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Research Article

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Study of Clinical-Pathological Discrepancies in Autopsies

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Abstract

Background: *Autopsy is a traditional method in pathology for the study of diseases or injuries, being key to elucidate the cause of death. However, the number of autopsies has been decreasing progressively. Design and Context: Retrospective cross-sectional study to analyze the presence of discrepancy between clinical and pathological diagnoses as to the cause of death according to the Goldman criteria, verify the epidemiological profile of the main causes of death, and tabulate the number of procedures conducted annually.*

Method: *Analyzing clinical records and autopsy reports from the Department of Pathology and Legal Medicine of the Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA) from 1963 to 2012 and performing statistical analysis on the data collected.*

Results: *The predominant age group was of dead fetuses (30.6% of all cases). The main cause of death was infection (68.4% of diagnoses). After a peak in the early 1980s, there was a progressive drop in the rates of postmortem examination. In the 1990s, the average number of autopsies fell by 58% in relation to the previous decade, and the last decade of the Century registered a decrease of 80% as compared to the average of the 1980s. According to the Goldman criteria, there was discrepancy between ante- and postmortem diagnoses as to the cause of death in 26.2% of the cases.*
Conclusion: The rates of discrepancy between clinical diagnoses and autopsy findings regarding the cause of death remain high, even though medicine has become more and more advanced in technology.

Keywords: Autopsy, Clinical Audit, Death, Diagnosis, Quality Control

Introduction

In the beginning based on organ dissection, the autopsy became an advanced method of study that investigates the cause of death, taking further the general knowledge about the patient's disease [1]. Postmortem examination became therefore a source of diagnosis and clinical hypothesis, evaluation of response to treatment, elucidation of the health-disease process, obtaining epidemiological data, identification of new diseases and new patterns, notification of rare diseases and/or with atypical presentation, and identification of hereditary diseases, assisting in genetic counseling and preventive care for family members. It also provides rich biological material for education and research [2, 3].

Autopsy rates have, however, been declining steadily in recent years, in spite of the little improvement in clinical-pathological discrepancy rates. Some authors state that at least one third of the death certificates are incorrect, and that 50% of the autopsies reveal findings not suspected before death with possible impact on survival, had they been diagnosed in time [4, 5]. This study analyzed the autopsies conducted at the Department of Pathology and Legal Medicine of the Universidade Federal de Ciências da Saúde de Porto Alegre (UFCSPA), with the main objective of assessing the presence of discrepancy between the clinical hypothesis and the pathology diagnosis after the autopsy. Among the secondary objectives, we evaluated the number of procedures carried out annually and analyze the epidemiological profile of the main caus-

es of death of the patients submitted to autopsy during almost 50 years.

Materials and Methods

Cross-sectional retrospective study that analyzed autopsies carried out in the Department of Pathology and Legal Medicine of the UFCSPA from 1963 to 2012 comparing the diagnoses listed by the clinicians and by the pathologists. Clinical diagnoses were those listed by the clinician on the autopsy request and autopsy diagnoses were the diagnoses listed on the final autopsy report. Other studies, were also based on the obtention of clinical data through the analysis of autopsy requests, because it is the main clinical diagnostic hypothesis [6-8]. The study protocol was approved by the institution's internal review board (protocol number 817.219). The Department performs only clinical autopsies, and that's the reason for which medico-legal cases weren't included in this paper. In Brazil, hospitals don't have legal permission to perform forensic autopsies, these cases being attributed to the Medical-Legal Department.

A total of 4,475 autopsy cases were identified in the analyzed period. The patients were mostly from the Santa Casa de Misericórdia Hospital Complex. In order to carry out this study, a database was set in a specific program, collecting information including autopsy number, the date the procedure, the patient's name, age, gender, medical diagnosis, pathological diagnosis with causa mortis and the comparison between clinical and autopsy findings according to the Goldman criteria. Data were tabulated by a team of three medical students and a reviewer medical pathologist under the supervision of a second pathologist. The reviewer physician did the application of the Goldman criteria after tabulation of the data.

Patients were divided according to the age group into six categories, at the discretion of the authors of the study: dead fetuses, newborns to 45 days of age, 46 days to 1 year of age, older than 1 year up to 14 years, older than 15 years, and subjects of unknown age. As a large part of pediatric treatment performed in the reference hospital determined the age limit at 14 years, 11 months and 29 days, we kept this classification in the research. The age group above 15 years was joined with adult age individuals. Dead fetuses that underwent autopsy had body weight equal to or greater than 500 (five hundred) grams and/or length equal to or greater than 25 centimeters or 20 weeks or more of gestational age [9].

After autopsy, a case classification was established in relation to the probable underlying cause of death, according to the demand observed on the autopsy reports (Table 1). In the group of disorders that cause fetal or perinatal anoxia, we included fetal and/or maternal conditions that may lead to fetal hypoxemia. In surgical cases, the underlying cause was the disease that required intervention. In the category of pregnancy and/or puerperal state, maternal death was considered to occur up to 42 days after the end of pregnancy, according to International Classification of Diseases (ICD)-11 [10]. For the group of infections and neoplasms, the specific diagnoses by disease are in supplementary material.

Table 1: Classification of causes of death

Pathologies causing fetal or perinatal anoxia: intrauterine infection, true knot or umbilical cord prolapse, prolonged expulsion stage, premature rupture of membranes, nuchal cord, uterine hypertonia, maternal hemorrhage, placenta previa, eclampsia or pre-eclampsia, gestational diabetes, hyaline membrane disease, meconium aspiration syndrome, neonatal respiratory distress syndrome (bullous emphysema), and pulmonary sequestration
Prematurity: multiorgan immaturity
Post transplant rejection
Congenital malformations and genetic syndromes
Infections: includes parasitosis and septic shock
Neurological causes: kernicterus, stroke, intracranial hypertension, subarachnoid hemorrhage, subdural hemorrhage, hydrocephalus, central pontine myelinolysis, ruptured cerebral aneurysm, and degenerative diseases of the central nervous system
Pulmonary causes: pulmonary thromboembolism, pulmonary infarction, pulmonary hypertension, chronic obstructive pulmonary disease, asthma, adult respiratory distress syndrome, pulmonary hemorrhage, bronchiectasis, acute pulmonary edema, pneumothorax, hydro pneumothorax, respiratory failure, and Mikity Wilson syndrome
Cardiac causes: ischemic heart disease, cardiomyopathies, cardiac tamponade, congestive heart failure, and cardiogenic shock
Hypovolemic shock: ruptured abdominal aortic aneurysm, aortic dissection, gastrointestinal bleeding, and dehydration
Malnutrition
Liver failure
Autoimmune diseases
Neoplasms
Allergic reactions: includes anaphylactic shock and Stevens-Johnson syndrome
Postoperative state: includes post-transplant death without rejection
Pregnancy and/or puerperal state
Gastrointestinal or abdominal causes: acute abdomen, megacolon, choledocholithiasis, esophageal rupture by parasites, and inflammatory bowel disease
Renal causes: renal infarction, renal dysplasia, acute tubular necrosis, rapidly progressive glomerulonephritis, acute diffuse glomerulonephritis, proliferative glomerulonephritis, membranous glomerulonephritis, sclerosing glomerulonephritis, kidney failure, and cyclosporine nephrotoxicity

Vascular causes: mesenteric thrombosis, thrombosis of uterine and parametrial vessels, thrombosis in hepatic vessels, thrombosis of the superior vena cava, thrombosis in the subclavian artery, carotid artery thrombosis, portal vein thrombosis, thrombosis in femoral vessels, thrombosis in iliac vessels, thrombosis in renal vessels, thrombosis of the inferior vena cava, and aortic thrombosis. Does not include thrombosis in pulmonary vessels.
Abortion
Iatrogenic causes: hemoperitoneum after percutaneous liver biopsy, duodenal perforation after correction of imperforate anus, complications after correction of diaphragmatic hernia, injury due to pericardiocentesis, and laceration of subclavian artery after puncture
Miscellaneous: hematological disorders (hemorrhagic diathesis, disseminated intravascular coagulation, thrombocytopenic purpura, hemolytic disease of the newborn), hepatorenal syndrome, hemolytic-uremic syndrome, and hypoglycemia

The comparison between the clinical hypotheses in the autopsy order and the autopsy findings was conducted according to the Goldman criteria (Table 2). The Goldman code system can be used effectively in autopsy-based quality improvement programs [11]. For the purpose of analysis, classes I and II were established as discrepancy, whereas classes III, IV and V were classified as concordance. A diagnosis made only through the autopsy that would have, in life, had an impact on treatment or prognosis would also be considered as discrepancy. We considered as the main diagnosis the basic cause of death, and as "less important diagnoses" those that contributed with death, but did not take an active part in it. Class VI included cases in which the cause of death was not identified even after the autopsy. Only one category of discrepancy, considering the most important type of discrepancy, was attributed to each patient. For statistical analysis, the Poisson regression for binary data and the Pearson's chi-square test were used.

Table 2: Goldman's criteria for discrepancy in autopsies[a]

Definition	Class	Definition
Discrepant	I	Main diagnosis was not identified, with potential adverse impact on survival and could have changed the outcome with different management
	II	Main diagnosis was not identified, with no potential impact on survival and would not have modified treatment
Concordant	III	A less important diagnosis related to the terminal illness but not related to the cause of death was not identified (basic cause identified and terminal cause not identified)
	IV	Other secondary diagnosis, less important, were not identified
	V	Absolute concordance
	VI	Undefined autopsy diagnosis

Results

In our study, the most prevalent age group was of dead fetuses, corresponding to 30.6% of all cases. Neonates to 45 days were 19.6%; people at 46 days to 1 year, 13.6%; 1 to 14 years, 6.6%, older than 15, 28.6%. People of unknown age were 0.85%.

We also noted a progressive decline in the rates of postmortem examination over the period 1963 to 2012 (Figure 1). It is necessary to emphasize, though, that we only have information on the number of autopsies conducted, not about the total of deaths at the hospital in this period. In 1982, the number of autopsies recorded was the highest, with 312 procedures performed, while in 2012 there were the fewest exams, with only 12 autopsies. We underscore that the results of the autopsies carried out in the years 2000, 2001, 2002 and 2003 were missing.

The most frequent final event leading to death was infection in 68.4% of the patients, followed by cardiac causes in 24.4%, and neurological causes in 22.8%. From the total of 4,475 autopsies, we excluded 2,162 cases because they did not present clinical information provided by the attending physician at the time of the autopsy (absence of clinical data) or because the report was inadequately filled, incomplete (9.51% of cases).

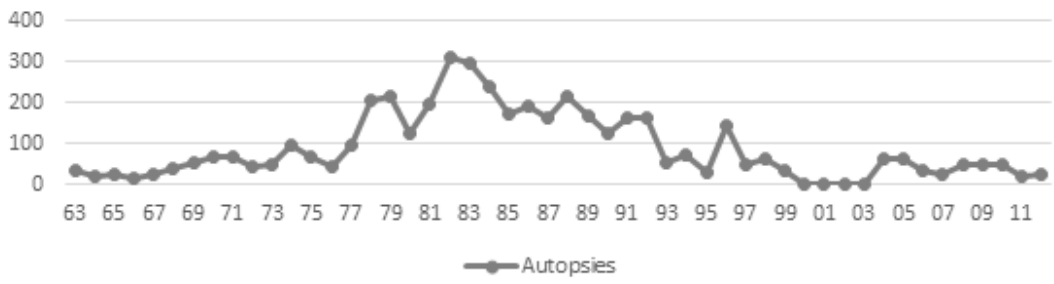

Figure 1: Number of autopsies per year

When we analyzed autopsy findings according to the Goldman criteria, in 608 cases (26.2%), the classification was either I or II. Of these, 22.3% were classified as class I; in other words, the previous diagnosis would have modified the treatment with potential impact on survival; 3.8% were Goldman class II, the findings being discrepant but would not have changed treatment or survival. On the other hand, in 26.3% of the cases, there was total concordance between the antemortem and postmortem diagnoses, being classified as class V. Less relevant errors (classes III and IV) occurred in 23.9% of the cases. In 23.3% of the patients, neither the macroscopic nor the microscopic diagnosis could clarify the final diagnosis (class VI), meaning inconclusive autopsy.

The age group correlated significantly with the outcome diagnostic discrepancy: the higher the age, the higher the chance of disagreement between clinical and autopsy findings (Table 3). According to the authors, the main diagnoses class I and II not identified by the attending physicians and that would have had potential impact on survival if they had been diagnosed in time were pneumonia, pulmonary thromboembolism and heart failure, where the main cause was acute myocardium infarct. For these three main class I and II discrepancies of our study, the clinical hypotheses that had been prepared by attending physicians and filled in at the autopsy requisition are detailed in (Table 4).

Table 3: Poisson regression for binary data for discrepancy according to age group

Outcome				
Age group	**Discrepant (I e II)**	**Concordant (III, IV, V)**	**PR (CI 95%)[a]**	**p - value[b]**
Dead fetuses	29 (15.9%)	153 (84.1%)	1	
NNc-45 days	99 (25.1%)	296 (74.9%)	1.57 (1.08 - 2.29)	0.018
46 days - 1 year	71 (29.2%)	172 (70.8%)	1.83 (1.24 - 2.70)	0.002
1 – 14 years	50 (32.1%)	106 (67.9%)	2.01 (1.34 - 3.01)	0.001
Older than 15 years	323 (43.8%)	415 (56.2%)	2.74 (1.94 - 3.87)	< 0.001
[a]PR = Prevalence rate. CI = Confidence interval.[b] p = 0.05. [c]NN = neonates				

Table 4: Autopsy Diagnose (pathologist) x clinical hypothesis (attending physician)

Autopsy diagnose	Clinical	Hypothesis
PNEUMONIA	- Acute B hepatitis - Acute gastrointestinal tract infection - Acute kidney failure from non established cause - Acute myocardial infarction - Acute pulmonary edema - “Cardiopathy” - Bleeding peptic ulcer - Bronchopleural fistula - “Cardiorespiratory arrest” - Cellulite in lower limb - Congenital hepatic fibrosis - Congestive heart failure - Dehydration - Delirium by alcoholic abstinence - Diabetic coma - “Exogenous intoxication” - Hypertensive pneumothorax - Infected scabies - Influenza - Intracranial hypertension - “Laryngeal pathology” - Leroy syndrome	- Liver failure/encephalopathy - Meningoencephalitis - Metabolic coma - Metoclopramide poisoning - Multiorgan immaturity - “Multiple congenital malformations” - Neonatal asphyxia - Post-correction route intestinal invagination - “Postictal state” - Pulmonary thromboembolism - Rabies - Respiratory failure - Reye syndrome - Schilder disease - Sepsis of unknown origin - Stroke - Tetanus - Tuberculosis - Typhoid fever - Unknown site infection - West syndrome

PULMONARY THROMBOEMBOLISM	- Bronchopleural fistula - Cardiogenic shock - Chagasic cardiomyopathy - Chronic active hepatitis B - Congestive heart failure - Cor pulmonale - Diabetic ketoacidosis - Digitalis intoxication - Epilepsy - "Exogenous intoxication" - Gstric neoplasm - Infective endocarditis	- Liver failure - Lung abscess - Lung neoplasm - Mediastinal neoplasm - Mitral stenosis - Neoplasm of undetermined origin - Pneumonia - "Postictal state" - "Pulmonary edema" - Septic shock - Stroke - Tuberculosis
HEART FAILURE	- Acute gastrointestinal tract infection - Acute kidney failure - Acute pulmonary edema - Aortic dissection - Biliary peritonitis - Bleeding peptic ulcer - Cirrhosis - Coma of unknown cause - Epigastralgia - Infective endocarditis - Lymphangitic carcinomatosis	- Meningoencephalitis - Metabolic dysfunction - Metastatic prostate carcinoma - Parasitosis - Pneumonia - Post-measles septicemia - Pulmonary thromboembolism - Rabies - Respiratory failure - Septic shock - Stroke
Death cause (according to the autopsy)	**Specific diagnose by diseases (according to the autopsy)**	
NEOPLASMS	- Acute lymphoblastic leukemia - Adenocarcinoma of extrahepatic biliary tract (common hepatic duct) - Adenocarcinoma of the rectum - Adrenal carcinoma - Adrenal neuroblastoma - Anaplastic oligodendroglioma - Anterior mediastinal seminoma - "Brain tumor" - Breast carcinoma - Burkitt-type lymphoblastic lymphoma - Carcinoma of intrahepatic bile ducts - Cerebellar neuroblastoma - Cerebral astroblastoma - Colonic adenocarcinoma - Choroid plexus papilloma - Chromophobe adenoma of pituitary gland - Diffuse fibrillar astrocytoma - Duodenal adenocarcinoma - Duodenal periampullary adenocarcinoma - Endometrial adenocarcinoma - Epidermoid carcinoma in burn scar - Epidermoid carcinoma of the hypopharynx - Epidermoid carcinoma of the larynx - Epidermoid carcinoma of the uterine cervix - Esophageal adenocarcinoma - Ewing's sarcoma - Fascicular meningioma - Fibrous astrocytoma of the cerebellar vermis - Gallbladder carcinoma - Gastric adenocarcinoma - Hepatocarcinoma	- "Kidney cancer" - Leiomyosarcoma - Lung carcinoma - Lymphocytic lymphoma - Lymphocytic lymphosarcoma - Malignant histiocytosis - Malignant triton tumor - Medullary astrocytoma - Medulloblastoma - Meningothelial meningioma - Metastatic neoplasm of unknown primary site - Myeloma of plasma cells - Mixed-cell lymphoma (lymphohistiocytic) - Pancreatic carcinoma - Papillary adenocarcinoma of ovary - Papillary carcinoma of the endometrium - Parathyroid carcinoma - Prostatic adenocarcinoma - Protoplasmic cerebellar astrocytoma - Protoplasmic protuberance astrocytoma - Renal cell carcinoma, clear cell type - Renal tubular adenocarcinoma - Retroperitoneal malignant fibrous histiocytoma - Schwannoma in the cerebellopontine angle - Spindle cell sarcoma of unknown primary site - Supraorbital cranial plasmacytoma - "Thyroid cancer" - Thyroid follicular carcinoma - Transitional pelvic carcinoma

	- Heteromorphic brainstem glioblastoma - Histiocytic lymphoma - Hodgkin's lymphoma - Hypernephroma - Intracerebral melanoma - "Jejunal cancer"	- Unclassified diffuse lymphoma - Undifferentiated carcinoma of the anterior mediastinum - Undifferentiated thyroid carcinoma - "Urinary bladder cancer" - Wilms' tumor
INFECTIONS	- Abdominal postoperative with foreign body in the cavity - Acute appendicitis - Acute bacterial hepatitis - Acute cholecystitis - Acute endomyometritis - Acute diverticulitis - Acute gastroenteritis - Acute necrotizing orchitis - Acute necrotizing pharyngolaryngotracheobronquitis - Acute necrotizing tonsillitis - Acute omphalitis - Acute osteomyelitis - Acute pancreatitis - Acute pharyngitis - Acute pyelonephritis - Acute pyoderma - Acute suppurative mastoiditis - Adenovirus pneumonia - Aortic abscess - Aspergillosis - Aspiration pneumonia - Brain abscess - Bronchopneumonia - Cerebellar abscess - Congenital herpes - Congenital lues - Congenital toxoplasmosis - Cryptococcosis - Cystitis with perforation - Cytomegalic inclusion disease - Diphtheria - Disseminated candidiasis - Disseminated impetiginized scabies - Fulminant acute viral hepatitis - Hepatic abscess - Herpes pneumonia - Histoplasmosis - Infected bronchiectasis - Infective endocarditis - Interstitial pneumonia - Intestinal parasitosis (ascariasis, Enterobius vermicularis)	- Intra-articular abscess - Leprosy - Leptospirosis - Lobar pneumonia - Lung abscess - Malaria - Measles - Mediastinitis post-dehiscence of suture - Myiasis - Myocarditis - Necrotizing enterocolitis - Necrotizing fasciitis - Necrotizing gastritis - Neurocysticercosis - Paracoccidioidomycosis - Pericarditis - Peritonitis (fecal, biliary) - Pleural abscess - Pneumonia by Pneumocystis jiroveci - Pneumonia by Pseudomonas sp - Pneumonia by Staphilococus aureus - Post-measles pneumonia - Pseudomembranous colitis - Pulmonary and miliary tuberculosis - Rabies - Retention of placental remnants - Retroperitoneal abscess - Strongyloidiasis - Shigella infection - Suppurative cholangitis - Suppurative glomerulonephritis - Surgical wound infection - Tungiasis - Typhoid fever - Urinary bladder abscess - Uterine perforation by probe - Varicella - Viral/bacterial meningoencephalitis

We could also note that the number of clinical and autopsy diagnoses that were discrepant decreased slightly over the years, with values of 31.58% in the 1960's, 33.33% in the 1970's, 36.11 % in the 1980's e 27.23% in the 1990's. For purposes of analysis, we chose to include in the chart only cases of autopsy from the period 1963 to 1999, since the cases of the later years presented a high percentage of incomplete clinical records and/or autopsy reports, making it impossible to evaluate discrepancy.

Discussion

The rates of autopsy are decreasing in the world estimates, despite the importance of this examination for the purpose of technical, scientific and epidemiologic learning [12-14]. In our study, in the 1980's there was an increase in the number of autopsies in relation

to the 60's and 70's, probably coinciding with the start of HIV epidemics and its deaths by infections, with pneumonia in many cases. However, there was a progressive decrease in the following decades and our findings are consistent with this phenomenon. Nowadays, several factors contribute to low interest in performing autopsies, like the increasing confidence in clinical diagnose (new techniques); fear of diagnostic error and increase of malpractice suits; aversion to additional time and work spent with bureaucracy for performing autopsy; insufficient exposure to autopsies during medical graduation; low value attributed to autopsy-based research; discomfort in soliciting authorization to the family for performing the procedure; the belief that autopsy does not contribute relevant information and lack of satisfaction with quality, delay, or both, of the autopsy report [15].

We have found in the study 9.51% of cases with incomplete autopsy reports. A research performed at National Confidential Enquiry into Patient Outcome and Death (NCEPOD), which evaluated autopsy report quality, found that, in 8% of reports, large clinical problems had not been accounted for, by error of the pathologist [16]. Furthermore, in another study, the NCEPOD declared that about 25% of autopsy reports on maternal deaths were "poor" or "terrible", with inconsistent information [17]. In academic institutions, where residents are the authors of much of the report, inaccuracies may be numerous [18]. This could be due to little time spent on performing the procedure and on the elaboration of an investigative report that aims to explain the possible causes of death.

In over 95% of hospital autopsy cases, a causa mortis is asserted, because an experienced pathologist can discover, during the examination, significant and sometimes subtle data [19]. However, in our work, we have found a high rate (23.3%) of inconclusive diagnoses. Some studies have revealed that, in cases in which the clinical questions were not answered definitively, the main cause was failure by the pathologist in performing adequately, and failure to undertake histological examination was noted as a substantial deficiency in 28% of reports analyses by NCEPOD in 2002 [20]. Autopsy quality depends on pathologists with great knowledge of post-mortem pathology. In general, medical residency services in pathology do not invest in autopsy performers, attribute little value to the procedure: very frequently, the resident, lacking experience, is left alone performing a post-mortem examination. A junior trainee cannot be expected to fulfill this qualification without supervision for lack of sufficient experience to recognize the significance of any gross morphologic finding [21]. These facts may have been a cause for the large number of cases of undetermined death causes in our work, although this has not been the focus of this research.

In our study, most autopsies were performed in fetuses. In Brazil, autopsy is mandatory in cases of fetal death, being sent to pathology service to clarify the causa mortis, in many cases to comfort the family by excluding a possible genetic disease and bringing important information for future gestation, while such development does not occur for other age groups [22].

In the age group up to 1 year, excluding dead fetuses, infections were the main cause of death (30.7% of diagnoses). A relatively high proportion of infectious disease-related deaths in children under one year of age, in general due to diarrhea, pneumonia, and malnutrition, indicates a large number of preventable deaths, and therefore low economic and social development, and faulty health care [23, 24]. In the group of 1 to 14 years and in the subjects above the age of 15, infections were the main cause of death (8.4% and 27.3%, respectively) in our study. Several authors have underlined that infectious diseases make the most of death causes unidentified by assisting doctors. This may be explained by the increase of patient exposure to wide spectrum antimicrobial therapies, promoting the emergence of virulent organisms that will cause more resistant infections, often of difficult diagnose. It is necessary to foment the rational use of wide spectrum antibiotics. The high prevalence of infectious diseases in our study may be due to our country having many contributing factors for this condition, like parasitic diseases, low socioeconomic status, malnutrition and deficiencies in basic healthcare related to disease prevention [24].

We have found discrepancy between the antemortem and postmortem diagnoses, with 26.2% of the patients presenting discrepant clinical and pathological diagnoses (Goldman classes I and II). This result is comparable to most studies performed in general hospitals, which present a discrepancy rate varying between 16 and 57% [25, 26]. One study analyzed 53 series of autopsies performed through 40 years, finding a diagnostic error rate (classes I and II) of 9.8% [27]. Another study has found clinically relevant discrepancy rates as high as 40% and exceeding 10% in most researches [28]. In Brazil, one research has studied autopsies performed in 1972-1985 and 1992-1996 finding discrepancy rates of 27.1% and 20.6%, respectively [29].

We have found a small decrease in the discrepancy rate, from 31.58% in the 1960's to 27.23% in the 1990's. This agrees with other studies, which report that, despite advances in diagnostic medicine, there was little improvement in discrepancy rates from the 1960s to the present. In previous years, diagnostic discrepancies may have occurred because of limited diagnostic methods. However, with advances in imaging, microbiology, and clinical biochemistry testing, it is inevitable that the discrepancies discovered today are increasingly attributable to errors in clinical judgment, although not necessarily due to culpable negligence. Some possible causes for this are: failure to use rationalized propaedeutic (about 50% of cases of clinical failure); minimum lesions, beyond the sensitivity of the most common semiotic methods; misinterpretation of propaedeutic data; failures inherent to the method used which is sometimes ambiguous in its diagnostic significance; short stay of the patient under clinical observation (less than 24 hours) [30, 31]. Besides, according to literature, the main clinical-pathological discrepancies are more frequent in places with limited access to health resources. Therefore, raising the level of suspicion of infectious diseases and expanding the availability of diagnostic tests may significantly improve the acknowledgement of diseases that cause life risk, especially infections, and so reduce mortality associated to these [32].

Our findings also concluded that the possibility of discrepancy increases with age: subjects older than 15 years of age presented the highest degrees of discrepancy between clinical diagnoses and autopsy findings. One research has also found that the frequency

of discrepancies increased with age, most of them (57.9%) having occurred in patients 50 or older. In cases with guarded prognosis, more common in advanced age, it is possible that physicians and patient's relatives decide not to proceed with supplemental clinical investigation, which may contribute to a higher proportion of mistaken diagnoses in older individuals. These patients usually have multiple concurrent diseases and an unclear clinical presentation.

Our most common diagnostic discrepancies (Goldman classes I and II) were pneumonia, pulmonary thromboembolism and heart failure, represented mainly by cases of acute myocardial infarct. This finding agrees with previous studies [33]. Pneumonia and acute myocardial infarct present a wide spectrum of symptoms, allowing for confusion between them and other pathologies. In the phase of HIV's emergence, the lack of knowledge about it and its pathophysiology contributed for many deaths by pneumonia. Besides that, pneumonia may also evolve with soft symptoms or even be assymptomatic, not being easily recognized, which makes diagnose difficult. Maybe it is necessary to review conducts towards further examination that can diagnose this condition. In cases of acute myocardial infarct, one conduct to be followed could be the performance of an electrocardiogram even in cases whose clinical examination does not suggest cardiac problem. The diagnose of pulmonary thromboembolism, in turn, depends on a high level of suspicion to be performed in time. The findings emphasize the need to establish an adequate diagnostic algorithm for this frequently unrecognized condition to be identified.

Limitations, Conclusions & Recommendations

Our study has some limitations. Most autopsies were performed by resident doctors in training; our findings regarding the main causes of death are not generalizable; this is a retrospective analysis, often based on poorly completed or incomplete autopsy reports and clinical records, which led to the loss of a great number of cases. In addition, the fact that we used autopsy orders as source of clinical history led to conclusions derived exclusively from clinical reasoning, not based on medical records or results of diagnostic tests, except when the latter were transcribed in the order. On the other hand, it is worth mentioning that there is no record of a Brazilian study spanning such a long time (almost 50 years). Typing of the original autopsy reports in the data sheet developed for the study was done by four people, and this may have led to loss of information, since it was necessary to summarize the most relevant information, and the assessment of the importance of a given data for future analysis, depending on the interpretation of the typist. However, there was revision by a senior pathologist, and a research protocol was followed.

We conclude that despite scientific and technological advances in medicine, clinical/pathological discrepancies with regard to the cause of death remain. Therefore, the possibility of an autopsy revealing an important unsuspected diagnosis has declined over the years, but it remains high enough to encourage and justify the permanent use of autopsy as a diagnostic exam with a significant role in the promotion of programs for improvement of hospital quality. One contribution of this article relative to medical residency in pathologic anatomy concerns to the importance of better training of residents for performing autopsy, which also depends on a bigger commitment by the senior staff. Furthermore, our study emphasizes the need for the medical diagnose to be honed in relation to cardiorespiratory diseases in our region, in order to improve the quality of medical assistance to the patients.

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