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REVIEW

Discrepancies between clinical and autopsy diagnosis and the value of post mortem histology; a meta-analysis and review

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The autopsy is in decline, despite the fact that accurate mortality statistics remain essential for public health and health service planning. The falling autopsy rate combined with the Coroners Review and Human Tissue Act have contributed to this decline, and to a falling use of autopsy histology, with potential impact on clinical audit and mortality statistics. At a time when the need for reform and improvement in the death certification process is so prominent, we felt it important to assess the value of the autopsy and autopsy histology. We carried out a meta-analysis of discrepancies between clinical and autopsy diagnoses and the contribution of autopsy histology. There has been little improvement in the overall rate of discrepancies between the 1960s and the present. At least a third of death certificates are likely to be incorrect and 50% of autopsies produce findings unsuspected before death. In addition, the cases which give rise to discrepancies cannot be identified prior to autopsy. Over 20% of clinically unexpected autopsy findings, including 5% of major findings, can be correctly diagnosed only by histological examination. Although the autopsy and particularly autopsy histology are being undermined, they are still the most accurate method of determining the cause of death and auditing accuracy of clinical diagnosis, diagnostic tests and death certification.

Keywords: autopsy, cause of death, diagnostic errors, histology

Introduction

Until the 1960s the autopsy was at the heart of modern medicine, crucial to the discovery, characterization and understanding of disease. It was at the centre of medical research, education and professional development. Doctors felt it was essential to recognize discrepancies between clinical and autopsy diagnoses both for self-improvement and to further the science of medicine. In addition, the aetiology of over 80 diseases has been elucidated since 1950 by pathology studies including biopsy.[1]

In the 1960s the hospital autopsy rate in Europe and the USA was around 60%, but has been falling and is now around 10% or less. In 1993 the Royal College of Pathologists published *The Autopsy and Audit*, giving a discrepancy rate of 75% for significant clinical discrepancies, and 10% for discrepancies where the patient would have been expected to live had the clinical diagnosis been correct. The report recommended that at least 10% of hospital deaths were autopsied for the purposes of audit but by 2002 in *Guidelines on Autopsy Practice* this figure was no longer considered acceptable. In the 21st century hospital post mortem rates are still falling and it has been questioned if the autopsy is still useful. This is in part because of strong beliefs in the power of scans and other investigations, but also because clinicians may not seek autopsies because of potential medico-legal consequences. New methods of autopsy, most prominently magnetic by resonance imaging, are being investigated but as yet there is no

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evidence they are able to adequately replace the conventional autopsy.[2] Other factors implicated in the declining rate include inadequate and delayed communication of autopsy results to clinicians and the requesting of autopsies being delegated to junior medical staff.

Pathologists do not usually publicly question the value of the autopsy, although recently this has started to change.[3] The advent of the Bristol Inquiry, Alder Hey and Coroners Reviews,[4,5] as well as a new consultant contract, have focused histopathologists on the contribution of the autopsy to their working lives and its perceived lack of contribution to the audit process. Much of the media attention has been focused on paediatric post mortems and this subspeciality is in particular crisis in the UK. Organ retention issues are also a problem in adult autopsies; for example, the Isaacs Report[6] dealt with the non-consented retention of adult human brains. In some diseases retention of organs or tissues is essential for diagnosis, but there is apocryphal evidence that many pathologists are now reluctant, with the advent of the Human Tissue Act, to seek consent from relatives to examine histological sections in autopsy cases. In many cases coroners will not permit such retention of tissue.

Based on this background, we felt it was appropriate to examine the recent literature critically to assess the value of the post mortem and especially histology. A meta-analysis of studies examining discrepancies between clinical and post mortem diagnoses was carried out, especially when they studied the value of histology.

Materials and methods

English language articles published between 1980 and 2004 studying discrepancies between clinical and post mortem diagnoses were selected using Medline. These were conducted in European and American hospitals. The articles dealt with hospital post mortems, coroner's autopsies and, in one case, perioperative deaths. One review paper[7] encompassing several studies conducted between 1930 and 1977 was included. The articles were examined for the following information:

Type of hospital (teaching/non-teaching)
Period of study
Number of cases
Male : female ratio
Post mortem rate
Post mortem guidelines followed
Groups of patients studied
How clinical information was obtained
Whether histology was taken and, if so, how many blocks in each case
Any discrepancy between macroscopic and microscopic diagnosis
Discrepancy between clinical and post mortem diagnosis
Areas of discrepancy
Sensitivity and specificity of clinical diagnoses given in the article were used, or calculated, where possible, according to the formulae:

$$\text{Sensitivity} = \text{true positives}/(\text{true positives} + \text{false negatives})$$

$$\text{Specificity} = \text{true negatives}/(\text{true negatives} + \text{false positives}).$$

Results

We searched Medline and included 18 papers as fulfilling some or all of the criteria listed above (see Table 1).

The articles spanned the years 1972–2002, with the review paper covering 1930–1977. The periods of study ranged from 6 months to 20 years and cases reported in each paper ranged from 50 to 3042. The review paper[7] covered over 50 000 cases. The mean number of cases per study, excluding the review, was 703. The average male : female ratio was 1.09 : 1. When the type of hospital was stated, they were teaching hospitals in 13 cases[8–11,13,14,17,20–25] except one,[9] which was conducted partly in a teaching, and partly in a non-teaching hospital. Four papers[15,16,18,19] did not state the type of hospital.

The one study that stated guidelines were used[8] employed the 1993 guidelines from the Royal College of Pathologists. Another[25] stated that a 'standard' post mortem technique was used but did not describe this.

POST MORTEM RATES

These varied from 80% in 1977[14] to 9% in 1983.[10] In one study the post mortem rate was deliberately increased from 30% to 65%.[15] A study of surgical patients achieved a post mortem rate of 68%, though the overall rate for the hospital was 37%.[20] Two of the studies noted a fall in the post mortem rate during the period of study, from 22% in 1970–1981 to 9–12% in 1982–1984;[10] and 80% in 1977 to 39% in 1988.[14] Four studies did not give a post mortem rate.

PATIENT SELECTION

Most studies concentrated on adults, but some included all ages[10,12,13] and one also incorporated stillbirths.[14] One paper concentrated on geriatric patients,[9] six

Table 1. Articles included in the study

Reference	Period of study	Patient group	Mean age of patients, years (range)	M : F ratio	No. of cases	Post mortem rate
8	Published 1997	Adults	78 (54–94)	1.04 : 1	108	Not stated
9	1972–92	Geriatric patients	80 (62–102)	1 : 1.4	3000	44%
10	1981–84	All except stillbirths/ newborns	Not stated	1.6 : 1	2145	22% in 1981 9–12% 1982–84
11	1977–87	Surgical patients with GI tract disease	59 (29–89)	1.03 : 1	77	51%
12	1978–82	All except newborns/ stillbirths/any dying within 24 h of admission	Not stated	Not stated	428	Not stated
13	1986–88	Patients dying during/within 30 days of surgery	Range < 1 to > 80	1.5 : 1	213	Not stated
14	1977–78 and 1987–88	All, including stillbirths	Not stated	Not stated	3042	80% in 1977, 73% in 1978, 45% in 1987, 39% in 1988
15	6-month period, published 1980	Patients on 4 medical and 2 surgical units	Not stated	Not stated	154	65% (had been deliberately increased for the study)
16	1989–91	General surgery patients	73 for males/78 for females (39–96)	1 : 1.06	64	Not stated
17	1982–84	Adults	(15–94)	Not stated	400	16%
18 and 19	1975–77	Adults	Not stated	1.28 : 1	1152	25%
20	6 months, 1990	Surgical patients	74	1.4 : 1	50	68%
21	1977–87	General and vascular surgery patients	60 (14–93)	1.7 : 1	312	51%
22	1977–87	Non-cardiac vascular surgery patients	69 (50–87)	4.7 : 1	68	30–40%
23	1992–3	Medical patients	49	2.03 : 1	152	16%
24	1984	Medical patients	Median age 62 (17–94)	1.3 : 1	143	47%
25	1999–2000	Adults	78 (28–100)	1.1 : 1	440	21%

investigated surgical patients[11,13,16,20–22] and two studied medical patients.[23,24]

SOURCE OF CLINICAL INFORMATION

Clinical information was obtained from patients' notes in most papers. In some a formal or 'dummy' death certificate or *proforma* was completed by clinicians prior to post mortem and was then compared with the post mortem findings.[15,18,19,24,25] In another study a clinical conference was held, where the clinicians decided on the clinical diagnoses before they knew the results of the post mortem.[12]

HISTOLOGY

Histology was used, but not discussed further, in several studies.[14,17–19] In two, histology was taken

on all cases[8,9] and in another[25] it was taken on 60%, and reported in 38% of these. In this study 97% of the histology reported confirmed the macroscopic diagnosis. In the article by Zaitoun and Fernandez[8] 6–12 histology blocks were taken on all of their 108 cases. Five percent of the major diagnoses and 23% of all clinically unexpected diagnoses were found on histology only. The major conditions diagnosed on histology only included five of 26 confirmed cases of bronchopneumonia and seven of 18 confirmed cases of pulmonary fibrosis/emphysema.

CLINICAL/POST MORTEM DISCREPANCY

The discrepancies between clinical and post mortem diagnoses ranged from 15%[15] to 41%[24] with a discrepant major diagnosis, with a rate of 30%[8] to 63%[16] for the cause of death. Between 45%[14] and 76.5%[13] of all post mortems revealed at least one clinically unsuspected finding, with most studies giving a figure of around 50%.

Goldman *et al.*[26] classified discrepancies into four categories

Class 1: a discrepant diagnosis with a potential impact on survival

Class 2: a discrepant major diagnosis but with equivocal or no impact on survival

Class 3: a discrepant minor diagnosis that could have been diagnosed before death

Class 4: a discrepant minor diagnosis that could not have been made before death

This classification was used in only two papers[13,23] and in another,[10] cases that would be classified as Goldman class 1 could be identified. In the other studies Goldman's classification could not be applied.

MAIN DIAGNOSIS

Surgical patients

Six studies of surgical patients noted a low discrepancy rate in the main surgical diagnosis but a higher one for complications of the surgical problem or treatment. Discrepancy rates for the primary surgical diagnoses were 1% among 68 non-cardiac vascular surgery patients;[22] 5% among 77 surgical patients with gastrointestinal tract disorders;[11] and 7% among 312 general and vascular patients[21] (including those patients in references 11 and 21).

The discrepancy rates for the diagnosis of complications alone among these patients were 40% for all the surgical patients,[21] 41% for vascular surgery patients[22] and 43% for patients with gastrointestinal tract disease.[11] Overall discrepancy rates for diagnosis of the primary complaint plus complications in surgical patients were 20.6%[13] and 28%[20] for major diagnoses and 63% for the cause of death.[16] The most common discrepant diagnoses were pulmonary embolism (PE) and peritonitis/perforated viscus. Two papers noted that the most common error in treatment was failure to do, or repeat, a laparotomy due to underdiagnosis of peritonitis/perforated viscus[16,21] seen in 11% of all patients in one study.[16] Peritonitis and other acute abdominal conditions, including intestinal ischaemia, were also often discrepant in studies which included all groups of patients[8,17,18] and the elderly.[9]

Medical patients

Only two studies concentrated on medical patients. In one, the discrepancy rate for the main admitting diagnosis was 25%, and 41% of the 143 patients had a major discrepancy.[24] In the other, 35% of 152 patients had a significant discrepancy and in 10% of all cases the patient would have been treated differently if the diagnosis had been correct.[23]

All patient groups

Most studies examined discrepancies in the main admitting diagnosis and found discrepancy rates ranging from 15% of 154 patients[15] to 39% of 1152 patients.[19] When larger numbers of patients were studied the discrepancy rates for these series lay at the higher end of the scale (15.6% of 428 patients,[12] 25% of 3042 patients[14] and 29% of 2145 patients[10]).

In a study including adult medical and surgical patients, Cameron and McGoogan[15] increased the autopsy rate to 65% during the period of their study to reduce a possible bias due to only difficult cases being autopsied. The clinicians were asked to complete a dummy death certificate indicating the cause of death, the main admitting diagnosis, the confidence of their diagnosis and whether they would normally have asked for an autopsy. The discrepancy rate for the main diagnosis was 12% when the clinicians described themselves as 'certain' or 'fairly certain', compared with a rate of 15% for all levels of certainty. In cases where the clinicians said they would have requested an autopsy, the discrepancy rate for the main diagnosis was 15%. In cases where they would not usually have requested one, it was similar, at 14%.

In a study including medical patients the discrepancy rate for the main diagnosis was 6% when the diagnosis was 'certain', 28% when the diagnosis was 'probable' and 60% when it was 'uncertain'.[24] In this study the clinicians could give several main diagnoses, in the study by Cameron and McGoogan only one main diagnosis could be given.

CAUSE OF DEATH

Four studies looked specifically at the cause of death. The discrepancy rates ranged from 30% (108 adult cases)[8] to 63% (64 general surgery patients).[16] The mean discrepancy rate was 45.5%, based on a total of 766 patients. Again, it is interesting that the series with the largest number of cases had a high discrepancy rate (53% based on 440 adults[25]). In the study of confidence of diagnosis by Cameron and McGoogan,[15] the cause of death was discrepant in 38% of cases where clinicians described themselves as 'certain' or 'fairly certain' and 42% for all levels of certainty. In another study of 1152 patients,[19] these authors found the discrepancy rate was 25% for causes of death described as 'certain' by clinicians, 45% when it was 'probable' and 54% when it was 'uncertain'.

POTENTIALLY TREATABLE CONDITIONS

Seven studies identified the number of patients with a potentially treatable condition[10,13,16,17,19,21,23] which was undiagnosed clinically. The discrepancy rate ranged from 10% among 152 medical patients[23] to 44% of 2145 patients from all groups.[10] Two studies of adult medical and surgical patients found discrepancy rates of 13% among 400 patients[17] and 38% among 1152 patients.[19] Three studies of surgical patients[13,16,21] showed discrepancy rates ranging from 11% (312 patients)[21] to 28% (64 patients)[16] with a mean of 19.9% based on a total of 589 cases.

Some authors identified those patients who would potentially have survived if they had been correctly diagnosed and treated: these are given in Table 2.

CONDITIONS COMMONLY LEADING TO DISCREPANCIES

The main diagnoses leading to discrepancies were PE,[8,9,11,17–19,21–23,25] cardiovascular disease/myocardial infarction,[9,11,14,17–19,22,23,25] pneumonia[8,11,17,19,22,23] and infections at other sites.[9,10,18,19,23] These are all potentially treatable and/or preventable. Pulmonary emboli, ischaemic heart disease/myocardial infarction and pneumonia were often confused with each other.

Many of the studies calculated the sensitivity/specificity rates of some common clinical diagnoses (see Table 3).

CHANGE IN DISCREPANCIES OVER TIME

Changes in the sensitivity and specificity of clinical diagnosis over time were examined in a review paper.[7] Eleven common diagnoses were chosen for the study because the authors felt they usually had unambiguous macroscopic findings. These were pulmonary tuberculosis (TB), cirrhosis (not including biliary or cardiac cirrhosis), peptic ulcer, rheumatic heart disease, leukaemia, gastric carcinoma, carcinoma of the liver/extrahepatic bile ducts, peritonitis, myocardial infarction/coronary thrombosis, PE and carcinoma lung/bronchus. Only cases where the condition was the underlying cause of death, or contributed significantly to death, were included. The sensitivity and specificity were calculated for various time periods between 1930 and 1977. Some conditions showed a decline in diagnostic sensitivity/specificity (Table 4) (e.g. TB, peritonitis, gastric carcinoma and liver/biliary carcinoma); some showed an improvement (e.g. rheumatic heart disease and leukaemia), and some showed no sustained change over time, e.g. PE, which has a low diagnostic sensitivity across centres and time periods (see Table 3).

Goldman *et al.*[26] compared major discrepancies (class 1 and 2) over three time periods and found that the overall rate did not change with time (see Table 5). Discrepancies moved between classes 1 and 2 over time as class 2 discrepancies in earlier periods, when no effective treatment was available, became class 1 discrepancies as new treatments were developed.

Table 2. Cases where the patient would potentially have survived if the clinical diagnosis had been correct

Author	Year	Total no. of patients	Discrepancy (%)	Group of patients
Goldman *et al.*[26]	1983	300	10.3	All
Mercer, Talbot[17]	1985	400	13	Adults
Battle *et al.*[28]	1987	2067	13.2	All
Shanks *et al.*[13]	1990	213	20.6	Perioperative deaths
Bernicker *et al.*[23]	1993	152	10	Medical patients

Table 3. Sensitivity and specificity of some common diagnoses

Reference	8	9	10	11	14	17	18	21	22	25
Pulmonary embolism	0.24/0.93	0.26	0.16	0.67/0.98		0.25/0.97	0.28/0.97	0.29/0.96		0.23
Pneumonia	0.70/0.88		0.47	0.84	0.56 (77–78) 0.64 (87–88)	0.51/0.93		0.74/0.96	0.76/0.98	0.52
Myocardial infarction/ ischaemic heart disease	0.69/0.96	0.26	0.76/0.97	0.75/0.94	0.71/0.96 (77–78) 0.61/0.95 (87–88)	0.69/0.96	0.80/0.94	0.72/0.96	0.71/0.88	0.34
Cerebral haemorrhage	0.78/0.93		0.87			0.86/0.99	0.65/0.96			0.96
Peritonitis/ acute abdomen		0.28		0.87/1.00			0.48/0.99	0.88		
Malignancy	0.77/0.89		0.75		0.94/0.86 (77–78) 0.94/0.85 (87–88)	0.92/0.93				0.65

Figures are given as sensitivity/specificity. For 9, 10, and 25 the figure is for sensitivity only
In paper 14, the first figure is for 1977–78, and the second for 1987–88.

Table 4. Sensitivity and specificity of some common diagnoses over time

Diagnosis	1930–39	1975–77
Pulmonary TB	0.91/0.994	0.50/0.992
Hepatic cirrhosis	0.57/0.998	0.70/0.995
Peptic ulcer	0.66/0.998	0.34/0.998
Rheumatic heart disease	0.46/0.998	0.70/0.997
Leukaemia	0.90/0.999	0.96/0.999
Gastric carcinoma	0.73/0.996	0.61/0.994
Liver/biliary carcinoma	0.40/0.998	0.28/0.998
Peritonitis	0.61/1.00	0.48/0.997
MI/coronary thrombosis	0.26/0.997	0.76/0.937
Pulmonary embolism	0.41/0.988 (figures from 1934–39)	0.44/0.966
Carcinoma lung/ bronchus	0.70/0.998 (figures from 1940–49)	0.66/0.985

Figures are given as sensitivity/specificity.
MI, Myocardial infarction.

Table 5. Major discrepancy rate over time

	1959–60	1969–70	1979–80
Class 1	8%	12%	11%
Class 2	14%	11%	10%
Total	22%	23%	21%

DIAGNOSTIC TESTS

Four studies noted that some patients had a discrepant diagnosis due to a misleading result from a diagnostic test. This occurred in 3% of 68 vascular surgery patients,[22] 4% of 312 general and vascular surgery patients,[21] 4.4% of 428 patients[12] and 6% of 77 surgical patients with gastrointestinal tract disorders.[11] These discrepancies occurred even though tests were judged to have been appropriately requested and performed. Goldman *et al.*[26] studied discrepancies due to diagnostic tests between 1960 and 1980. They classified tests into three categories and found that 1% of 209 endoscopies/biopsies/surgical explorations led to a discrepant diagnosis, as did 0.7% of 541 standard radiology procedures and 3% of 157 computed tomography (CT)/ultrasound/ isotope scans.

Discussion

Despite around 100 years of research it is still difficult to compare results, as various studies look at different aspects and types of discrepancy and classify discrepancies in different ways. Goldman *et al.*[26] suggested a useful method of classification in 1983 but it was used by only two other studies.[13,23] Veress and Alafuzoff[14,20] devised their own classification of discrepancies. Use of a defined classification system would enable the results of different studies to be compared more easily. The Goldman classification is useful in that it differentiates between major and minor discrepancies and identifies those deaths where the discrepancy had an impact on patient survival. However, this requires a judgement about whether a patient would have survived or not, which may be difficult to determine. Discrepancies may be better divided into:

Discrepancies of potentially treatable major conditions (those leading to, or significantly contributing to death)

Discrepancies of untreatable major conditions

Discrepancies of minor/coexistent conditions

This would highlight the most significant discrepancies without requiring a judgement about potential survival.

These studies deal with different groups of patients which may not be comparable. Many of the conditions affecting and causing death are different between children and the elderly, and between medical and surgical patients. The same condition may also present differently in a young child compared with an adult or an elderly person.

Clinicians appear to be more accurate in diagnosing the main admitting condition, with discrepancy rates ranging from 15 to 30% and lower (6–12%) when they were confident of the diagnosis. The cause of death produces more discrepancies than the main diagnosis, with rates of 30% and above. In the studies by Cameron and McGoogan, clinicians filled in a dummy death certificate before the autopsy. In their larger study 1152 cases were included (autopsy rate 25%) and they found 25% of causes of death described as 'certain' were incorrect. This rose to 54% when clinicians were 'uncertain'. To reduce the possible effects of selection bias they increased their autopsy rate to 65% for 6 months and found the cause of death was discrepant in 38% of cases[15] even when clinicians were 'certain' or 'fairly certain'. These studies indicate the cause of death is likely to be wrong on at least a third of death certificates. It is not possible to predict clinically which cases will reveal discrepant diagnoses: Cameron and McGoogan showed that the discrepancy rate was similar in cases where clinicians would not normally have requested an autopsy compared with those where they would.

Ten to thirteen percent of deaths are potentially avoidable if the patient is correctly diagnosed and treated. The rate among perioperative patients was as high as 20.6%[13] in one study, although the National Confidential Enquiry into Patient Outcome and Death (NCEPOD) report published in 2002[27] gives a figure of 6% for potentially avoidable deaths.

The overall major discrepancy rate seems to have remained the same since 1960.[26] Goldman found a shift in discrepancies from class 2 (a discrepant major diagnosis but with equivocal or no impact on survival) to class 1 (a discrepant diagnosis with a potential impact on survival) between the 1960s and 1980s but with no change in the overall discrepancy rate. He attributed this to effective treatments for previously untreatable conditions becoming available during that time, shifting some causes of death from class 2 into class 1.

It is important to note that these discrepancy rates apply only to those patients who die and have an autopsy. The rate of diagnostic errors may be lower now, but since the majority of patients survive their hospital stay, they are not included in our figures and the discrepancy rate appears to remain the same. Patients who died after being discharged from hospital were included in only one study,[13] so most do not appear in our figures, either.

The conditions leading to discrepancies have also changed: some conditions are better diagnosed today than in the past, others less well. Overall diagnostic sensitivity appears to have remained the same over time, with diagnosis of some conditions improving, others worsening. Pulmonary TB had a diagnostic sensitivity of 0.91 in the 1930s, which had fallen to 0.5 in the 1970s.[7] It may have been less well diagnosed recently due to lack of experience of the disease among many doctors. Diagnosis may improve as rates of the disease increase. PE is a frequently cited cause of discrepancies, and diagnostic sensitivity has not improved with modern methods. Sensitivity was 0.41 in the 1930s, 0.44 in the 1970s[7] and 0.23 in 1999–2000.[25] Although many of the calculated sensitivities are based on results from different centres, some authors studying diagnostic discrepancies at the same centre over different time periods find a consistently poor sensitivity for PE between 1960 and 1980[26] and a falling sensitivity for TB between 1977 and 1988.[14] Pneumonia and ischaemic heart disease/myocardial infarction are also common causes of discrepancy, as

these conditions can be confused with each other and all may present with a wide spectrum of symptoms. Acute abdominal conditions are another major cause of discrepancy in all groups of patients, but especially surgical patients, in whom missed cases affect up to 11% of patients dying perioperatively.[16]

Several studies noted a declining autopsy rate and some considered the potential effect of a low autopsy rate to raise the apparent discrepancy rate as the cases which are thought to be least likely to show discrepancies do not undergo autopsy. There are studies showing this effect[28] and one study of 300 patients in a centre with an autopsy rate of around 90% found a declining major discrepancy rate from 30% in 1972 to 14% in 1992.[29] The study by Cameron and McGoogan[15] designed to reduce this potential bias, with an autopsy rate of 65%, found little difference between cases where the clinicians were confident of their diagnosis and those where they were not; there was also a similar discrepancy rate in cases where the clinicians would have requested an autopsy to those where they would not.

In a small percentage of cases (4–6%) a misleading diagnostic test led to a discrepancy and it is important to know how often a test is likely to give a false-positive or false-negative result to interpret it appropriately. The most recent paper studying this appeared in 1980[26] and showed the lowest rate of discrepancy with standard radiology and the highest with newer methods of diagnosis (CT, ultrasound and isotope scans). With increasing experience and improved methods and machines, these discrepancy rates may now be lower.

The Royal College of Pathologists recommends histological sampling of all major organs as part of a full autopsy in its guidelines on autopsy practice (2002), depending on consent from the relatives and/or the coroner. Lack of histology significantly detracted from the quality of the autopsy report in 28% of reports examined by NCEPOD in their 2001 report.[30] Few of the papers studied specifically examined histology. Those that did showed that diagnoses made on macroscopic examination were altered by histology and that macroscopically normal organs showed histological abnormalities. Microscopy gave diagnoses not made macroscopically in 5% of main diagnoses and 23% of all unexpected diagnoses in one study.[8] In a study of pneumonia, 23% of confirmed cases were diagnosed only on histology, with 31% of macroscopic diagnoses of bronchopneumonia unconfirmed by microscopy.[31] We have seen acute respiratory distress syndrome and carcinoma misdiagnosed as lobar and bronchopneumonia. Therefore, histology is still essential to confirm or refute macroscopic diagnoses. However, the impact of the Human Tissue Act is likely to reduce further the amount of histology that is taken, with a consequent reduction in the accuracy of the autopsy diagnosis. There are also problems with taking samples unrelated to the cause of death which may hinder the investigation of genetic conditions, with potential impact on the deceased's relatives. There is now therefore an ethical problem facing pathologists who may be banned from taking histology by coroners.

The Fundamental Review of Death Certification and Investigation[5] states that one of the functions of the death certification process is to provide mortality statistics essential for public health, and that there is a need for improvement in this area. It also acknowledges that 'substantial discrepancies and levels of error' have been identified when comparing autopsy findings with clinical diagnosis, and when examining the completion of death certificates. The report fails to address the problem of diagnostic discrepancies and although it is recommended that the death certification process should be audited, there is no comment made on specific audit of the accuracy of death certificates. The report makes recommendations that will lead to 'a significant reduction' in the coroners' autopsy rate, while admitting that 'there is no evidence base from which to assess properly the indications for autopsy as opposed to other investigations by coroners, there is no foundation on which to build a detailed reduction target'. The evidence shows that it is not possible to predict which cases will show diagnostic discrepancies and which autopsies could be avoided.

If knowledge of diagnostic discrepancies is to benefit patients, then autopsy results must be given to clinicians promptly and reports must contain an adequate summary correlating the clinical and autopsy findings. With an increasing emphasis on audit and clinical governance, the audit of diagnostic accuracy is essential. Although alternatives to the autopsy are being researched, the autopsy, including histology, remains the most accurate means of determining the cause of death and other significant and incidental diagnoses.

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