SHORT REPORT

Evidence for cause of death in patients dying in an accident and emergency department

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Objective: This study assesses the evidence used for certification of the cause of death in an accident and emergency department.

Methods: The subjects were all patients for whom a certificate of the cause of death was issued in the A&E department of a Scottish district general hospital over a period of two years from September 1998 to August 2000. The case notes and details of necropsies were examined for evidence of the cause of death. Patients were allocated to one of three descending categories according to the strength of the evidence available; (1) Evidence of the cause of death was available at the time of death or from postmortem examination. (2) There was a history (hospital notes/from relatives/from GP) of morbidity supporting the cause. (3) There was no recorded history of morbidity supporting the stated cause of death.

Results: There were a total of 28 deaths in the A&E department over the study period. Two of the patients who died in A&E received postmortem examinations and had death certificates completed by pathologists. Death certificates were issued from A&E for a total of 24 cases. Of these 24, nine patients had strong evidence of the given cause of death and eight patients had a past history or other identifiable evidence that could support the cause of death. The cause of death in seven patients was not directly supported by available evidence.

Conclusion: Death certificates issued in an A&E department were supported by strong evidence in one third of cases. Many certificates seem to be issued with slender evidence for the cause of death readily identifiable, and few patients are subjected to necropsy.

Accident and emergency (A&E) occupies a position between the community and the hospital ward. Evidence for the cause of death in A&E may be obtained from examinations not immediately available in the community, such as ultrasonography and electrocardiograms. In contrast with the situation in the community however, A&E medical staff are presented with patients they do not know. Postmortem examinations are undertaken "inhouse" at the discretion of the supervising hospital team and sometimes at the request of the deceased's family. They may also result from deaths that have been referred to the procurator fiscal (PF) and have been granted a postmortem examination as a legal requirement. Doctors need to be aware of the nature of deaths that require referral to the PF but essentially it is the duty of the PF to inquire into all sudden, suspicious, accidental, unexpected, and unexplained deaths and moreover into deaths where the doctor is unable to certify a cause.¹ Necropsy rates are continually falling worldwide.^{2,3} In Scotland the average hospital necropsy rate is 32%, representing a 57% decline from 1986 to 1994.³ In England and Wales in 1999, 33% of deaths were referred to the coroner and 62% of these had a postmor-

tem examination performed. In Scotland the figures were 24% referred to the PF and a 40% necropsy rate.⁴ Careful examination of case records coupled with postmortem findings has been proposed as the most accurate way to determine the cause of death.^{5,6} We are aware of several studies that have investigated the issue of death certification, postmortem rates and postmortem findings in inpatient departments but little work has examined what happens in an A&E department. This study attempts to identify what evidence the doctors used to complete death certificates on the patients who died in our department.

METHODS

We examined the counterfoil of the A&E death registration book to identify all patients who had a death certificate issued from A&E over a period of two years from September 1998 to September 2000. A computerised search of the database was made to uncover all patients who had died in the department. The pathology department was asked to provide details of any postmortem examinations performed on patients from A&E. The hospital notes and A&E records of all patients were examined by one doctor (MQ).

RESULTS

There were 28 deaths in the A&E department in the two year period. The department sees about 30 000 cases a year. A death certificate was completed in A&E in 24 cases. One case had a death certificate completed by another hospital unit and another case had a certificate completed by the patient's GP. Two patients had postmortem examinations; the death certificates being completed by a pathologist. One of the postmortem examinations was carried out on a trauma case as a legal requirement, and the other was carried out at the request of the deceased's family.

Examination of the clinical notes established what evidence was used to arrive at the cause of death and identified if the case had been discussed with the GP or the PF. To determine the evidence for cause of death we considered all recorded details about the death, including elements of the history, clinical examination, and investigations. This included electrocardiograms (ECG), blood test results, and the findings of computed tomography (CT) scan or ultrasound. The case notes were examined for evidence of medical history (verified ischaemic heart disease or known aortic aneurysm for example) and drug history. Their presence was assumed to represent evidence of other active disease processes that the certifying doctor may have considered as contributing to the cause of death. If there was reported history available from a family member (the presence of chest pain before a collapse or a recent history of increasing angina, etc) then this again was assumed to contribute to evidence of a possible cause of death.

Three categories of evidence were considered;

1 There was acute evidence at presentation, either clinically, in the history or in investigations performed. (Table 1).

Table 1 Acute evidence for cause of death; nine cases

Death certificate entry	Age	History	Main evidence for cause of death
Abdominal aneurysm	68	Abdominal pain/collapse	Ultrasound showed aneurysm
	77	Abdominal pain/collapse	Ultrasound showed aneurysm
	70	Abdominal pain/collapse	Died in theatre during repair
	79	Abdominal pain/collapse	Died in theatre during repair
Myocardial infarct	86	Collapse	Acute ECG changes
Myocardial infarct	75	Chest pain/collapse	Acute ECG changes
Myocardial infarct	80	Collapse/hypotensive	Acute ECG changes
Cardiac failure	82	Gross clinical failure	Ischaemic ECG
Cerebrovascular accident (CVA)	74	Collapse/unresponsive	CT showed acute infarct

Table 2 Secondary evidence for cause of death; nine cases

Death certificate entry	Age	Main evidence	Additional evidence	Discussed with GP	Discussed with PF
Ischaemic heart disease (IHD)	73	Proven IHD	Sudden collapse/VF arrest	yes	yes
IHD	74	Proven IHD	Found unconscious	no	no
			Previous VF arrest		
IHD	81	Proven IHD	Sudden collapse	yes	yes
Myocardial infarct (MI)	64	Proven IHD	Sudden collapse	no	no
MI	79	Proven IHD	Sudden collapse	yes	yes
MI	87	Proven IHD	Sudden collapse	yes	yes
MI	72	Proven IHD	Sudden collapse previous VF arrest	yes	yes
Abdominal aortic aneurysm	71	Known aneurysm	History of abdominal pain and sudden loss of output	no	no

Table 3 No concrete evidence for cause of death; seven cases

Death certificate entry	Age	Main evidence available	Discussed with GP	Discussed with PF
MI	76	Sudden collapse PMH high blood pressure (HBP)	yes	yes
		son gave history of recent chest pain		
MI	76	Sudden collapse PMH HBP	yes	yes
MI	86	Found collapsed PMH CVA	yes	yes
VF/IHD	68	Found collapsed	yes	yes
		PMH CVA, HBP, peripheral vascular disease		
MI	80	Sudden collapse PMH primary biliary cirrhosis	yes	yes
MI	87	Sudden collapse PMH HBP	yes	yes
Cardiorespiratory arrest	86	Choking episode collapse and VF arrest	yes	yes

2 There was secondary evidence in relation to medical history, previous pathology, drug history, or obtained from discussion with GP/relatives. (Table 2)

3 There was no evidence for a cause of death identifiable, as determined by the investigators. (Table 3)

DISCUSSION

Given that most patients who die in an A&E unit are unknown to the medical staff, it is remarkable that many death certificates issued are supported by little evidence for the causes of death stated. Death certificates would appear to be completed on the basis of available clinical information, from the history, or after discussion with the GP or the PF. Predicting the cause of death by analysing available clinical information has been shown to be an inaccurate process.⁴ Three pathologists in England attempted to predict the cause of death in 568 people by examining case notes. They were able to offer a prediction in 56% of cases and this matched the necropsy findings in 43%.⁴ When the cause of death is clinically "fairly certain" it has been confirmed correct in 71% of cases, but when the cause is clinically "uncertain" the agreement with PM findings decreases to 36%.⁶

Necropsies are performed infrequently on patients dying in A&E and most doctors are aware of a growing aversion to postmortem examinations on the part of relatives. However, the fact that all cases where little evidence was available were discussed with the PF, suggests that doctors are well aware of the potential pitfalls. Unexpected findings are discovered at postmortem examination and these can have important health implications.² In 1000 postmortem examinations in Sussex, England, 575 important findings were uncovered in 532 cases; these findings would have been investigated and treated if detected in life.⁷ American research has shown how up to 40% of necropsies demonstrated clinical findings that would have led to a change in management had they been discovered in life.² In deaths occurring in a medical intensive care unit necropsies uncovered new active diagnoses in 90% of cases, although the primary clinical diagnosis was accurate in 83% of cases.² Other studies have highlighted disagreement rates of 12%–22% between the PM cause of death and that stated in the death certificate.⁵

There are many reasons why necropsy rates have declined. More sophisticated and non-invasive diagnostic techniques are available that can confirm diagnoses without the need for postmortem examination.^{2,3} However, in contrast with those

patients in hospital wards the patients who die suddenly in A&E often have not had the time to undergo computed tomography, echocardiography, or ultrasound. Some work has suggested that physicians may be more reluctant to request necropsy for fear of litigation if new or different causes of death are uncovered.² There may be cost and staffing constraints that restrict necropsy use but studies have also confirmed that the limiting factor is often a reluctance of doctors to ask for a postmortem examination and a refusal of families to grant it.^{2,3} A Scottish study on ITU deaths revealed how the seniority of the doctor making the request and the number of family members present did not affect the decision of the relatives to allow the postmortem examination to proceed. The main reasons given for refusal were that the procedure would not benefit the deceased and that they had been through enough already.³ On introducing a universal postmortem requesting policy in all patients dying in a hospital ward, consent rates of 31%–53% have been achieved.^{2,3} The feelings of relatives of ITU/ICU patients may not reflect those of the relatives of patients who die unexpectedly in A&E.

Often sudden deaths of patients arriving in an A&E department are given the label of myocardial infarct; a label that is seldom questioned socially, medically, or legally. Six of the seven cases in our study that showed no supporting evidence for cause of death fell into this category. Circulatory disease is over-reported as the cause of death in up to 25% of patients and at the same time it can be under-reported by 18%–30%.^{5,6} Research has illustrated how deaths attributable to cardiovascular disease showed well established evidence of cause in only 12% of cases and inadequately established cause in 47%.⁶ Forty per cent of myocardial infarctions can be silent or atypical and therefore not clinically recognised, yet it is both the most over diagnosed and most under diagnosed entry on death certificates.⁷ Patients frequently die of causes unrelated to pre-existing problems and even using case notes to arrive at the cause of death can be misleading.⁶

It is generally realised that death certificates have limited reliability and validity as a source of mortality statistics and despite these weaknesses they are still used for epidemiological processes, health planning services, and research.^{5,6} Some work has suggested that as much as 30% of major cardiovascular findings and 34% of respiratory findings are not recorded on death certificates because they are clinically silent.⁷ Death certificates issued from A&E would seem to perpetuate a false picture of our nation's health.

Doctors feel pressure from families, GPs, and the fiscal system to make rapid decisions about the cause of death and this inevitably leads to errors, especially in the emergency department where there is a lack of familiarity with the deceased.⁶ The doctors may have to rely on information from relatives at times when communication is difficult. A sudden death is such a traumatic event that is difficult for junior doctors to approach family with requests for a postmortem examination, let alone the family agreeing to allow it to proceed. It might be much kinder and often more convenient for us to issue a certificate on tenuous evidence rather than pursue and organise a necropsy.

Not only does a necropsy aid as a teaching tool but confirming a diagnosis can be reassuring for medical staff and family and may be important for the grieving process.³ A&E doctors could be forgiven a little uneasiness when they complete certificates of the cause of death, uneasiness on their own behalf and that of the deceased.

Study weaknesses and further research

The numbers in our study are small and not suitable for statistical analysis but the findings should prompt other departments with larger numbers to examine their practices

and establish guidelines for issuing death certificates and requesting necropsies. In our opinion the categories of evidence we arrived at represented the realities of clinical practice in our department. They may not apply to other hospitals or departments. Inevitably the evidence for the cause of death required qualitative assessment of the available documentation and we relied on the accuracy and completeness of clinical note keeping. There may have been other findings that the certifying doctor may have used to establish the cause of death that were not recorded (verbal discussion with GP, clinical findings, etc). To promote consistency in interpreting the evidence only one investigator reviewed the notes. By performing this audit we also identified deficiencies and inconsistencies in the quality of note keeping and documentation at the time of death. An area that would merit study in future work.

Conclusion

Death certificates issued in our accident unit were supported by strong evidence in one third of cases. Many certificates are issued with slender evidence of the cause of death available, and few patients are subjected to necropsy. Information from such death certificates may misrepresent true mortality statistics. Improving the accuracy of death certification will result from promoting necropsy use. Greater use of necropsy will entail a combined approach in educating the doctors involved in dealing with sudden death, defining the role of the PF and changing the public perception of the nature and purpose of postmortem examinations.^{2,3}

Contributors

Michael Quigley gathered the clinical information, analysed the data, and performed the literature search. John Burton and Michael Quigley were responsible for discussing core ideas and formulating the nature of the audit. Both authors contributed to writing the paper. Dr A McGowan, consultant in A&E, St James Hospital Leeds will act as guarantor for the paper. We would like to thank Dr Ivan Gibson, Department of Pathology, Dumfries and Galloway Royal Infirmary.

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REFERENCES

- 1 The Scottish Office Department of Health. *Death and the procurator fiscal*. Edinburgh: The Scottish Office Department of Health, 1998.
- 2 Blosser SA, Zimmerman HE, Stauffer JL. Do autopsies of critically ill patients reveal important findings that were clinically undetected? *Crit Care Med* 1998;**26**:1332–6.
- 3 Wright JC, Grant IS. Evaluation of the autopsy following intensive care. *British Journal of Intensive Care* 2001;**11**:6–9.
- 4 Rutty GN, Duerden RM, Carter N, et al. Are coroners' necropsies necessary? A prospective study examining whether a 'view and grant' system of death certification could be introduced into England and Wales. *J Clin Pathol* 2001;**54**:279–84.
- 5 Kircher T, Nelson J, Burdo H. The autopsy as a measure of accuracy of the death certificate. *N Engl J Med* 1985;**313**:1263–9.
- 6 Smith CJ, Scott SM, Wagner BM. The necessary role of the autopsy in cardiovascular epidemiology. *Hum Pathol* 1998;**29**:1469–79.
- 7 Sullivan JP. The coroner's necropsy in sudden death: an underused source of epidemiological information. *J Clin Pathol* 1996;**49**:737–40.