. However, paying attention to three issues is essential when using the medical standard as an abstract judgment standard. They are: 1) to clarify the relationship between medical standards, the obligation to transfer to another hospital and the obligation to explain; 2) to correctly handle the relationship between the medical standard and scientific development; 3) to reconcile the relationship between the medical standard and the right to expect. We can alleviate the

contradictions between doctors and patients to a certain extent only after correctly handling the above three kinds of relationships. Finally, we can achieve the effect of not increasing doctors' responsibility but protecting patients' reasonable interests. The medical standard only provides a general standard for the abstract judgment of negligence. The doctors' general medical technical level is taken as the standard to measure whether there is negligence in specific medical acts.

Second, medical specialization. In the medical situation of increasingly highly specialized technology, finding a standard for all technologies to be applied uniformly is difficult. Therefore, medical specialization must be considered in judging negligence. It is also the product of the increasingly refined and specialized modern medical research and division of labor. In practice, people should pay attention to the method of identifying negligence when non-professional doctors engage in treatment work in this special field under specific circumstances.

Third, regional factors of medical treatment. In addition to the specialized factors of doctors, the judgment of doctors' negligence according to medical standards should pay attention to the specific environment and conditions of doctors. It means the regional factors of medical treatment. Regional factors include two aspects. One is the difference between large hospitals and small hospitals. According to the specific situation, they show reasonable differences in the degree of attention. Then, whether there is fault is judged by measuring the specific abilities of hospitals and doctors. The other is the difference between economically developed areas and remote areas. Although the gap between the two will continue to narrow, the differences due to regional characteristics will exist for a long time. It is undeniable.

Fourth, medical emergencies. The judgment of a doctor's fault according to the medical level should pay attention to medical emergencies. The degree of attention a doctor can achieve in an emergency certainly differs from that in a general situation with plenty of time. Generally, medical emergencies mainly include time emergencies and matters emergencies. The law usually requires doctors to pay less attention to medical behaviors with emergency factors than general medical situations. Therefore, for the urgent choice factors of doctors, judges usually pay less attention to the requirements of doctors than in general cases.

The specific judgment standards of medical tort are mainly to judge through the duty of care stipulated in laws, regulations and rules. In the specific judging criteria, the normative types of legal obligations should be first understood (Holm, Stanton, & Bartlett, 2021; Rai & Devaiah, 2019). According to the provisions of the *Regulations on the Handling of Medical Accidents*, whether a behavior constitutes a medical accident should be judged based on specific standards. These standards are the four categories of laws, administrative regulations, departmental rules, diagnosis and treatment and nursing norms and routines. Table 1 shows the regulations included in each type.

Table. 1

Classification table of regulations for specific judgment standards of medical accidents.

Types	Formulation subject	Regulations
Laws	Formulated by the National People's Congress or its Standing Committee	*Law on Practicing Doctors, Drug Administration Law, Blood Donation Law, Infectious Disease Prevention Law, Food Hygiene Law, Frontier Health and Quarantine Law, Red Cross Society Law, Maternal and Infant Health Care Law, and Occupational Disease Prevention Law*
Administrative regulations	Formulated by the State Council	*Regulations on the Administration of Medical Institutions, Regulations on the Administration of Blood Products, Measures For The Implementation of the Law on the Prevention and Control of Infectious Diseases, Measures for the Implementation of the Law on Maternal and Infant Health Care, Measures for the Administration of Toxic Drugs for Medical Use, and Regulations on the Supervision and Administration of Medical Devices*
Departmental rules	Formulated and promulgated by the Ministry of Health or the Ministry of Health and Relevant State Council Departments separately or jointly	*The Detailed Rules for the Implementation of the Regulations on the Management of Medical Institutions, the Responsibilities of Staff in Chinese Medicine Hospitals (For Trial Implementation), the Measures for the Management of Clinical Blood in Medical Institutions (For Trial Implementation), the Measures for the Management of Nurses, The National Regulations on the Work of Hospitals, the Basic Standards of Medical Institutions (For Trial Implementation), the Basic Standards of Eye Hospitals (For Trial Implementation), the National Regulations on the Work of Chinese Medicine Hospitals (For Trial Implementation), and the Hospital Work System*
Diagnosis and treatment and nursing norms and routines	Formulated by the national health administrative department and the National Industry Association	*Technical Specifications for Clinical Blood Transfusion, Management Specifications for Nosocomial Infection and Diagnostic Standards for Nosocomial Infection*
	Formulated by local health administrative departments and local industry associations	*Beijing Clinical Disease Diagnosis, Treatment and Nursing Practice*

Of course, some medical ethics norms in the specific judgment standards are relatively specific and operable. Hence, the general medical staff should do their best to fulfill their duty of care. The corresponding laws and regulations have clearly provided the

basis for the tort liability claim. Therefore, medical ethics can also be used as the standard for judging negligence. Violations of these norms should be recognized as negligence, such as protecting patients' privacy, and not violating humanitarian principles to conduct in vivo experiments on pathogens.

Hence, in judicial practice, whether negligence exists in medical acts can generally be combined with the above two standards to draw an appropriate conclusion. It is of great significance to the judgment of liability for medical tort.

2.2 Identification and Compensation of Tort Liability for Medical Accidents

In a medical accident, the identification of a medical accident tort is actually the attribution of responsibility. Imputation is a process of determining whether people are responsible for the damage caused by their actions and their belongings with a judgment standard after causing the result. In medical accidents, the attribution of responsibility is a complicated judgment process. Liability determination does not necessarily lead to responsibility. Conformity leads to liability and non conformity leads to no liability (Wallis, 2017). This exploration is to study the criterion of liability for medical damage. It is the general criterion for determining the liability of medical tortfeasors for medical accidents or damages. Sorting out the principles of medical accident attribution to confirm whether there is responsibility, and whether the compensation is timely after assuming responsibility is particularly crucial for alleviating the current medical disputes and reducing the medical accident incidence. Usually, medical accidents occur in medical activities. This process mainly includes diagnosis, treatment, operation, anesthesia, blood transfusion, radiotherapy and other links, as shown in Figure 3.

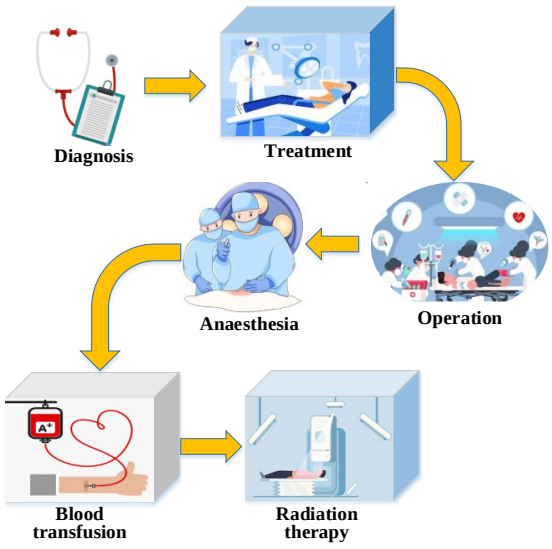

Figure. 3 Schematic diagram of specific types of tort liability for medical accidents. (The author draws this figure, and the inspiration comes from literature (Kotera et al., 2021) and literature (CHAN, 2020))

Figure 3 suggests that medical accidents can occur in any link, such as diagnosis, treatment, operation, anesthesia, blood transfusion, and radiation therapy. Among them, the fault in the diagnosis process refers to the failure to make a correct judgment, mainly including the fault in the diagnosis process and the fault in the diagnosis content. In the treatment process, the main fault is in selecting treatment methods. The fault in treatment behavior involves the selection and discretion of treatment, the application of new treatment and unconfirmed treatment, the implementation of treatment, the manner and degree of treatment (Almeida et al., 2019). According to the operation period, the mistakes in the operation can be divided as follows. They are the mistakes in the judgment before operation, the mistakes during operation and the mistakes in the management after operation. Anesthesia is taken as an auxiliary operation means, but it is sometimes used alone as symptomatic therapy. During anesthesia, doctors should pay attention to the following aspects. The first is to carry out the preparations before anesthesia correctly. The second is the correct implementation of anesthesia, including the correct allocation of anesthetic agents, the correct use of anesthetic tools, and the correct selection of anesthesia time. The third is to observe correctly after anesthesia and after operation. If doctors violate these duties of care, they are at fault. In blood collection and transfusion, the most crucial thing to pay attention to is whether the equipment is clean and whether the blood matches. If there is a medical accident, it is very likely to threaten the patient's life. In the radiation therapy process, the tolerance of radiation exposure amount, position, and method (distance, time) are comprehensively considered, selected and implemented. Violating this duty of care is a fault (Born, Eastman, & Viscusi, 2020; Ploug & Holm, 2020).

However, in the practice of liability determination and compensation for medical accident tort, the tension between doctors and patients cannot be just a problem of liability determination or compensation. It must be comprehensive. The existing problems are as follows. First, it is difficult for patients to provide evidence. There are multiple obstacles to the attribution of responsibility, resulting in patients having no choice but to evade legal channels and adopt extreme methods. Second, the treatment cycle is too long and the relief channel is not smooth, resulting in the intensification of patient conflicts and an unbearable burden on the hospital. Third, the compensation standard and time limit are different, and the law is not uniform. It leads to different compensation prices for the same life. Both doctors and patients have difficulties, but contradictions are prominent. Therefore, the solution to the above problems has also become the research focus here.

3. Intelligent Medical Tort Compensation and Liability Determination System

3.1 Machine Learning

Machine learning is widely used in the medical field. It has been involved in all aspects of diagnosis, treatment and research, such as genomics, medical records, image data analysis, disease prediction and personalized medicine. Machine learning algorithms include many types, such as the support vector machine (Kaissis et al., 2020), random forest (Chen et al., 2021), the decision tree (Wilkinson et al., 2020), and the artificial neural network (Abdullah & Ahmed, 2020). However, compared with the artificial neural network algorithm, the data in the k-Nearest Neighbor (KNN) algorithm is more transparent. Moreover, KNN has certain advantages in forecasting problems. Therefore, this exploration mainly analyzes and studies the application of the KNN algorithm in machine learning in medical accident tort.

KNN is one of the machine learning algorithms and is often used for prediction and classification in the field of AI. It is mainly used to find k samples most similar to the samples to be tested from the known dataset, and then select the category with the largest category proportion among the k samples as the classification and prediction results of the samples to be tested (Horislavska et al., 2020). Before using the KNN algorithm to conduct medical data mining, the preparation work includes feature extraction and classification of text samples in known medical datasets, quantitative representation with vectors, and composition of new medical vector datasets. If all sample points m belong to n-dimensional space R^n, the i-th sample can be expressed as:

$$m_i = \{m_1^i, m_2^i, m_3^i, \ldots, m_n^i\} \quad (1)$$

m_t^i is the eigenvalue of the t-th attribute in the i-th sample. Then, the distance between m_i and m_j can be expressed as follows:

$$d(m_i, m_j) = \sqrt{\sum_{t=1}^{n} (m_t^i - m_t^j)^2} \quad (2)$$

The sample to be tested is input for feature segmentation, and is qualitatively expressed by vectors, such as m_s for normalization. m_1, m_2,..., m_k refer to the first k similar samples after calculating and sorting the sample similarity distance with m_s. If the result after classification is hash, it can be obtained that:

$$f: R^n \to v_i \quad (3)$$

The return value $\bar{f}(m_s)$ is an estimate of $f(m_s)$. It is the most common f value among the k training samples closest to m_s:

$$\bar{f}(m_s) \leftarrow \underset{v \in V}{argmax} \sum_{i=1}^{k} \delta(v, f(m_i)) \quad (4)$$

$V = \{v_1, \ldots, v_s\}$. v_i refers to the mark of the i-th category. $\delta(x, y)$ refers to the category discriminant function, and its equation is as follows:

$$\delta(x, y) = \begin{cases} 1 & x = y \\ 0 & else \end{cases} \Phi = \{y_j | j = 1,2, \cdots, m\} \quad (5)$$

Finally, $\bar{f}(m_s)$ refers to the category prediction of the sample m_s to be classified.

The KNN algorithm is one of the basic algorithms of machine learning. Its principle is easy to understand and program. It does not need too much human intervention and preparation, and belongs to one of the inert machine learning algorithms. Moreover, the time spent in training samples is short. The sample set can be added at any time, and the sample category can be added. It is easy to extend to multi-classification problems. With the increase of the number of samples, there is a higher convergence rate. Any sample in the training sample set may be the central sample, with higher classification accuracy. However, with the increase of samples, the calculation amount of the KNN algorithm increases and the speed slows down. Observing the classification results directly through KNN algorithm steps is not intuitive, because comparing the similarity takes a long time and consumes a lot of computing resources (Amirthalingam, 2022). Therefore, introducing it into the construction of intelligent medical accident tort compensation and liability determination system can improve the efficiency of medical accident liability determination and compensation.

3.2 Construction and Analysis of Tort Compensation and Liability Determination System for Medical Accidents Based on Intelligent Assistance of Occupational Psychotherapy

From a legal point of view, a simple analysis of medical accidents cannot fully explain medical disputes, and the cost and compensation of medical accidents cannot be reasonably solved. Careful study and analysis of the problems reflected in medical accidents and in-depth disclosure of attribution problems will help improve legislation and policies and protect patient accident compensation. It enables doctors to gain patients' trust, makes ordinary citizens deeply understand the liability principle for medical negligence, corrects their original wrong judgment, and forms a correct medical concept. A series of problems leading to prominent contradictions between doctors and patients in the above-mentioned tort compensation and liability determination of medical accidents are realized. Based on this, this exploration introduces occupational psychotherapy and adds the assistance of AI technology (Albro & Hendell, 2020). Finally, a medical accident tort compensation and liability determination system based on the intelligent assistance of occupational psychotherapy is constructed (Figure 4).

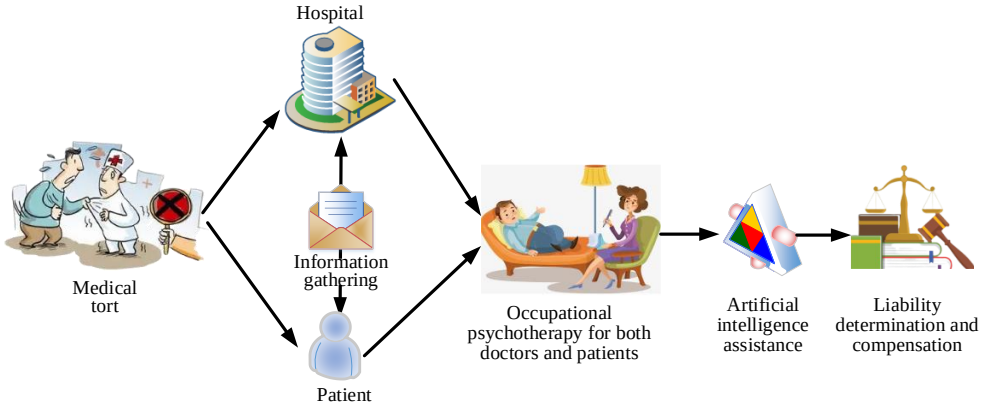

Figure. 4 The framework schematic diagram of the tort compensation and liability determination system for medical accidents based on intelligent assistance of occupational psychotherapy (The author draws this figure, and the inspiration comes from literature (Amirthalingam, 2022) and literature (Chen et al., 2021).

Figure 4 reveals that when a medical accident tort occurs, patients and medical institutions first collect relevant information about medical tort. After understanding the cause of the medical accident, the liability of the medical accident tort will be attributed. The liability determination and compensation of medical accidents are extremely complicated. In order to ensure a win-win situation between doctors and patients as soon as possible, this exploration intervenes in the judgment of occupational psychotherapy for both medical staff and patients. Then, both sides can clearly understand the principles of compensation and liability for medical tort in the context of mental health. Meanwhile, an AI algorithm is adopted to assist it. The AI structure proposed here is advisory. The system makes no assumptions about diagnosis or treatment, but only performs medical accidents. Patients will still get advice and judgment from healthcare professionals in the decision-making process. The reason is that AI programs can make significant health-related decisions in the health field and affect people, and people with skills and abilities must make decisions. Finally, it will achieve a win-win result for both doctors and patients.

4. Research Results and Discussion

4.1 Experimental Analysis

The constructed occupational psychotherapy intelligent assisted medical accident tort compensation and liability determination system is simulated. The results show that this system provides an efficient consulting method for medical accident tort compensation and liability determination. Machine learning algorithms are adopted to predict the liability of medical accidents, provide a reference for doctors and patients, improve the compensation efficiency of medical tort cases, and contribute to medical automation. In order to evaluate the performance of the system, this exploration takes the tort cases of medical accidents that occurred in xx Hospital from April 2018 to May 2021 as an example, and desensitizes the data information of the selected relevant cases. In this way, patients' privacy can be protected in the use process. The effect of medical accident classification and the efficiency of compensation liability determination of the system constructed here are analyzed.

For machine learning algorithm, the following hyperparameters need to be set. The number of iterations is 60 and the simulation time is 2000s. Among them, the specific simulation experiment configuration is mainly considered from both hardware and software aspects. In the hardware, the CPU is Intel core i7-7700@4. 2GHz 8-core. The memory is Kingston ddr4 2400MHz 16G. The GPU is Nvidia GeForce 1060 8G. In the software, the operating system is Linux 64bit. The Python version is Python 3.6.1. The development platform is PyCharm.

4.2 Analysis on the Result of Tort Compensation for Medical Accidents

After desensitization and pretreatment of medical accident tort cases, 42 cases meet the requirements. Figure 5 is the model prediction case type, and Figure 6 is the comparison between the model and the actual case type.

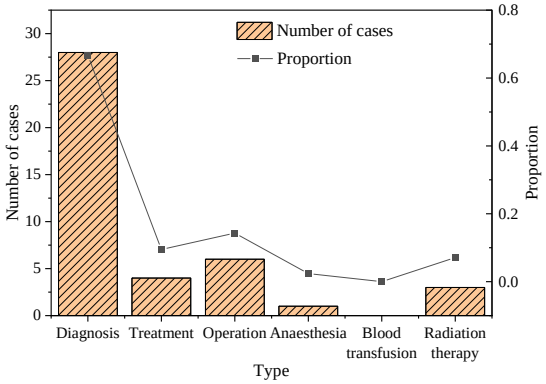

Figure. 5 Classification results of medical accident tort cases in the system model.

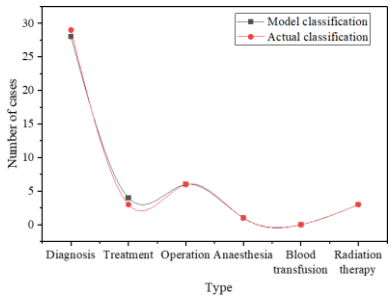

Figure. 6 Classification comparison results of system model and actual medical accident tort cases.

Figure 5 reveals that in medical accident tort cases, the most common is the fault in the diagnosis link, accounting for more than 65%. The proportion of medical accidents is (from large to small): operation > treatment > radiation therapy > anesthesia. In Figure 6, the case classification predicted by the model is compared with the actual case classification. Apart from the classification error of one case in the diagnosis and treatment links, the medical accident tort cases in other links have achieved the effect of accurate classification.

The types of tort negligence in the above-mentioned different links of medical accidents are analyzed. The results suggest that the negligence judgment of medical institutions and their medical personnel mainly depends on the identification of medical negligence. A complete medical accident certificate generally includes: whether the medical institution's handling measures conform to medical practice, whether the medical institution has a fault, and whether there is a causal relationship between the fault and the damage consequences. The medical institution should bear the responsibility as long as it is proved that a medical act constitutes a medical tort. Moreover, medical accident proof is the result of evaluation in the process of obtaining evidence. After collecting evidence of medical behavior, the medical institution can make its own judgment.

4.3 Optimization of compensation and liability determination strategies in tort litigation

The system model's compensation and liability determination efficiency is further compared with the actual liability determination efficiency. Figure 7 displays the result.

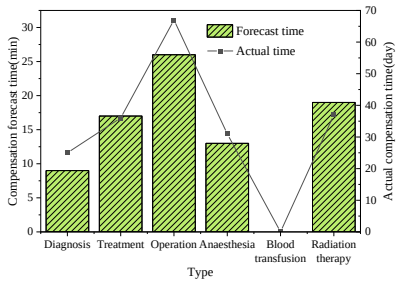

Figure. 7 Comparison results of system model's liability determination efficiency and actual liability determination efficiency.

Figure 7 reveals that the system model's liability determination efficiency is significantly improved compared with the actual liability determination efficiency. The liability determination and compensation time of the infringement type of medical accident of the operation type is the longest, but it still does not exceed 30min. The actual liability determination and compensation time even exceeds 60 days. Since the selected cases do not include medical accidents of blood drawing and transfusion type, the time required is ignored. Therefore, using this model can significantly improve the efficiency of compensation and liability determination in medical accidents. It may be because, in the process of actual compensation and liability determination, the hospital thinks that the amount of compensation is too high and brings a heavy burden to the hospital itself. Therefore, even if there is a medical tort, they are unwilling to admit it, and the compensation delay is longer. Moreover, in the face of high medical expenses, the compensation standard for patients is not uniform, and they must pay high legal fees. Therefore, the phenomenon of low efficiency of medical tort compensation is more common. Hence, the court should determine the actual compensation amount of each property and unify the compensation standard. Moreover, the compensation and liability determination strategy in tort disputes can be further optimized by strengthening the interpretation of medical negligence in the judgment.

5. Conclusion

In order to improve the efficiency of tort compensation and liability determination when medical accidents occur and effectively solve the doctor-patient conflict, this exploration introduces the principles of occupational psychotherapy and AI technology through the analysis of medical accident tort standards. Finally, a medical accident tort compensation and liability determination system based on intelligent assistance of occupational psychotherapy is constructed. Based on an intelligent medical management system, the system strategy is evaluated. The results show that the compensation liability for medical damage needs to be reasonably refined according to the subjective behavior of medical actors in medical accidents. Moreover, the intelligent development of the medical system can improve the efficiency of medical accident compensation and liability determination, hoping to provide a reference for the medical field's standardized development. Of course, there are also some research deficiencies, mainly due to insufficient data collected from medical dispute cases. In future research, it is necessary to further optimize the

compensation and liability determination strategy of medical tort cases in combination with specific reality. In this way, the strategy can be applied to tort compensation and liability determination-related cases in the actual medical field as soon as possible.

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