Clinical Diagnosis versus Autopsy[1]

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Records from 910 autopsies performed at a university hospital in Salvador, Bahia, Brazil, were examined in order to assess the accuracy of clinical diagnoses of the patients' underlying causes of death. This study found inaccurate clinical diagnoses in 31% of the cases.

The overall rate of diagnostic error appeared to remain fairly stable from 1970 to 1982, being highest for older patients. Thirty-six percent of the 263 cancer deaths were incorrectly diagnosed, and a number of pathologies considered relatively easy to diagnose were not always correctly identified. Quite aside from their direct medical implications, diagnostic errors of the magnitude observed in this and other studies seriously jeopardize the quality of vital statistics and such statistics' usefulness for improving public health.

The accuracy of clinical diagnosis is traditionally assessed by comparing it with autopsy results. On the basis of postmortem diagnoses, doctors can increase their clinical knowledge and diagnostic ability so as to improve the quality of their work with other patients. The autopsy is thus an important learning tool, especially in university hospitals (*1–3*).

Pathologists indicate that, on the average, significant diagnostic errors are revealed by about 40% of all autopsies (*1–4*), the range varying from 6% to 68% depending on a variety of circumstances (*5*). Curiously, this high proportion of errors has remained stable in recent decades despite major technologic advances in diagnostic methods (*6*).

The aim of the work reported here was to determine the accuracy of clinical diagnoses of underlying causes of death through autopsies carried out at a university hospital in Salvador, Brazil. (It is important that the underlying cause of death not be confused with the terminal or immediate "*causa mortis*"—*7*). Variables considered included the decedent's age, sex, and year of death, as well as the kind of pathology involved.

MATERIALS AND METHODS

Most hospital instruction at the Federal University of Bahia's Medical School takes place at the Professor Edgard Santos University Hospital. The patients admitted to this referral hospital are generally suffering from chronic diseases; emergency, obstetric, and tuberculosis patients are not normally admitted.

Autopsies are carried out by resident physicians under the supervision of professors and physicians in the hospital's Department of Pathological Anatomy. Basic data on each patient (age, sex, clinical diagnosis, date of death, and underlying cause of death at autopsy) were routinely placed in the files of the Department of Pathological Anatomy. Since 1970, this material has been organized in a standardized manner by resident physicians.

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[1]This article will also be published in Spanish in the *Boletín de la Oficina Sanitaria Panamericana*, vol. 110.

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The study reported here was based on 1,222 autopsies carried out in all the even-numbered years from 1970 through 1982. During these seven years 1,852 deaths occurred (proportion autopsied: 66%). From 1982 onwards, with the re-emergence of a crisis in Brazil's university hospitals, the number of admissions and autopsies fell sharply.

Of the 1,222 cases, 312 were excluded from the study. In some instances (about two-thirds) this was because the available information was incomplete, while in the remainder it was because the diagnosis could have given rise to mistaken interpretations (the anatomopathologic diagnosis being twofold, imprecise, unusual, or hard to reconcile with clinical and anatomopathologic terminology). The bulk of the cases excluded came from the hospital's surgical clinics.

The clinical diagnosis made by the clinical teams in the hospital was compared with the anatomopathologic diagnosis of the underlying cause of death at autopsy. On this basis, the clinical diagnosis was placed in one of three categories: *completely correct*—total agreement between the clinical and anatomopathologic diagnoses; *partially correct*—partial agreement between the two diagnoses; *incorrect*—total disagreement between the diagnoses. In general, the partially correct diagnoses reflected situations where the underlying disease identified by the pathologist was mentioned in the clinical diagnosis among other suspected diseases, without having been indicated as the principal cause of death. In contrast, where the diagnosis was classified as incorrect the underlying cause of death found by the pathologist was not even mentioned in the clinical diagnosis.

Care was taken to ensure that differences between clinical and anatomopathologic terminology did not lead to discrepancies between the two kinds of diagnosis. For example, heart failure, myocardial insufficiency, and atheromatosis of the coronary arteries were regarded as the same diagnosis, irrespective of distinctions cited in the International Classification of Diseases. Clinical diagnoses that could not be associated with morphologic diagnostic findings at autopsy (such as hydroelectrolytic disturbances, cardiac arrhythmias, etc.) were fully accepted, thereby justifying the clinical diagnosis.

RESULTS AND DISCUSSION

Of the 910 study cases, the clinical diagnosis of the underlying cause of death was found to be completely correct in 314 cases (35%), partially correct in 312 (34%), and incorrect in 284 (31%). Though the latter 31% figure may seem high for incorrect diagnoses, in fact it is comparable to levels observed at hospitals in developed countries (*2, 5, 6, 8*).

As Table 1 indicates, the accuracy of the clinical diagnoses was approximately the same for both sexes. However, like previous studies, the data show a tendency for the rate of incorrect clinical diagnoses to increase with patient age (*1, 5, 8*).

It is also noteworthy that the percentage of incorrect clinical diagnoses did not show any pronounced overall tendency to increase or diminish over the course of the study period. This relative stability could conceivably be associated with a steady decline in the autopsy percentage at the study hospital (from 81% to 58%) during the same period. However, Goldman and others (*6*), who analyzed 100 randomly selected autopsies performed at a university hospital in Boston in 1960, 1970, and 1980, found that introduction of advanced diagnostic procedures such as scanning, ultrasound, and computerized tomography did not lead to a reduction in the proportion of diagnostic errors. It was also observed that, over the period in question, kidney diseases and

Table 1. Accuracy of clinical diagnoses of the underlying cause of death of the 910 study subjects grouped according to sex, age, and year of death.

	No. of deaths	Diagnoses					
		Incorrect		Partly correct		Completely correct	
		No.	(%)	No.	(%)	No.	(%)
Sex:							
Male	517	168	(32)	187	(36)	162	(31)
Female	393	116	(30)	125	(32)	152	(38)
Total	910	284	(31)	312	(34)	314	(35)
Age (years):							
0	39	10	(26)	15	(38)	14	(36)
1–4	25	6	(24)	10	(40)	9	(36)
5–9	23	6	(26)	9	(39)	8	(35)
10–49	451	133	(30)	151	(33)	167	(37)
50–69	290	99	(34)	94	(32)	97	(33)
≥70	82	30	(37)	33	(40)	19	(23)
Total	910	284	(31)	312	(34)	314	(35)
Year of death:							
1970	160	56	(35)	44	(28)	60	(38)
1972	194	63	(32)	72	(37)	59	(30)
1974	141	46	(33)	38	(27)	57	(40)
1976	152	40	(26)	69	(45)	43	(28)
1978	120	33	(28)	44	(37)	43	(36)
1980	76	27	(36)	24	(32)	25	(33)
1982	67	19	(28)	21	(31)	27	(40)
Total	910	284	(31)	312	(34)	314	(35)

pulmonary embolisms became less frequent causes of death. On the other hand, frequencies of systemic infections with fungal, viral, and bacterial origins increased significantly—and in 1980 clinical diagnoses failed to identify these infections in 24% of the cases studied.

In our 910 study cases, 263 deaths were found at autopsy to have been due to cancer, while 647 were assigned to other causes. The proportions of incorrect diagnosis in these two groups of deaths were 36% and 29%, respectively. The difference between these figures was found to be statistically significant at the 5% probability level (chi-square with continuity correction = 4.22).

Table 2 shows that among the deaths from cancer, the proportion of incorrect diagnosis varied considerably—from 17% (for cancer of the pancreas) to 56% (for esophageal cancer). Interestingly, comparison of the proportions of incorrect cancer diagnosis found by us with those found by Cameron and McGoogan (*8, 9*) in studying 320 deaths from cancer at Scottish hospitals (percentage autopsied: 25%) indicates that their observed proportions were higher than ours for cancers of the liver (66%), gall bladder and bile ducts (43%), and pancreas (43%), but were lower than ours for lung cancer (28%) and similar to ours for cancer of the stomach (33%) and lymphoma (32%).

The 45% proportion of incorrect diagnosis shown for the category "other cancers" may seem very high. The explanation should be sought in the "bias" caused by referrals (*10*). Specifically, many patients with relatively rare forms of cancer and other hard to diagnose diseases tend to be referred to the Professor

Table 2. The accuracy with which cancer deaths were clinically diagnosed in the 910 study subjects, as indicated by autopsy data.

Cancer	No. of deaths	Diagnoses		
		% incorrect	% partly correct	% completely correct
Esophagus	9	56	33	11
Gall bladder/bile ducts	22	32	64	4
Leukemia/lymphoma	50	28	20	52
Liver	11	27	46	27
Lung	21	43	33	24
Pancreas	17	17	65	18
Stomach	35	31	29	40
Other cancers	98	45	35	20
Total	263	36	36	28

Edgard Santos University Hospital for diagnostic clarification. It would therefore be wrong to consider the cases studied as constituting a representative sample of fatal cancer cases occurring in the Bahia population.

Table 3 shows the accuracy of clinical diagnoses for 14 selected causes of death. These data draw attention to certain causes of death that are being incorrectly diagnosed in our hospitals, including such relatively easy to diagnose diseases as arterial hypertension (20% incorrect), Chagas' disease (12% incorrect),[3] chronic obstructive lung disease (43% incorrect), pneumonia/bronchopneumonia (75% incorrect), and schistosomiasis (36% incorrect).

It could be argued that the data shown demonstrate nothing more than that clinicians are not filling out their patients' death certificates properly. However, even this "minor" oversight would seriously jeopardize the quality of data provided to our vital statistics services; and inaccuracies in the information derived from death certificates could make such information unsuitable for use in research and planning. Data from the inter-American investigations of mortality (*11*) and childhood mortality (*12*) in the city of São Paulo indicate that the underlying causes of death among study subjects were correctly identified on their death certificates in 67% of the cases among individuals between the ages of 15 and 74 years and in 52% of the cases among children below the age of five. (It should be noted, however, that the proportion of autopsies among the study subjects was 11.8% among those aged 15–74 and 20.1% among the children under age 5.)

As regards our 910 cases, we are more inclined to believe the bulk of the discrepancies arose from actual errors in clinical diagnosis of the underlying cause of death, in line with results obtained by studies made in other parts of the world (*1, 2, 4–6, 8, 9*).

These various findings, as well as ours, make it clear that the medical profession is not taking full advantage of its opportunities to increase knowledge through analysis of its own errors. In the developed countries, autopsies are becoming less and less frequent, stated reasons being a low cost-benefit ratio and fear of

[3]Chagas' disease is very common in the state of Bahia. Important research is conducted at the university hospital, which usually attracts patients from endemic areas of the state. Serology for this disease is routinely performed for all cardiac patients as well as for gastrointestinal patients suspected of having "mega" forms of the disease.

Table 3. The accuracy with which selected causes of death (and other causes of death not specified here) were clinically diagnosed in the 910 study subjects, as indicated by autopsy data.

Cause of death	No. of deaths	Diagnoses		
		% incorrect	% partly correct	% completely correct
Arterial hypertension	39	20	31	49
Atherosclerosis	29	34	35	31
Chagas' disease	115	12	26	62
Chronic obstructive lung disease	14	43	43	14
Glomerulonephritis	23	39	26	35
Hepatitis	8	62	25	13
Hepatic cirrhosis	35	26	63	11
Lupus erythematosus	10	30	30	40
Malnutrition	12	8	34	58
Peptic ulcer	7	43	57	0
Pneumonia/bronchopneumonia	12	75	17	8
Rheumatic disease	36	31	25	44
Schistosomiasis	36	36	30	34
Tuberculosis	28	36	39	25
Other diagnoses	243	35	39	36
Total	647	29	34	37

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Antônio Almeida of the Department of Pathological Anatomy at the Professor Edgard Santos University Hospital for their support and encouragement, and also the medical students of the Federal University of Bahia in Epidemiology Course 85.2, Class PO2, for their assistance with data collection.

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Meeting on Hunger Research

The Fourth Annual Hunger Research Briefing and Exchange will be held at Brown University in Providence, Rhode Island (USA), from 3 to 5 April 1991. Cosponsored by Brown University's Alan Shawn Feinstein World Hunger Program and InterAction—The American Council for Voluntary International Action, the briefing is designed to encourage dialogue among researchers and practitioners concerned with alleviating hunger.

The topic of this year's briefing will be the Bellagio Declaration, a document created at an international meeting held in Bellagio, Italy, in 1989, that identifies four goals for the 1990s: 1) eliminating deaths from famine, 2) ending hunger in half of the poorest households, 3) reducing by half the rate of malnutrition among mothers and small children, and 4) eradicating iodine and vitamin A deficiencies. The briefing will focus on implementation strategies for these goals including identification of resources, development of ongoing programs, and linkage of grassroots efforts with those from higher levels. The program will be supplemented by an extensive exhibit of hunger-related publications and a notebook of abstracts of recently completed or ongoing research and project reports.

For further information, contact Briefing Coordinator, World Hunger Program, Box 1831, Brown University, Providence, RI 02912, USA; telephone (401) 863-2700; telex 952095; fax (401) 863-2192.