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RESEARCH ARTICLE

EXAMINATION OF THE CAUSE OF DEATH DETERMINED AFTER AUTOPSY WITH THE CAUSE OF DEATH DETERMINED BASED ON THE CLINICAL FILE

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ABSTRACT

Background and Objectives: Determining the cause of death is one of the most important diagnosis issued by doctors and lack of enough precision and failure to observe scientific principles can lead to serious legal problems for doctors. Lack of attention to the possibility of apparent death in the diagnosis of death, in addition to causing delay in CPR proceedings, can lead to victims family's complains from doctors and make them face serious problems. This study can examine the cause of death determined after autopsy in dissection hall of Tehran Legal Medicine with the cause of death determined in treatment centers in 2012.

Analysis method: A cross-sectional study was designed where data collection tools consisted of two parts: first part consisted of clinical information available in 4641 death files referred from health centers to the center of Tehran Legal Medicine as well as the cause of death based on the results of statistical program were provided.

Findings: The highest percentage of non-identical cause of death is related to internal specialists with 47% and the lowest percentage of non-identical cause of death is related to neurosurgery specialists with 2%.

Conclusion: The causes of death were different in many ways, based on the results it is suggest that a process be designed according to statistic of significantly incorrect diagnosis so that doctors can be informed of the results of autopsy and determination of final cause of death of their patients in order to have more accurate clinical diagnosis in case of facing with similar patients.

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INTRODUCTION

Causes of death recorded in death certificates is reference of a lot of data and information which is used by the Ministry of Health and Medical Education, insurance organizations, researchers in epidemiology and international health organizations. The other hand death certificate can be used as important evidence for defense in courts (Rodríguez *et al*., 2005). Due to the fact that statistical studies and researches about this title have been limited and weak and in some cases incomplete, so it seems that this study will be useful and helpful. The issue which is being studied can include the following and also the fact that it is the right of victim's family to ask the cause of death from their doctor that arguably the relatives of the deceased have the right to demand the cause of death and the doctor cannot refuse to perform this task unless there is legal restriction on the cause of death (Sauku Pekka and Knight Bernard, 2016). How can we determine the cause of death? The cause of death can be determined in several ways but in all cases it is important that naturalness of death be announced without any doubt and with absolute certainty. Remember that you can do whatever you want due to being doctor but in the end you should be held accountable for your actions. Determining the cause of death can be done using very detailed information and benefiting from autopsy and based on documented evidence of hospital or by using incomplete and limited information such as old records, family information, examination of body and absence of unusual symptoms and so on. Another important issue on the assignment and allocation of cause of death is mentioning some irrelevant factors or codes (Ong *et al*., 2002). Other concepts that can be useful in topic of thanatology in connection with the issuance of death are: 1.Mode of death 2. Cause of death

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3.Manner of death. Familiarity with three above concepts is extremely necessary in time of issuing the cause of death and imprecision about their meaning and concepts and applying interchangeably are among the basic problems in time of issuing the cause of death (Shkrum Michael *et al*., 2007).

Mode of death

Mode of death is a pathophysiologic state that exists in time of death and patient dies with that pathophysiology. Although the cause of death are numerous but the pathophysiology of people in time of death are a handful. From modes of death, Heart failure, DIC, ARDS, bleeding and hypovolemia, cardiac arrhythmia, heart failure, respiratory failure and etc. can be mentioned. Usually the person dies in the presence of one or two of the above-mentioned physiological factors no matter what the cause of death is. It is clear that different causes can lead to one single pathophysiologic state and lead to death with that mode (Shojania *et al*., 2002).

Cause of death

The twelfth meeting of World Health Organization in 1967 has defined the causes of death in order to record in certificate of death cause in this way: The cause of death is all diseases and conditions of ill health and injuries that resulted in death or have contributed to its occurrence. This definition also contains conditions of occurrence of accidents or violence. In other words, cause of death is a factor that leads to death immediately after the occurrence or by creating a chain of events or pathophysiologic changes. It is clear that the cause of death is at the beginning of this chain and remaining cases will not occur by removing it (Rodríguez *et al*., 2005).

Manner of death

Manner of death is conditions that cause of death takes shape in and leads to death followed by mode of death. Conditions of creating cause of death may be a natural factor or an accident or a suicide or murder. It is clear that doctors will determine the cause of death if they ensure that it has been natural. Diagnosis of death being an accident, suicide or murder is from the duties of forensics and the judicial system. All of the deaths with unknown or abnormal cause of death must be referred to Legal Medicine (Ong *et al*., 2002). Medical knowledge is divided into five sections in Avesta, one of whom was medical examiner, a doctor who issued the death certificate and the mummified bodies, performed autopsy in order to clarify the cause of death and in this way had a significant role in advancing medical knowledge. Death usually reported to the judicial authorities if the treating doctor cannot issue a death certificate and the body will be autopsied to determine the cause of death. In cases where the treating doctor issues death certificate, issue wrong diagnosis of the cause of death in 25 to 50 percent of cases. In some countries, most cases of forensic autopsies are related to natural death For example, in England and Wales 80% of cases of coronary autopsies have been related to natural death and other cases are suicide, accident and crime (Veress and Alafuzoff, 1994).

METHODOLOGY

1. **Study Type:** a cross-sectional descriptive study was conducted
2. **Data collection method:** examination of hospital records and autopsy results available in Legal Medicine Organization in the bodies that have been autopsied during 2012. The data collection tool was researcher-made questionnaire.
3. **The population under study:** All cases referred to dissection hall of Tehran Legal Medicine by treatment centers whom have died for any reason.
4. **Exclusion criteria:** Lack of clinical files and clinical records in some autopsy files and the possibility of incomplete records in files, that in this case, the deceased will be excluded from the study.
5. **Methods of data analysis:** analyze was carried out using 21 SPSS software and also chi-square test was used for statistical analysis to determine the compliance between the forensic report and other centers.
6. **Ethical considerations:** 1.Doctors' names remained confidential 2.Names of the bodies remained confidential 3. All personal and clinical information is kept confidential.

Findings

A. Research data were provided using descriptive statistics. The research was conducted on 4641 individuals that 37% of them aged less than 40 and 27.4% aged between 60-41 years, and finally 36.6% of them aged over 60 years. 73.8% of deaths were related to men and 26.2%of them were related to women. Results showed that determined cause of death in treatment centers had compliance with forensics in 68.2% of cases and did not have compliance in 31.8% of cases. In cases, the actual amount of its confidence interval with 95% confidence estimated the degree of homology from minimum of 30.5 to 33.1 percent.

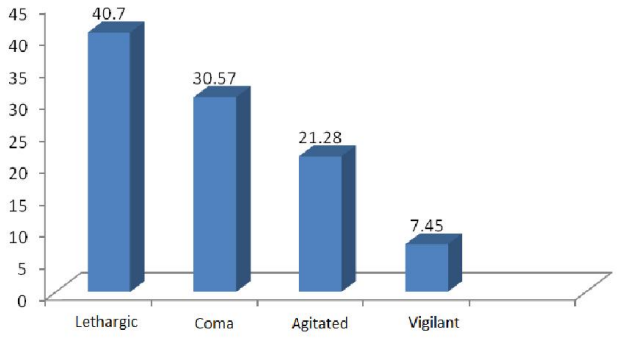

Figure 1. Distribution of 4641 individuals examined based on the level of consciousness

According to the above table, the cause of death in all referred bodies after autopsy is related to internal diseases which has allocated the highest percentage (24.6) and also general surgery with (22.2) percent has the highest percentage of after Internal diseases and poisoning is after surgery problems with 13.9 percent.

Table 1. Frequency distribution and percent of the bodies referred from treatment centers in terms of causes of death in studied group

Initial diagnosis of hospital	Frequency	Percent
Poisoning	645	13.9
Internal diseases	1142	24.6
Cardiovascular problems	491	10.6
Lung problems	105	2.3
Surgical complications	143	3.1
infectious diseases	285	6.1
others	428	9.2
Neurosurgery	97	2
Accidents	251	5
General surgery	1031	22.2
Unknown	23	0.4
total	4641	100

Table 2. Frequency distribution and percent of all referred bodies in terms of the expertise of doctors in hospitals in studied group

Determining cause of death according to expertise of doctors	Frequency	Percent
General Practitioner	370	8
Anesthesiologist	1340	29
Surgeon General	426	9
Emergency Medicine	219	5
Internal Medicine Specialist	2200	47
Neurosurgery	86	2
total	4641	100

B. Inferential statistics

Chi-square tests was used in order to examine the similarity of observed frequency of cause of death by general practitioners in 2012 with the frequency of cause of death determined after the autopsy in Tehran's anatomy hall. Cause of death determined by general practitioners in 2012 was 370 individuals among which 323 have diagnosed correct cause of death and 47 have diagnosed incorrect cause of death. Chi-square test for compliance ratio showed that frequency of determining the correct cause of death (323) and incorrect determination of cause of death (47) have no compliance compared with the expected value (50%) $\{X^2(1, N=370) =205.881, P<0.05\}$. Cause of death determined by specialists in emergency medicine in 2012 was 219 individuals among which 158 have diagnosed correct cause of death and 61 have diagnosed incorrect cause of death. Cause of death determined by anesthesiologists in 2012 was 1340 individuals among which 928 have diagnosed correct cause of death and 412 have diagnosed incorrect cause of death. Chi-square test for compliance ratio showed that frequency of determining the correct cause of death (928) and incorrect determination of cause of death (412) have no compliance compared with the expected value (50%) $\{X^2(1, N=1340) =198.699, P<0.05\}$. Cause of death determined by Internal Medicine Specialists in 2012 was 2200 individuals among which 1361 have diagnosed correct cause of death and 839 have diagnosed incorrect cause of death. Chi-square test for compliance ratio showed that frequency of determining the correct cause of death (1361) and incorrect determination of cause of death (839) have no compliance compared with the expected value (50%) $\{X^2(1, N=2200) =123.856, P<0.05\}$. Cause of death determined by Neurosurgery specialists in 2012 was 86 individuals among which 73 have diagnosed correct cause of death and 13 have diagnosed incorrect cause of death. Chi-square test for compliance ratio showed that frequency of determining the correct cause of death (73) and incorrect determination of cause of death (13) have no compliance compared with the expected value (50%) $\{X^2(1, N=86) =41.860, P<0.05\}$. Chi-square test for compliance ratio of two above mentioned groups showed that frequency of determining the correct cause of and incorrect determination of cause of death have no compliance compared with the expected value (50%) $\{X^2(1, N=2200) =123.856, P<0.05\}$.

DISCUSSION AND CONCLUSION

Research has shown that consistency of results of hospitals with forensic was in 68.2% of cases and non-compliance was in 31.8% of cases that this average level (25%) of wrong diagnosis before death is in the expected level based on other reported studies (Esteban *et al*., 2004; Leitao *et al*., 2014). Various statistics and reports about the amount of difference between clinical diagnosis and autopsy results have been published in the world that this amount has been varied from 5 to 40% (Cristina Basso *et al*., 2001; Pumphery Richard and Roberts Ian, 2000). It is difficult to assess results of the study due to Factors such as poisoning service, referring a high percentage of patients with a decreased level of consciousness due to the unknown cause and the possibility of poisoning with illegal substances and the lack of diagnostic and laboratory features. Patient disability due to loss of consciousness from drowsiness to coma has been among other causes of confusion in diagnosis in this study. Background of comorbidities chronic disease and referral with unusual symptoms are among the factors that create distribution in correct diagnosis or timely diagnosis (Tejerina Eva *et al*., 2010; Torgersen *et al*., 2009). Another reason for the lack of proper and timely diagnosis is patient getting ill quickly, or not enough time to diagnosis which has been referred to in most of the studies. Different reports about the relation between length of hospitalization and the lack of compatibility of clinical diagnosis and autopsy results can be observed in different studies. There are a variety of reports about error increase in diagnosis in a shorter length of hospitalization. There are also studies about lack of relation between lengths of hospitalization and the lack of compatibility of clinical diagnosis and autopsy results. Although in this study most contradicts in diagnosis were in patients with more than 72 hours of hospitalization time. With respect to medical actions and interferes and increased duration of hospitalization in the case of poisoning that not only leads to metabolize and excretion of drugs and materials from the body, but also the effects and side effects of drugs and materials (illegal and chemical) on different organs will lead to new problems and thus autopsy findings will be inconsistent with the clinical diagnosis. On the other hand undetermined cases were in patients who were hospitalized for less than one hour, this shows the inadequacy of time for review and appropriate diagnostic procedures. Clinical error percentage in this report was completely different compared to other global studies with regard to mistakes in diagnosis and detection of unknown. The difference in the results of studies depend not only on the type of treatment center but also on opinion of therapist for requesting autopsy in his selection in referral of deceased case to determine the exact cause of death. To avoid these errors,

patient must be examined with an open and accurate state of mind and inadequate measures must be prevented. Meanwhile hospital system and primary and emergency measures have special importance. In addition existing facilities, power of clinical judgment in the diagnosis and treatment is always the most decisive factor (Leitao *et al*., 2014; Sankar *et al*., 2006). The purpose of autopsy is not only unraveling the medical errors or judging them but rather, it is important to learn from these errors and convert weaknesses into strength. Since treatment is based on clinical observations, weaknesses in clinical diagnosis and only requesting experiments and other laboratory measures not only in economic terms is not effective for patients and society but also in many cases will lead to diagnostic errors which can be irreversible and irrecoverable. The limitations observed in this study are a retrospective study in type of follow-up diagnostic studies could not be carried out, variations in laboratory findings affects the diagnosis, length of hospitalization of patients was among factors affecting diagnosis which has not been enough for conclusion in many cases and the most important limitation was related to the number of studied deaths for more accurate assessment in examination of conflict between and determining the cause of death in the autopsy. Overall, this study shows an obvious contradiction between the final clinical diagnosis at the time life and autopsy results after death even in academic training centers. This study shows the importance autopsy to determine the cause of death. Inconsistent of the clinical diagnosis and autopsy results do not mean failure but rather it is a good educational tool which needs to be considered to improve patient care and reduce the number of undiagnosed cases. Determining false definite in clinical diagnosis is not in the scope of this study and requires broader studies. But the results showed that the most common cause of difference between clinical diagnosis and autopsy results is mental diagnosis and not a diagnosis based on clinical findings. Other causes are failure to assess signs and symptoms or providing unusual symptoms of unknown biographies or mistakes, especially in patients with decreased level of consciousness, time-consuming diagnostic tests or receiving results with delay and disregard for keeping track of experimental answer.

Selecting deceased case by treating doctor (Failure to diagnose or doubt about diagnose of a cause of a disease and determining the cause of death) for referral to the forensic is another part of this issue. Another reason for misdiagnosis is rapid course of disease progression during hospitalization but examination in just one center cannot be a reliable assessment. Results of this study show that despite the suitable diagnostic diversity (modalities) of study after death, determines the difference between the diagnosis before death and after it. Moreover, documentaries and sources in the past several decades have stated that Postmortem studies are a useful tool for clinical and pathological correlation and it is necessary for to review the lessons learned bedside patient. Inattention to these lessons may cause negative consequences for young doctors (Esteban *et al*., 2004; Tejerina *et al*., 2010).

Correct diagnosis may be difficult in some cases, for example, when symptoms are brief or unusual at the time of referral or in the case comorbidities of disease or multi-drug consumption in poisonings. On the other hand, events leading to the deaths that occur shortly before death make diagnosis difficult. Selecting deceased for autopsy is more a reflection of therapist's selection which is due to lack of confidence in diagnosis or failure of his diagnosis. However, equipping hospitals with facilities and up to date diagnostic equipment will increase confidence in the validity of the therapist's diagnosis but accurate diagnosis appears to be still difficult in some cases. Considering the lack of information about the results diagnosed in patients transferred from other centers, it can be said that confidence in clinical diagnosis does not have a high relation with its accuracy. According to current laws and regulations, referral of all deceased due to or with the possibility of diagnosed or undiagnosed poisoning is mandatory for autopsy that this leads to bias in the selection of other types of clinical death (Ferguson *et al*., 2005; Tejerina Eva *et al*., 2010). The failure to determine the cause of death in autopsy with precise and enough technique is 1 to 5 percent although in some reports there have been higher statistics about inability to determine the cause of death with autopsy, especially in perinatal deaths.

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