

Quantitative Research in Modern Forensic Analysis of Death Cause: New Classification of Death Cause, Degree of Contribution, and Determination of Manner of Death

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Abstract

In practice of the forensic pathology, many scholars have been keenly aware that the classification of death cause in International Statistical Classification of Diseases (ICD) could not contain and explain the all situations of multiple factors leading to death. Additionally, there remain some viewpoints to be discussed about the traditional rules and method of degree of contribution and manner of death (MOD). To solve the new growing problems in forensic examination and criminal investigation, the quantitative method was introduced into the legal medicine. Firstly, the classification method of death causes was further perfected on the basis of the traditional theory in WHO-ICD (10). And all factors related to death had been divided into eight kinds of death causes and given the definitions and degrees of contribution, according to their quantitative effects in death mechanism. Moreover, authors suggested that the more accurate definition of MOD based on above principle should be adopted for the determination of MOD conveniently. Years of our successful experiences, especially for the cases involved in the multiple factors, have shown that the principle should be considered as the scientific basis to comprehend correctly the causality of the factors related to death, and to provide the more scientific and quantitative evidences for the court trial and civil compensation.

Keywords: Classification of death causes; Manner of death; Degree of contribution; Quantitative legal Medicine

Introduction

The process to discriminate all the factors related to death is defined as forensic analysis of death cause. Although International Statistical Classification of Diseases (ICD) compiled by the World Health Organization (WHO) had supply some rules for death causes, it is still a can of worms for medical examiners to discriminate them in the death cases with multiple factors [1]. In practice of the forensic pathology, many scholars have been keenly aware that the four causes of death in ICD could not contain and explain the all situations of multiple factors leading to death [2-16]. Additionally, the present determining methods of manner of death (MOD) seem not work in such a case, and some examiners lose their bearings. Therefore, it needs urgently to enrich and develop the new theories of death causes for forensic medicine.

Demarcation of degree of contribution based the classification of death causes is another important task for forensic investigation. In compensation medicine, experts have given the method for degree of contribution, and they classified the degrees with interval of 10% or 25% from 0% to 100% [17-19]. It seemed that the arithmetic progression of 10% and 25% was more regular and easier to operate in practice, but the method of classification, we think, was more idealized and mechanized. Our opinion is that the classification of degree of contribution is on basis of the medical theories for death mechanisms, and not a simple group of arithmetic sequence.

The scientific analysis of death cause and reasonable standard of degree of contribution would contribute to distinguish the interaction and causality of multiple factors related to death accurately, to carry out the forensic examination correctly, to provide scientific evidences for the criminal investigation and civil compensation conveniently, and also to protect the legitimate interest of citizen effectively. In this article, the deeper study about the current theories were further perfected, and the quantitative method was introduced to analyze the death causes and determinate the manner of death, which was expected to provide a new idea to deal with forensic examination.

New classification of death causes based on ICD

In 1967, ICD defined the causes of death as “all those diseases, morbid conditions or injuries which either resulted in or contributed to death and the circumstances of the accident or violence which produced any such injuries” [1]. The definition contained nearly all factors related to death, which include the diseases, injuries, complications, medical mistakes, iatrogenic diseases and the results from the initial accidents or conditions. In ICD, four kinds of death causes had been listed as follow:

- a. Underlying cause of death
- b. Immediate cause of death
- c. Intervening cause of death
- d. Contributory cause of death.

On basis of ICD, authors believed that it is necessary to supply other four kinds of death causes to apply in forensic practices, and all

factors related to death had been divided into eight kinds in total. We are pleased that some views have been accepted gradually by forensic colleagues in China [7-16]. Other four kinds of death cause have been listed as follows.

e. Inductive cause of death

The slight and transitory injury or other stimulus result in the potential diseases attack, progression and even the individual death, and the factor is defined as the inductive cause of death. The factor could not cause the severe injuries and fatal outcomes separately. Generally, they should be the slight, temporary and transient physical or mental stimuli acted on the physiological function.

For example, the factors such as agitation, overtiredness and binge overeating etc. all may induce the attack of the potential and fatal coronary heart disease (CHD). The rupture of the encephalic angioma and fatal cerebral hemorrhage sometimes result from a slight strike such as slap in the face.

Considering as the degree of injury, it is believed that the inductive death cause should belong to the scope of "Slight Injury", however, the contributory death cause and intervening cause should be over "Flesh Injury" which affect the physical and mental function continuously and result in death finally. For the reason, their degrees of contribution are different.

f. Combined cause of death

Two or more simultaneous factors including diseases, injuries or toxicosis, one of which could cause the individual death separately, and the factors are defined as combined cause of death. It is only the coincident meeting, and there is no causality between or among them. Therefore, the factors are also named as the coordinate cause of death.

There are may be three conditions, a. injury-injury combination, such as cardiac nygma and laceration of brainstem; b. injury-disease combination, such as laceration of brainstem and hemorrhage of the ruptured gastric ulcer; c. disease-disease combination, such as hypertensive cerebral hemorrhage and myocardial infarction of CHD.

g. Synergetic cause of death

Two or more simultaneous factors including diseases, injuries or toxicosis, which could not cause individual death separately, result in fatal outcome by collective or interactive effects of them just like synergetic effect in pharmacology, and the factors are defined as synergetic cause of death. Because of the features of factors, it is difficult to discriminate the primary or secondary role in forensic practice. Just like combined the cause of death, there are also three conditions, and that is injury-injury synergism, injury-disease synergism and disease-disease synergism.

In forensic analysis of death causes, the differences of combined and synergetic cause of death should be well distinguished, and the single factor of synergetic cause of death could not lead to death independently. For example, hitting a drunken person's neck or head with fist, the synergetic effects of alcoholism and strike may cause the fatal traumatic subarachnoid hemorrhage.

h. Irrelevant factor

The irrelevant factor is defined as "other independent diseases or injuries which either resulted in or contributed to death". For instance, a patient with deafness had acute hemorrhagic necrotizing pancreatitis and got sudden death for the binge overeating and excessive drinking. In this case, the acute hemorrhagic necrotizing pancreatitis was

considered as the underlying cause and immediate cause of death, and binge overeating and excessive drinking were the inductive cause of death. As for the deafness was the irrelevant factor in the incident.

In forensic analysis of death causes, the irrelevant factor and contributory cause of death should be discriminated correctly. The irrelevant factors are the coincidence conditions with no relation to fatal outcome, and they play no role in death mechanism. However, the contributory cause of death could accelerate the process of death for the negative effects, even though it has no causality with the diseases or injuries leading to death directly.

New demarcation of degree of contribution in death causes

Interactions of death causes

In clinical or forensic practice, an individual death usually results from over one kind of diseases or injuries even with the complications, potential diseases induced by outside factors, medical mistakes or iatrogenic diseases. It is one of the most important tasks for medical examiners to discriminate the interaction and causality of the reticular death causes. The schematic diagram shown in Figure 1 may benefit for us to understand the relations among them correctly.

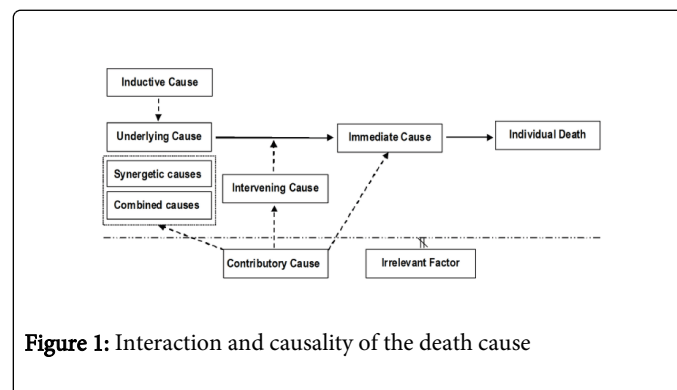


Figure 1: Interaction and causality of the death cause

Demarcation of degree of contribution in death causes

The primary or secondary relation of death causes in death mechanism are discriminated clearly by using the basic medical theories, which could be benefit not only to guide the exact identification of death cause and avoid the mistakes or omission for medical examiners but also to provide the scientific and quantitative evidences for criminal investigation and civil compensation in death cases.

Normura [17] introduced the apportioning causality in compensation of injury in 1969, and Tomio Watanabe et al. [18] in 1980 given a method named degree of contribution which was classified total eleven degrees with interval of 10% from 0% to 100%. Choei Wakasugi et al. [19] in 1994 also put forward a revised edition in which five degrees had been classified with the interval of 25%, and they considered the modulation would be benefit to establish the more equitable and precise assessment system. However, it seemed that the arithmetic sequence of 10% or 25% was more regular and easier to operate in practice, authors think the classified methods were more idealized and mechanized, and they could hardly accord with the actual conditions of death cases. Otherwise, the calculated results with 5% would get the irregular non-integer numbers. Therefore, we

suggested that the actual actions of death causes in death mechanism were of quantitative assessment according to the medical theories, and the regulation of degree of contribution described as Table 1 should be adopted.

Classification	Description	Degree of contribution
Immediate cause of death	It (They) is (are) death mechanism(s) or the final factor(s) as a result of death. Because other death causes, such as underlying cause of death, had shared the one, it's (their) degree of contribution should not be assigned or be zero.	0
Inductive cause of death	It (They) is (are) promoter(s) to induce the potential and fatal diseases, and it (they) should be the tolerant factor(s) (minor injury or mental stimulus, etc.) for the normal person. The factor(s) play(s) the smaller role in death mechanism.	10-20%
Contributory cause of death	It (They) is (are) the factor(s) to promote or accelerate the process of death in some extent, and there is no direct causality with the underlying cause of death. The factor(s) play(s) the indirect role in death mechanism.	20-30%
Intervening cause of death	It (They) is (are) the factor(s) between the underlying cause and immediate cause in the process of death, and the factor(s) play(s) the cohesive and secondary role in death mechanism.	30-40%
Underlying cause of death	It (They) is (are) the initial and crucial factor as a result of death, and the factor(s) play(s) the key and major role in death mechanism.	60-100%
Synergetic cause of death	Anyone of factors could not lead to death separately, but they interact and amplify the pathologic effect and result in the fatal outcome. Therefore, it is hard to discriminate the actions of them in death mechanism, and each factor should share the degree of contribution.	100%/n
Combined cause of death	Anyone of factors could lead to death respectively, and they are the coincidence conditions. Because the factors result in death by separate and different death mechanisms, each of them should add up the degree of contribution respectively.	n×100%
Irrelevant factor	It (They) is (are) the other independent disease(s) or injury(s), and the factor(s) play(s) no role in death mechanism.	0

Notes:

- In one case, the degrees of all factors add up to 100%, and more than two factors should share the total degree according to each contribution.
- For the Intervening / Contributory / Inductive cause of death, multiple Intervening / Contributory / Inductive factors will share equally the degree, if any.
- For the combined cause of death, each factor should match every independent condition or event, and the degree of contribution of each one should be 100%.

Table 1: Classification of death causes and their respective degree of contribution.

Determination of manner of death based on the forensic analysis

Improved method of Determination of MOD

Determining of MOD is another important task in forensic pathology. The final conclusion will determine the nature of the case (suicide? murder? or other manners), and it will also affect directly the subsequent questions of criminal investigation and civil compensation. As for the simple fatal disease or injury, it is easier to determinate the manner of death, and MOD is the circumstances of the accident or violence leading to the individual death. But for the multiple factors related to death, there would be full of conflict and it is more difficult to come to the accordant conclusions.

Based on the classification of death causes and the degree of contribution, authors think the quantitative method should be introduced to determinate MOD scientifically. Because the underlying cause of death is the initial and crucial factor and plays the major role in death mechanism, and its degree of contribution must be more than 50%. The degrees of other death causes such as the contributory cause, inductive cause, intervening cause of death are less than 50%. Theoretically, the circumstances or conditions which produced the underlying cause of death should be regarded as the manner of death, and the decision rules confirm to a preponderance of the evidence of common law system.

It would be specially mentioned that the MOD of synergetic cause of death for the equal degree of contribution is suggested to be judged according to the prior time of circumstances and conditions. However, the one of combined cause of death for 100% degree of each factor is suggested to be judged according to the respective circumstance or condition of each factor. Furthermore, because of no capacity of legal responsibility for decedent, the MOD of combined cause of injury and disease is suggested to ignore the “disease” but to concern the “injury” in decedent.

Redefinition of MOD

As for the definition and classification of MOD, there are many different representations in the different books and articles, such as “The manner of death indicates how death occurred”, “The manner of death explains how the cause of death came about”, etc. [2-6]. The definitions seem ambiguous and inaccurate, and it is hard to determinate the MOD accurately and clearly for the multiple factors involved in death cases, such as injury, disease, toxicosis, medical mistake, and so on. According to the discussion above, the definition of MOD is suggested that “The manner of death is the circumstances or conditions resulting in the underlying cause of death”, and it is divided into eight sorts, a. Natural (including Diseases and Aging); b. Homicide (including Murder, Death of Negligent Injury and Excessive Defense, etc.); c. Suicide; d. Accident or Disaster (including Traffic Accident, Industrial Accident, Medical Negligence, Natural Disaster,

etc.); e. Euthanasia; f. Death Penalty; g. Death of War; h. Undetermined [8-12].

Summary

The conclusions in this article should contribute to comprehend correctly the causality and interaction of the factors, and to clarify the quantitative effects of the factors in death mechanism and their degrees of contribution, and it also could be regarded as the guiding principles to direct the forensic examination. Actually, the quantitative method according to basic medical theories and legal medicine may be considered as the soul of forensic analysis of death causes, and the "Quantitative Legal Medicine" is expected to provide the more scientific and quantitative evidences for the court trial and civil compensation. Especially, it should be pointed out that the theoretical system including the classification and analysis on causes of death is only studied from the view of the basic medicine and legal medicine, and the other actual factors such as the subjective culpability of the mind, nature of case, social influences etc. should enter in consideration in practical court trial. That is to say, legal medical experts are in charge of analysis of the "factual causality", while legal practitioners are in charge of analysis of the "legal causality".

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