

Deontological examination as a criterion for the assessment of personal healthcare professional quality

A Strobe compliant retrospective study

Sandra Mazeikiene, MSc, Jurgita Stasiuniene, PhD, Diana Vasiljevaite, MSc, Sigitas Laima, PhD, Sigitas Chmieliauskas, PhD*, Dmitrij Fomin, MSc, Rokas Simakauskas, MSc, Algimantas Jasulaitis, PhD

Abstract

Discrepancies between clinical and autopsy diagnoses range from 30% to 37%. The significance of deontological examinations remains high. In the pursuit of proper evaluation of diagnostic discrepancies, the establishment of pathogenesis, the mechanism of death, and a correct diagnosis are of particular importance.

A retrospective study of deontological examinations, aimed at the detection of medical errors and carried out by the State Forensic Medicine Service during the period 1989 to 2016, was performed. The clinical and autopsy data from 1007 cases were collected in compliance with the research protocol.

The number of deontological examinations tends to increase. In 60% of cases, the deceased were men. Most cases were in the age group of 50 to 59 years. Most examinations were carried out in relation to improperly provided healthcare services and the patient's death in surgery, admission, intensive care and obstetrics-gynecology departments. In 13% of cases, the diagnosis did not coincide and, in 79% of cases, the diagnoses fully coincided. In 68% of cases, the medical error was disproved.

The number of deontological examinations is increasing. In most cases, clinical and autopsy diagnoses fully matched. Incorrectly clinically diagnosed intracranial injuries were the most common diagnostic mistakes. The data are similar to the results of research in other countries and would be relevant to ensuring the prevention of medical mistakes and the improvement of healthcare quality.

Abbreviation: EU = European Union.

Keywords: deontological examination, discrepancies, final diagnosis, forensic science, medical error, medical malpractice

1. Introduction

The healthcare system is rapidly changing in a constantly changing world. Advanced diagnostic and treatment methods, preventive care, increasingly sophisticated thinking of young physicians make healthcare services more accessible to everyone. Nevertheless, the novelties and increasing workload of physicians, pace, and stress have led to a higher number of medical

errors and more frequent misunderstandings between the physician and the patient. Deontological examinations are of significant importance in seeking to find out the relevance of the provided services and appropriateness of medical treatment. In the age of enlightenment, not only the medical practitioner's liability for mistakes was addressed, but also the legal liability doctrine, and the rules for determining the liability were particularly clearly developed. The first attempts to define proper medical practice and the most typical medical mistakes were recorded in the scripts of John Cotta (16th century).^[1-3] The term "deontology," which is of Ancient Greek origin (δέον, *déon*, "duty, obligation"; -λογία, *-logia*, "science"), denominates the theory of ethics stating that any action by itself can be regarded as right or wrong, no matter the consequences. In other words, deontology is the science of mandatory behavior. The author of the term is the English moralist D. Bentham (J. Bentham, 1749–1832).^[4] In recent years, the issues which were purely deontological have been resolved in legal terms, that is, the moral regulation of the actions of medical staff has become legal.^[5-7] Patients more often rebuke physicians for their mistakes, for infringements of the rules of medical treatment. The term "physician mistake" which was common earlier has been partially replaced with the term "medical mistake."^[3]

For the purpose of determining the medical mistakes, experts are invoked. In order to properly establish the diagnosis, the genesis of the disease, the cause of death, and the mechanism of death must be accurately determined. Diagnoses must be unified, meet the formulation and coding rules. Having completed the examination, the forensic medical examiners must compare the

Editor: Sergio Gonzalez Bombardiere.

The authors have no funding and conflicts of interest to disclose.

Department of Pathology, Forensic Medicine and Pharmacology, Institute of Biomedical Sciences of the Faculty of Medicine of Vilnius University, Vilnius, Lithuania.

* Correspondence: Sigitas Chmieliauskas, Department of Pathology, Forensic Medicine and Pharmacology, Institute of Biomedical Sciences, Faculty of Medicine, Vilnius University, Vilnius, M. K. Ciurlionio str. 21/27, Lithuania (e-mail: sigitas.chmieliauskas@mf.vu.lt).

Copyright © 2020 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial License 4.0 (CCBY-NC), where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.

How to cite this article: Mazeikiene S, Stasiuniene J, Vasiljevaite D, Laima S, Chmieliauskas S, Fomin D, Simakauskas R, Jasulaitis A. Deontological examination as a criterion for the assessment of personal healthcare professional quality: A Strobe – compliant retrospective study. *Medicine* 2020;99:3(e18770).

Received: 2 August 2019 / Received in final form: 3 December 2019 / Accepted: 11 December 2019

<http://dx.doi.org/10.1097/MD.00000000000018770>

clinical and autopsy diagnosis by 3 separate points: underlying cause of death; complications; concomitant diseases/conditions. A discrepancy between the diagnoses is deemed to be a material discrepancy if any of the nosologically units of the diagnosis in terms of location, etiology, nature of the pathological process, and delayed and untimely diagnostics of the major disease or injury. According to the literature data, discrepancies between clinical and autopsy diagnosis range, on average, from 30% to 37%. The significance of deontological examinations is still high and autopsy is deemed to be the criterion standard for the establishment of final diagnosis, allowing to improve clinical diagnostics and formulate the correct clinical diagnoses.^[1,2] This study is aimed at reviewing the collected data concerning the deontological examinations carried out by the State Forensic Medicine Service during the period of 1989 to 2016, comparing them with earlier research in Lithuania and abroad.

2. Methods

2.1. Study design and data source

The deontological examinations aimed at detecting medical mistakes and carried out in the State Forensic Medicine Service during the period of 1989 to 2016 were analyzed. The research was designed as a retrospective cohort study and was approved by the Vilnius Regional Biomedical Research Ethics Committee. An informed consent was signed by the research subjects' representatives. Additional data were collected from the central health e-database of Lithuania (www.esveikata.lt). A review of the literature sources concerning deontological examinations was carried out.

2.2. Identification of cases

The cases meeting the deontological examination criteria as set out below were included:

1. The cases concerning breaches of the professional activities or crimes committed by medical staff;
2. A commission of forensic science experts and physicians-practitioners is formed for the purposes of analyzing the expert examination;
3. The expert examination specifies the circumstances in which the health impairment or death of the patient has occurred;
4. The expert examination was assigned by a court or pretrial officers.

The data were collected from the archive of the State Forensic Medicine Service according to the research protocol. The data collected for the study were place of the incident, specialty of the medical personnel involved, time of the incident, time of the deontological examination, gender and age of the victim, clinical and autopsy diagnosis, reasons for ordering the deontological examination, composition of the expert commission, and number of questions.

All clinical and forensic pathological diagnoses were coded by ICD-10-CM codes. The first letter and the first 2 numbers of the ICD-10-CM diagnosis code were evaluated. If the first letter of the ICD-10-CM code of clinical and autopsy diagnoses was different (a separate nosologically unit), it was considered a complete mismatch of the diagnoses. If the first letter of the ICD-10-CM code of clinical and autopsy diagnoses was the same, but the first 2 numbers were different, it was considered a partial mismatch. If the first letter of the ICD-10-CM code and the first

2 numbers of the clinical and autopsy diagnoses were the same, it was considered a complete match of the diagnoses.

2.3. Statistical analysis

Statistical analysis package "R" was used for the data processing. The statistically significant differences between the 2 groups were established by means of the nonparametric test Mann-Whitney-Wilcoxon with a 95% level of confidence. The afore-mentioned test was chosen because data distribution was abnormal. The criterion also minimizes the likelihood of errors of the first type and the second type, that is, does not allow to accept a false hypothesis or to dismiss the right hypothesis. The calculated value of the criterion P suggests a statistically significant difference if P is $<.05$. The statistically relevant trends were evaluated by the Pearson correlation coefficient test with a 95% level of confidence. The afore-mentioned coefficient was chosen because it verifies the linear characteristics in a sufficiently informative manner.

3. Results

The total number of deontological examinations in the period 1989 to 2016 was 1007. The data provided in the first diagram (Fig. 1) suggest that the total number of deontological examinations per year tends to increase. The majority of cases for which deontological examinations were ordered occurred after 1995. The number of cases per year was increasing markedly until 2002. The highest number of deontological examinations was in 2011 (73 cases).

In 60% ($n=600$) of cases the victims were men and in 40% ($n=407$) – female. A more thorough analysis of the distribution of deontological examinations by sex in each year (Fig. 2) has shown that in all year's male victims were the majority, except for the year 1992, 1996, and 2010, when the number of female victims was higher. The proportion of men was higher in the year 2000 ($P=.033$). In other years, the portion of the examined persons did not significantly differ in terms of sex ($P>.05$).

A total of 985 cases were divided into age groups in terms of the age of the victim at the moment of the incident (Fig. 3). In 22 cases, the age of the victim was not indicated. The distribution of deontological examinations by the age of the male and female subjects was different nearly in all years and, only in certain age groups, the distribution was similar: 7- to 18-year age group, 30- to 39-year age group, and ≥ 70 -year age group. Furthermore, it is evident that the highest number of men was in 50- to 59-year age group, that is, 96 cases ($P=.004$). The lowest number of established cases was in 1 to 2 and 3 to 6 age groups (12 and 16 cases, respectively). The highest number of female victims was in 30- to 39-year age group, that is, 70 cases ($P=.016$). The lowest number of female victims was in 1- to 2-year age group (4 cases), whereas the number of victims in 3- to 6-year age group was slightly higher (8 cases).

Evaluation of the number of victims by age and comparison of the distribution of patients by age with the overall structure of age of the Lithuanian population suggests that the proportions of persons aged 1 year and over meet the overall structure of the population (correlation $r=0.53$, $P<.001$). The portion of persons younger than 1 year of age among the subjects is higher than the portion in the Lithuanian population ($P<.001$). The average age of victims has increased over the study period ($P=.002$). The age growth trend has been observed, that is, 0.56 year on an annual basis.

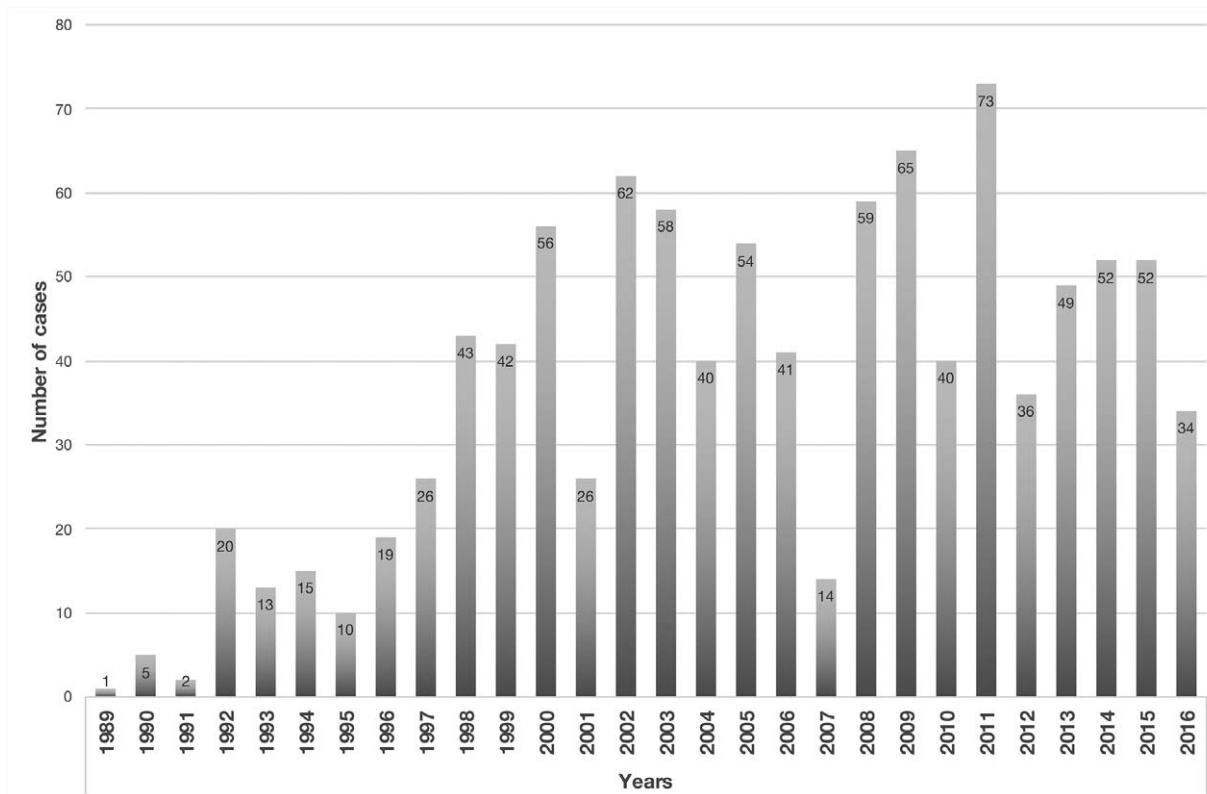


Figure 1. Distribution of deontological examinations by the year of incident.

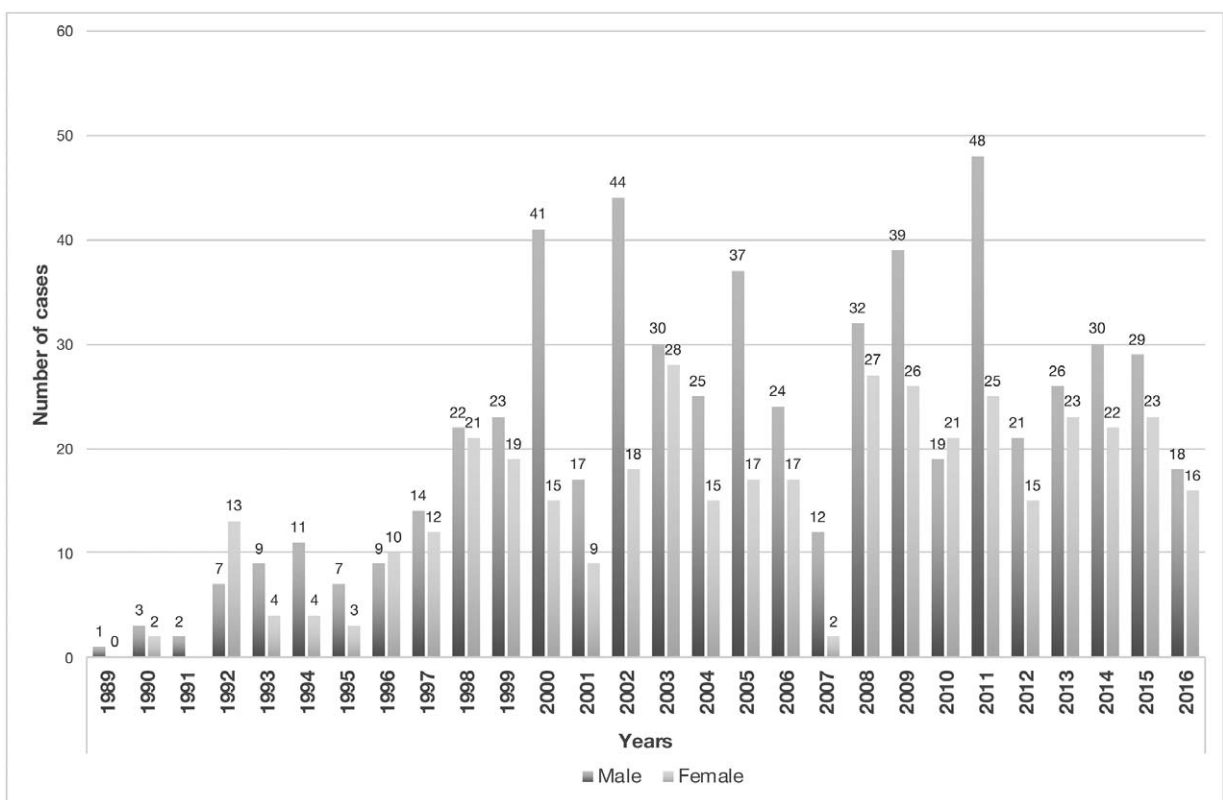


Figure 2. Distribution of the victims by sex in each analyzed year.

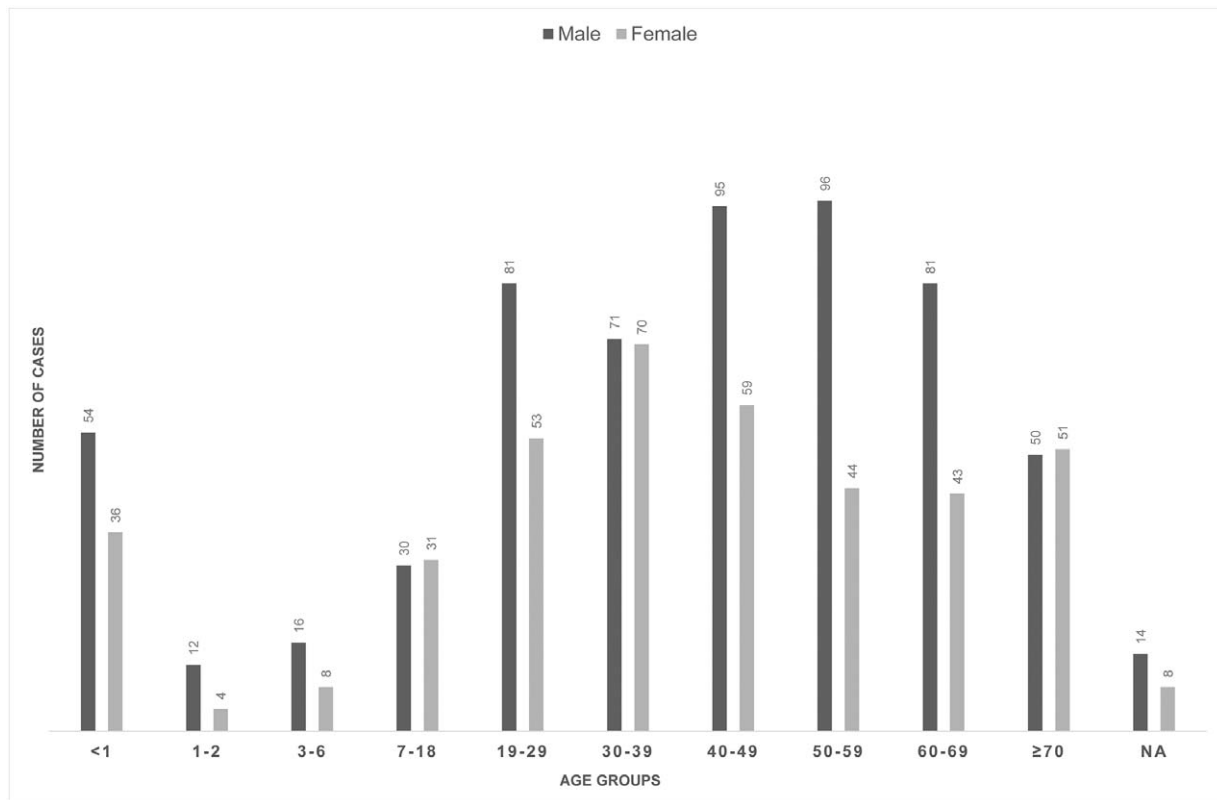


Figure 3. Distribution of deontological examinations by sex and age groups.

The specialty of medical practitioners for whose healthcare services the deontological examinations were assigned was determined. In 141 cases, the specialty was not indicated. In the majority of cases, deontological examinations were carried out in relation to the services provided by general surgeons, that is, 151 cases; obstetricians-gynecologists – 122 cases; trauma surgeons – 90 cases; intensive care physicians – 76 cases; neurosurgeons – 75 cases; and general medicine physicians – 65 cases. The numbers of deontological examinations in relation to the services provided by medical practitioners of other specialties were lower and the differences were not significant. The breakdown of cases by sex has revealed that, in the majority of cases, deontological examinations for male victims were assigned in relation to the services provided by surgeons ($P=.002$) and neurosurgeons and general medicine physicians ($P<.001$); deontological examinations for female victims were assigned in relation to the services provided by obstetricians-gynecologists ($P<.001$). The expert examination for persons younger than 1 year of age was most commonly assigned for the services provided by obstetricians-gynecologists ($P<.001$). Deontological examinations for patients aged 1 to 18 years were mainly assigned in relation to the services provided by obstetricians-gynecologists ($P=.002$). Deontological examinations for patients aged 70 years and older were mainly assigned in relation to the services provided by general surgeons ($P=.026$) and trauma surgeons ($P=.002$). The analysis of the distribution of deontological examinations by the department in which the cases in question emerged suggests that the highest number of cases emerged in surgery departments, that is, 154 cases, in admission departments – 133 cases, and in intensive care departments – 123 cases. The

number of cases in obstetrics and gynecology departments was slightly lower, that is, 105 cases. Such a high number of cases in the afore-mentioned departments could be linked to a high flow of patients and great expectations from their relatives.

The institutions in respect of the specialists of which deontological examinations were assigned were analyzed during the research. Inpatient services were provided in 855 cases, whereas only outpatient services were provided in 125 cases.

Deontological examinations in relation to the provided outpatient services were more often assigned for female victims ($P=.001$). Deontological examinations for inpatient treatment were more often assigned for young persons (younger than 1 year) and persons older than 70 years ($P=.003$).

During this research, distribution of deontological examinations by the outcome of the provided healthcare services was analyzed. In 715 cases (71%), the expert examination was assigned in relation to death of the patients, whereas in 292 cases (29%) the victims were discharged from health institutions. The patients who died were more usually men, that is, 475 (66.43%). Female patients were more commonly discharged from health institutions, that is, 167 (57.20%), ($P<.001$). The number of deaths in the 3 age groups of victims who were of age 30 years and older, that is, 30 to 39 years, 40 to 49 years, and 50 to 59 years, was similar (97, 97, and 95 cases, respectively). It has been determined that the lowest number of deaths was in 1- to 2-year age group (14 cases). In 72 cases of death, the patients were younger than 1 year. The highest number of victims who were discharged from health institutions was in the age groups of 19 to 29 years and 40 to 49 years, that is, 53 and 57 cases, respectively. In 2 cases deontological examination was ordered in relation to

children aged 1 to 2 years who were treated and discharged from health institutions.

The analysis of the reasons for assignment of a deontological examination (all cases including the cases where more than 1 option was marked were examined) suggests that in the majority of cases, that is, in 928 cases, a deontological examination was assigned in relation to improperly provided healthcare services; in 665 cases – in relation to the death of a patient in the course of treatment; in 85 cases – in relation to the establishment of health impairment; in 7 cases – in the event of any doubts for the diagnosis made in a primary health institution and discrepancy of expert cases, in diagnosis or correction of diagnosis; in 3 cases – in relation to the accuracy of determination of the scope of the health impairment (expert examination); and in 4 cases – for other reasons (discrepancies of the mechanism and time of causing injuries in expert conclusions). Deontological examinations for female victims were more often assigned in relation to health impairment ($P < .001$). Deontological examinations for male victims were more often assigned for the death of a patient in the course of treatment ($P = .017$). An expert examination in relation to health impairment was more often assigned to younger persons (younger than 40 years) ($P = .015$).

Examination of the number of experts and medical practitioners within the deontological examination commission suggests that in 769 cases, 2 forensic medicine experts were involved; in 194 cases, 1 expert was involved; and in 44 cases, 3 experts were involved. The number of medical practitioners invited to deontological examination commissions ranged from 1 to 6. In 481 cases, 1 medical practitioner was involved; in 318 cases – 2 medical practitioners; in 113 cases – 3 medical practitioners; in 38 cases – 4 medical practitioners; in 8 cases – 5 medical practitioners; and in 1 case – 6 medical practitioners. In 3

cases the number of involved specialists was not indicated. As for distribution by the specialists who were mainly involved in deontological examination commissions, the following specialists were most commonly involved: intensive care physicians (161 cases), neurosurgeons (158 cases), obstetricians-gynecologists (consulted in 157 cases), and trauma surgeons (123 cases). The specialty of the medical practitioners in the deontological examination commission correlates with the professional specialty of the accused physicians.

The number of cases by coincidence of the diagnoses made during deontological examinations and diagnoses made by the physicians who provided healthcare services is distributed as follows: in 79% of cases, the diagnoses coincided, in 13% of cases, the diagnoses did not coincide, and in 7% of cases, the diagnoses partially coincided. In 1% of cases, coincidence of the diagnoses could not be determined due to lack of data provided for the deontological examination.

In 129 cases of diagnosis discrepancies (13%), the most common discrepancies were incorrectly clinically diagnosed intracranial injuries (22 cases); superficial head injuries, head wounds, fractures of the bones of the skull and face, and unspecified intracranial injuries. The most common undiagnosed diseases and injuries were subdural hemorrhage – 10 cases; subarachnoid hemorrhage – 2 cases; epidural hemorrhage – 1 case; purulent meningitis – 2 cases; chest injuries with damage to internal organs – 2 cases; and polytrauma (multiple body injuries) – 1 case.

Figure 4 shows that in 68% of cases of 1007 deontological examinations carried out during the period of 1989 to 2016, the physicians' fault was disproved. During the research, it was noted that the amount of cases when the medical mistake was disproven/not supported has increased ($P < .001$). There is a growing trend of such cases, that is, 1.75 per year.

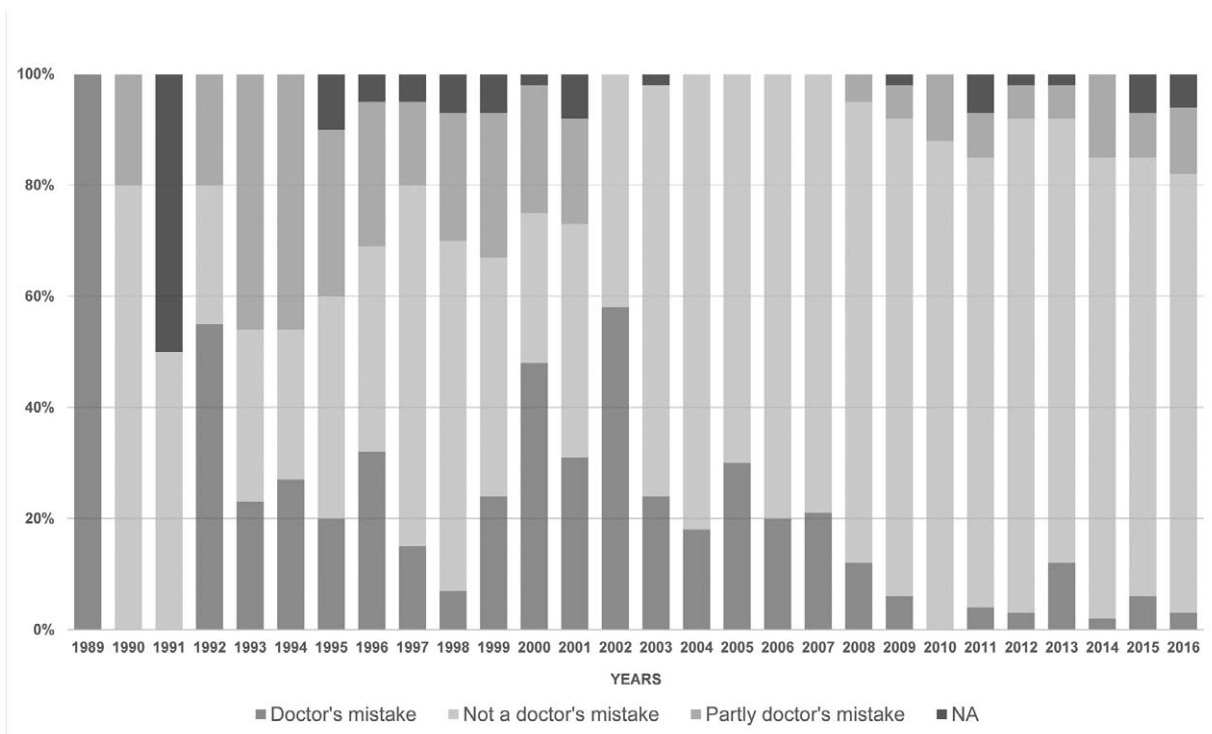


Figure 4. Findings of the deontological examinations presented during the period of 1989 to 2016.

4. Discussion

In Lithuania, a similar research was carried out in 1989 to 1991. The clinical and autopsy data were compared. In total, 1474 patients (aged 0–101 years) who died in an inpatient facility and not in hospital (at home, in the street, at the workplace, and in other places) were examined. The diagnosis of the underlying cause of death and the autopsy did not match: in cases of persons who died from cardiovascular diseases – 35.3% (n=117); tumors – 26.5% (n=49); fatal complication – 41.1% (n=194); and associated diseases and morbid conditions – 64.9% (mainly chronic bronchitis and ischemic heart disease). The most significant diagnostic mistakes which had an impact on lethal outcome were undiagnosed pneumonia and pulmonary artery embolism). The number of diagnostic discrepancies increased with the age of the subjects.^[8]

In 2005, the Health and Consumers Directorate General of the European Commission carried out a research aimed at explaining the most common mistakes made by the medical staff, the experience of patients and their trust in healthcare institutions and specialists in the European Union (EU) Member States and candidate countries.^[9] The countries in which the majority of the population perceives medical mistakes as a particularly serious problem were Italy (97% of the population), Poland (91%), and Lithuania (90%). According to public opinion, the percentage of medical mistakes in the hospitals of Lithuania is 26%, whereas the percentage of improper medical treatment is 16%.^[9] The review of the afore-mentioned EU research suggests that Lithuania is one of the countries characterized by the greatest mistrust in the national healthcare system and its employees among the EU Member States by the majority of criteria.

Medical mistakes are partly evidenced by the number of adverse events. The adverse event is an event which has occurred as a result of the activity which could cause or cause an adverse outcome (result), rather than for the reasons attributable to provision and organization of medical aid than for the disease or condition of the patient. Generally, an adverse event is caused not by 1 factor but by the interaction of a lot of circumstances and events.^[10] In Lithuania, adverse events are recorded by the Institute of Hygiene. In 2017, the total number of registered adverse events was 890 (except for the diagnosed hospital infections), 1.2 times higher than in 2016. The most common reports on adverse events are related to the use of pharmaceutical products, that is, 861.

The situation regarding discrepancies between clinical diagnoses and autopsy diagnoses in Lithuania does not differ substantially from the results of various researches carried out in foreign countries. Researches are carried out with the aim of finding out what diagnosis discrepancies are most frequent and the reasons for such discrepancies, because medical mistakes are very common and have become a major problem worldwide. For example, a retrospective analysis of 288 cases of death at the University Hospital in Brazil (San Paulo) suggests that, in 241 cases (84%), diagnoses matched and, in 47 cases (16%), diagnoses did not match. A similar research carried out in Greece, which included 252 random cases of adult deaths has revealed that diagnostic discrepancies occurred in 45 cases (19%). The most frequent diagnostic discrepancies were related to ischemic heart disease and pulmonary artery thromboembolism.^[11,12] Another study in Spain (53 patients) suggests that, in 37% cases, clinical and autopsy diagnosis did not match and the

most common discrepancies were related to respiratory failure and pulmonary artery thromboembolism.^[13] In order to determine the development of discrepancies between clinical and autopsy diagnosis in the long term, the data of 591 autopsies carried out during the period of 1947 to 2010 in India were analyzed. In 137 cases (23.18%), diagnostic discrepancies were noted and a statistically significant decrease in the number of cases of discrepancies between clinical and autopsy diagnoses was noted.^[14] A comparative study was also carried out in the Netherlands (Symbian Post-Mortem Examination Centre) where the results of autopsies (2007–2012/2013) were classified according to the diagnostic discrepancies between the underlying cause of death and concomitant diseases. The findings suggest that the discrepancies between the underlying causes of death were established in 23.5% of cases, the associated disease diagnosis discrepancies were established in 32.6% cases. Between 2007 and 2012/2013, the number of associated disease diagnosis discrepancies has increased from 26.8% to 39.3%.^[15] According to a study published in *Patient Safety* (2013), >300,000 patients die as a result of doctor mistakes every year in the United States.^[16] In the same year, 4 studies during which medical records of 34 million hospitalized patients were examined were carried out and, in 21% of cases, medical treatment mistakes were established including 2% of medical mistakes which were fatal for the patients.^[17] Nevertheless, according to the data of the most recent research carried out in 2015 in the United States (Mayo Clinic), the number of medical mistakes has decreased. Furthermore, a decrease in the diagnostic discrepancies has been noted in Switzerland where, according to a study in Zurich University Hospital in 2002, the number of diagnostic discrepancies has decreased from 16% to 2%.^[18]

5. Conclusion

Lithuania is not distinguishable among other countries in terms of the rate of medical mistakes. The number of deontological examinations tends to increase. Deontological examinations are more commonly ordered in cases when the victim is 40- to 69-year-old man. Deontological examinations were carried out in relation to the services provided by general surgeons, obstetricians-gynecologists, trauma surgeons, intensive care physicians, neurosurgeons, and general medicine physicians. The expert examination was most commonly assigned in cases of lethal outcome. In most cases, clinical and autopsy diagnoses fully matched. The most common diagnostic mistakes were incorrectly clinically diagnosed intracranial injuries. In 68% of cases, the physicians' fault was disproved/not supported. The results of this study are similar to the data of diagnostic discrepancies established during the clinical and autopsy studies in other countries and would be relevant to ensuring the prevention of medical mistakes and the improvement of healthcare quality.

Author contributions

Investigation: Sandra Mazeikiene, Jurgita Stasiuniene, Diana Vasiljevaite, Sigita Laima, Sigita Chmieliauskas, Dmitrij Fomin, Rokas Simakauskas.

Supervision: Jurgita Stasiuniene, Algimantas Jasulaitis. Sigita Chmieliauskas orcid: 0000-0001-9104-9835.

References

- [1] Fares AF, Cury PM, Lobo SM. Clinical - pathological discrepancies in critically ill patients with difficult premortem diagnoses. *Rev Bras Ter Intensiva* 2011;23:442–7.
- [2] Coradazzi AL, Morganti ALC, Montenegro MRG. Discrepancies between clinical diagnoses and autopsy findings. *Braz J Med Res* 2003;36:385–91.
- [3] Mappes TA, Degrazia D. *Medical Ethics*. Boston, MA: McGraw-Hill; 2001. 233–234.
- [4] Jasulaitis A. *Medical Ethics and Deontology*. Vilnius, Lithuania: Vilnius University; 1996.
- [5] Varga AC. *The Main Issues in Bioethics*. New York, NY: Cornwall Blackwell Publishing; 2002. 22.
- [6] Ashley B, O'Rourke KD. *Health Care Ethics*. Washington, DC: Georgetown University Press; 1997. 152–155.
- [7] Fletcher JF. *Four Indicators of Humanhood – The Enquiry Matures/On Moral Medicine/Ed.* St. E. Lammers E, Verhey A. Grand Rapids, MI: William B. Eerdmans Publishing Company; 1998: 378.
- [8] Stalioraityte E, Pangonyte D, Neimantas R. Reliability of data of death causes: comparison of premortem and verified by autopsy postmortem diagnoses. *Medicina (Kaunas)* 2004;40:690–5.
- [9] Eurobarometer Special TNS: Opinion and Social, European Commission Medical Errors. Available at: http://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_241_en.pdf [accessed May 18, 2016].
- [10] Implementation and Development of a System for Recording, Monitoring and Prevention of Adverse Events in Lithuanian Personal Health Care Institutions. Available at: http://ec.europa.eu/health/ph_systems/patient_eu_en.htm [accessed July 1, 2019].
- [11] Kotovicz F, Mauad T, Saldiva PHN. Clinico-pathological discrepancies in a general university hospital in Sao Paulo, Brazil. *Brazil Clinics (Sao Paulo)* 2008;63:581–8.
- [12] Spiliopoulou C, Papadodima S, Kotakidis N, et al. Clinical diagnoses and autopsy findings. A retrospective analysis of 252 cases in Greece. *Arch Pathol Lab Med* 2005;129:210–4.
- [13] Bürgesser MV, Camps D, Calafat P, et al. Discrepancies between clinical diagnoses and autopsy findings [in Spanish]. *Medicine (B Aires)* 2011;135–8.
- [14] Patrikar S, Moorchung N, Singh V, et al. Is necropsy obsolete - an audit of the clinical autopsy over six decades: a study from Indian sub-Continent. *Indian J Pathol Microbiol* 2013;372–7.
- [15] Kuijpers CC, Fronczek J, Van de Goot FR, et al. The value of autopsies in the era of high-tech medicine: discrepant findings persist. *J Clin Pathol* 2014;67:512–9.
- [16] Medical Errors: STILL the Third Leading Cause of Death. Available at: <http://articles.mercola.com/sites/articles/archive/2016/05/18/medical-errors-death.aspx> [accessed May 18, 2016].
- [17] Are Medical Errors Really the Third Most Common Cause of Death in the U.S.? Available at: <https://sciencebasedmedicine.org/are-medical-errors-really-the-third-most-common-cause-of-death-in-the-u-s/> [accessed July 1, 2019].
- [18] Schwanda-Burger S, Moch H, Muntwyler J, et al. Diagnostic errors in the new millennium: a follow-up autopsy study. *Mod Pathol* 2012;25:777–83.