

Autopsy: quality assurance in the ICU

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Received: 15 May 1998
Accepted: 4 December 1998

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Abstract *Objective:* To examine the correlation between the clinical diagnosis and autopsy findings in adult patients who died in an intensive care unit (ICU). To determine the rate of agreement of the basic and terminal causes of death and the types of errors in order to improve quality control of future care.

Design: Retrospective study.

Setting: Adult ICU in a university hospital.

Patients: 30 adult patients who died in the ICU, with the exclusion of medicolegal cases.

Methods and main results: Anatomic-clinical meetings were held to analyze the pre- and postmortem correlations in 30 consecutive autopsies at the ICU of the University Hospital, School of Medicine of Botucatu/ UNESP, from January

1994 to January 1997. The rate of correct clinical diagnoses of the basic cause was 66.7%; in 23.3% of cases, if the correct diagnosis was made, management would have been different, as would have been the evolution of the patient's course (Class I error); in 10% of the cases the error would not have led to a change in management (Class II error). The rate of correct clinical diagnoses of terminal cause was 80%. *Conclusions:* The rate of recognition of the basic cause was 66.7%, which is consistent with the literature, but the Class I error rate was higher than that reported in the literature.

Key words Critical care unit · Autopsy diagnosis · Quality assurance · Class I error · Class II error

Introduction

Despite all the supportive measures available for the treatment of critically ill patients, the difficulty in obtaining an adequate medical history on these patients and the speed at which their critical condition develops prevent the intensive care physician from making a diagnosis which, if established, would probably prevent the deaths of these patients.

Autopsy has been considered a way of achieving quality control [1]. Despite the decrease in autopsy rates observed over the last few decades, autopsy is still the final word in quality control and an important tool to be used in both research and medical education [2–5]. In the United States, autopsy rates were reduced

from 50% in the 1940s to 10% in the 1980s[5]. In the United Kingdom, autopsies are performed in less than 10% of the deaths [5]. Excessive reliance on diagnoses obtained through the currently available equipment and laboratory techniques has been pointed out as one of the causes of this reduction in the number of autopsies [6]. Other factors to be considered are the high costs [3] and the difficulty in obtaining authorization from the family.

Few data are available in the literature on the correlation between clinical diagnosis and the diagnosis made at autopsy, specifically in patients in intensive care units (ICUs). The objective of the present study of 30 consecutive autopsies, in patients admitted to an ICU was to determine the rate of agreement between

pre- and postmortem diagnoses and the frequency of Class I and Class II errors [7].

Patients and methods

For the present study, anatomo-clinical meetings were held with the purpose of analyzing 30 consecutive autopsies and finding how pre- and postmortem diagnoses correlated. Clinical and autopsy diagnoses were separately established. The autopsies were carried out from January 1994 to January 1997 on patients in the adult ICU of the University Hospital, School of Medicine of Botucatu/ UNESP, which is a general hospital and a referral center for the center-western region of the state of São Paulo. The ICU is a multidisciplinary four-bed unit where patients from the emergency unit, central surgery and wards are admitted. The autopsies performed in the Department of Pathology of the hospital were complete and accompanied by histological study of all organs.

Forty autopsies were performed during the study period but only 30 were analyzed. The remaining 10 cases were excluded because the patients' medical records were either incomplete or missing. As a rule, an authorization for autopsy is requested from the families of all the patients who die at our ICU, unless we are sure of the cause of death; but we are more emphatic in requests for authorization in the more severe cases or in cases about which we have doubts. Medicolegal cases were excluded from this study.

As authorized by the family, deceased patients were sent for autopsy accompanied by a summarized request form. After the autopsy was concluded, anatomo-clinical meetings were held every 30 or 45 days. In these meetings, the clinical information in the patients' medical records was reported by two intensive care physicians. The physicians assessing the correlation of diagnoses were always the same. The basic cause, terminal cause, contributing causes and other diseases in the autopsy record were presented by the same pathologist and correlated with the clinical records in each case. The basic cause of death was defined as the disease or attack that triggered the chain of morbid events that directly led to death. The terminal cause was the lesion or disorder that directly led to death. Contributing causes were complications of the primary cause that contributed to death. Other diseases not correlated with the cause of death were also reported.

Clinical and pathological diagnoses were classified according to the International Classification of Diseases (ICD), 9th revision (1975).

In order to compare the two groups of diagnoses, we used the criteria of Goldman et al. [7] where a Class I error is an error in the diagnosis of the basic cause which, if detected before death, would probably have changed the patient's treatment and clinical course; a Class II error is an error in the diagnosis of the basic cause which, if detected before death, would probably not have changed the patient's treatment or course; and a Class III error is an error in the diagnosis of contributing causes.

Age, sex and length of stay in the ICU, as well as iatrogenic lesions detected at autopsy, were also analyzed.

Results

The number of cases admitted to the ICU from January 1994 to January 1997 was 576, with 152 deaths, corresponding to a mortality of 26.4%. Of the 40 autopsies performed, only 30 were studied (21.7%). Of the 30 patients submitted to autopsy, 15 were male and 15 were

Table 1 Class I error: Discrepancy between clinical and autopsy diagnoses of basic illness

Clinical diagnosis	Autopsy diagnosis
Shock, pneumonia	Pseudomembranous ulcerative enterocolitis
Atherosclerosis, hypertensive myocardopathy	Spindle cell lung carcinoma
Mitral bacterial endocarditis	Fungal endocarditis, deep venous thrombosis in left lower limb
Chronic renal failure, systemic hypertension	Crescent glomerulonephritis associated with systemic vasculitis
Perinephritic abscess	Chronic suppurative pancreatitis
Spontaneous perforation of the bile duct	Ulcerated gastric adenocarcinoma
TVP in MIE	Massive pulmonary hemorrhage of etiology to be clarified

Table 2 Class II error: discrepancy between clinical and autopsy diagnoses of basic illness

Clinical diagnosis	Autopsy diagnosis
Atherosclerosis	Diabetes mellitus
Adult respiratory distress syndrome, bacterial pneumonia	Acute systemic viral disease
Atherosclerosis	Hypertensive heart disease

female. Patients ages ranged from 17 to 86 years (mean 52.2 years). Six patients were in the ICU for less than 24 h, 17 patients from 1 to 15 days and 7 patients for more than 15 days. Time of hospitalization did not change the results.

Basic cause of death was correctly diagnosed in 66.7% of the cases. The rate of Class I error was 23.3% (7 patients) and of Class II error 10% (3 patients). The correct diagnosis of terminal cause was made in 80% of the cases. With regard to terminal cause, only the rates of agreement and disagreement of diagnoses were studied. Tables 1 and 2 list both clinical and autopsy diagnoses and show the rates of Class I and Class II errors in the diagnosis of the basic cause. The groups of diseases of the digestive and cardiovascular systems presented higher diagnostic agreement with respect to the basic cause.

In relation to contributing causes (Class III error) the most discrepant diagnoses were: pancreatitis (5 cases), adult respiratory distress syndrome (4 cases), peptic ulcer (4 cases), cor pulmonale (3 cases) and acute hemorrhagic adrenal necrosis (3 cases).

Table 3 shows the iatrogenic lesions detected at autopsy that were caused by the therapeutic measures used for the ICU patients. It is noteworthy that, in a high percentage of cases (43.3%), traumatic ulcerative laryngotracheitis due to orotracheal intubation was detected.

Table 3 Frequency of iatrogenic lesions

Lesions	No. of patients	No. of cases	Time (days) ^a
Traumatic ulcerative laryngo-tracheitis	30	13	11.3
Acute cystitis due to bladder catheterization	30	3	10
Traumatic esophagitis due to a nasogastric tube	30	2	11
Interstitial nephritis caused by drugs (aminoglycosides)	11	1	14

^a Mean duration of time in which the devices were in place

Table 4 Most frequent lesions not suspected by clinicians

Diagnosis	No. of cases
Benign enlargement of the prostate	4
Diffuse colloid goiter	3
Cicatricial pulmonary tuberculosis	1
Calcified stenosis of the aorta	1

Some diseases not suspected by the clinicians that did not contribute to death were detected at autopsy (Table 4).

Discussion

Most studies in the literature compare clinical diagnoses with autopsy diagnoses in patients admitted to different clinical wards of a hospital. Few studies compared these data in patients specifically admitted to ICUs. One of the studies is by Fernandez-Segoviano et al. [8] performed with adult ICU patients, while Goldstein et al. [9] and Stambouly et al. [10] specifically refer to pediatric ICUs.

In the present work, there was agreement between clinical and autopsy diagnoses of the basic cause of death in 66.7% of the cases. This rate is consistent with

those reported in the literature; Scottolini and Weinstein found 69% [2], Cameron and McGoogan found 61% [6] and Gough 65% [11]. The rates of Class I error (23.3%) and Class II error (10%) differed from those reported by other authors. However, Blosser et al. [12] recently reported that in 27% of ICU patients autopsy detected a diagnosis that, if made during life, probably would have changed the treatment. Indeed, in the literature the majority of errors were Class II [7, 8, 13]. This discrepancy is perhaps due to the fact that a complete clinical history of ICU patients is often difficult to obtain. These patients are usually in no position to cooperate and their relatives are often unaware of all their complaints. In addition, several of our patients came from the emergency unit with few records. Moreover, patients whose deaths motivated a request for autopsy tend to be special cases, usually more serious and complicated than those involving average patients. The rate of correct clinical diagnoses of terminal cause agreed with the literature [2, 3, 6, 14, 15].

Other important data observed in the present study which should be highlighted were the iatrogenic lesions caused by therapeutic measures, detected at autopsy, especially traumatic laryngotracheitis, observed in 43.3% of the cases. In the literature, the percentage of traumatic laryngotracheitis following orotracheal intubation ranges from 4 to 95% [16–19]. Reports of traumatic laryngotracheitis after intubation have been published since the 1960s, with the lesions starting a few hours after intubation [16].

The diseases not directly correlated with the cause of death, and not suspected by the clinicians in a large number of the cases, were benign prostate hyperplasia and diffuse colloid goiter. This demonstrates that rectal examination and thyroid palpation are not properly valued in our midst.

Despite the decrease in the number of autopsies over the last few decades for the reasons mentioned earlier, the study of autopsies can provide additional information that leads to improved quality control in the service, and this extra information might later improve the treatment given to patients by clinicians.

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