



Original Article

Underreporting of Death Certification in a University Teaching Hospital – A Hospital Based Study in Ireland

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SUMMARY

Background: Death certificates are frequently used as the source for epidemiological data on the prevalence of diseases. We postulated that comorbidities may be under-documented, particularly in older patients with multiple coexisting conditions.

Methods: Death certificates completed during a six-month period notification forms completed between January and June 2016 To investigate the accuracy of death certificate completion in Galway University Hospital, with specific emphasis on accurate documentation of common comorbidities. A retrospective review of and comparison with the deceased patients' casenotes. All death certificates were divided into those relating to patients aged over and under 75 years. Death certificates were examined for accuracy and documentation of comorbidities and these, (and the number of omissions) were compared with the actual diagnoses documented in the patients' casenotes.

Results: The cause of death was accurately documented in all Death Certificates. Overall, comorbidities were more common and omissions were more frequent in the older group compared with the younger cohort, with at least one comorbidity omitted in 71% of death certificates versus 56% ($p = 0.0481$). For individual diagnoses, under-documentation rates were similar in both age-groups.

Conclusions: While the actual cause of death was accurately completed in the death certificates reviewed in this audit, the majority of certificates in both age groups omitted one or more important comorbidity. This result may be due to an inappropriate over-emphasis in training on accurate documentation of the correct cause of death.

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1. Introduction

Death certification is a formal documentation of the cause of death of individuals. As with all legal documentation, accuracy of death certification is paramount. The World Health Organization provides standards on recording causes of death in ICD-10¹ and hospital doctors are expected to adhere to these guidelines when filling out death certificates.

Reliable mortality data are essential not only in tracing risk factors for disease among families and the population, but also as the source of epidemiological data on the burden and prevalence of disease. Death certificates provide a potentially valuable source of primary data pertaining to frequency of disease and, the more

comprehensive the documentation of all comorbidities of the deceased, the better the prevalence data derived from this source. Older patients are characterized by complex presentations often involving an acute illness with multiple interplaying coexisting conditions.

A study in the United Kingdom reported significant inaccuracies in the completion of death certificates among hospital doctors. In that study, the authors focused on omissions of ascertainable data in the forms, such as patient age and inclusion of consultant name and deemed that 13.6% of death certificates did not meet statutory criteria, while 58.6% were deemed to have minor errors and omissions.²

The present study is a retrospective assessment of all death certificates completed in Galway University Hospital (GUH) between January and June 2016. The aim of the study was to determine the accuracy of death certificate completion in terms of cause of death with a particular emphasis on how comprehensive the documentation of relevant comorbidities was. Furthermore, the

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study explored whether increasing age was associated with a change in the accuracy of completion.

2. Methods

All death notification forms of patients who died between January and June 2016 in Galway University Hospital (GUH) were obtained and examined. In Ireland, the recommended method of optimal completion of a death certificate requires documentation of not only the primary cause of death, but also any antecedent conditions leading to this cause of death, along with any other comorbidities of the deceased.

All death certificates were assessed by one of two reviewers and they were not blinded to the original diagnoses. Firstly, death certificates were divided into those of patients aged older than 75 years versus those less than that age at the time of death. Descriptive data of the population were obtained from case notes, and these data are demonstrated in Table 1 including the gender breakdown in both groups, those who had less than or greater than 3 comorbidities as well as those with specific comorbidities such as hypertension, atrial fibrillation, hyperlipidaemia, diabetes mellitus, rheumatologic diseases, psychiatric illnesses and dementia.

The death certificates were also evaluated for legibility (defined as not legible to both reviewers), utilization of abbreviations or whether date of birth or death were omitted.

Finally, information in the death certificates was cross-referenced with case notes. Death Certificates were deemed inaccurately completed where comorbidities or other important data were omitted. The percentage of death certificates that omitted a comorbidity in either the younger or older cohort was assessed. Again specific comorbidities were assessed and discrepancies between the actual diagnoses of the patients and those documented of death certificates were noted.

Statistically significant differences in death certificate completion between the younger and older cohort was determined using the chi-squared test. This test was chosen because we were interested in comparing rates and owing to the fact that the groups for comparison are independent of one another. The program Graphpad Prism was used to calculate the p-values, and statistical significance was confirmed when p was <0.05.

The study was approved by the GUH Research Ethics Committee.

3. Results

Between January and June 2016, 183 death certificates were completed in GUH. Of this population, 75 were aged less than 75 years and 108 were aged 75 years or older. Baseline characteristics of the population are described in Table 1. An increased proportion of those over 75 years had more than 3 comorbidities and similarly

Table 1
Baseline characteristic of patients in both younger and older groups.

	<75yo (N = 75)	≥75 yo (N = 108)	p-value
Men	47 (63%)	55 (51%)	0.16
Women	28 (37%)	53 (49%)	0.16
<3 Comorbidities	47 (63%)	34 (31%)	0.0001
>3 Comorbidities	28 (37%)	74 (69%)	0.0001
Hypertension	21 (28%)	57 (53%)	0.002
Atrial Fibrillation	11 (15%)	51 (47%)	0.0001
Hyperlipidemia	13 (17%)	21 (19%)	0.87
Diabetes Mellitus	9 (12%)	22 (20%)	0.2
Rheumatological comorbidities	1 (1%)	13 (12%)	0.02
Psychiatric comorbidities	8 (11%)	14 (13%)	0.81
Dementia	2 (3%)	24 (22%)	0.0004

that group had significantly more cardiovascular risk factors and other comorbidities than the younger cohort.

As demonstrated in Table 2, similar proportions of death certificates in both age groups were illegible and included abbreviations. Date of birth and date of death were omitted in only one death certificate in the entire study.

In all reviewed death certificates, the primary cause of death was accurate i.e. consistent with the documented cause of death in the case notes. This 100% accuracy may be due to reliance on the clinical medical record alone. Omission of a comorbidity was more common in the older group compared with the younger cohort, with at least one comorbidity omitted in 71% of death certificates versus 56% of the younger cohort (p = 0.0481). In all cases in both cohorts, psychiatric illnesses were not recorded on the death certificates. However, for some individual diagnoses such as atrial fibrillation, hyperlipidaemia, diabetes mellitus, hypertension, and dementia (albeit there were only 2 diagnoses of dementia in the younger cohort), under-documentation was equally poor in both cohorts.

4. Discussion

This study has demonstrated significant deficiencies in the quality of completion of death certificates in a consecutive series of all certificates completed over a 6-month period in a University Teaching Hospital. While the actual cause of death was accurate in all cases the greatest difficulty related to lack of documentation of significant comorbidities of the deceased person.

As anticipated, the older cohort (>75 years) had significantly more comorbidities at the time of death. Indeed at least one omission of an important condition was noted more frequently in the older group also. However, an unexpected finding was that, for individual conditions, particularly cardiovascular risk factors like hyperlipidaemia and diabetes mellitus as well as dementia, the rate of omissions was similarly poor in the younger group. If this was extrapolated to the population as a whole, there would be a significant underestimation of the prevalence of these conditions in younger age groups.

A previous similar study in the UK focused on identifying significant inaccuracies such as patient date of birth and consultant name.² While the current study found relatively few omissions in this regard, our major finding relates to inadequate documentation of significant associated conditions or comorbidities. Reliable mortality data are essential not only in tracing risk factors for disease among families and the population, but also as the source of epidemiological data on the burden and prevalence of disease. Death certificates provide a valuable primary source of data pertaining to frequency of such diseases and risk factors but if

Table 2
The accuracy and rates of omission of comorbidities in death certificates compared between age groups.

	<75 yo	>75 yo	p-value
Illegible	7 (9%)	9 (8%)	0.81
Abbreviations used	2 (2.6%)	4 (3.7%)	0.7
Omission of DOB/DOD	0 (0%)	1 (0.93%)	0.4
Actual cause of death omitted	0 (0%)	0 (0%)	1
Conditions/diagnoses omitted (total):	42 (56%)	77 (71%)	0.05
Hypertension	16 (76%)	39 (68%)	0.69
Atrial Fibrillation	5 (45%)	29 (57%)	0.52
Hyperlipidemia	13 (100%)	18 (86%)	0.42
Diabetes Mellitus	6 (66%)	6 (27%)	0.1
Rheumatological illnesses	1 (100%)	9 (69%)	0.51
Psychiatric illnesses	8 (100%)	14 (100%)	1
Dementia	1 (50%)	7 (29%)	0.54

completed inaccurately as highlighted here, any decisions such as planning for the healthcare needs of sufferers of such conditions would be equally inaccurate and probably inadequate.

As a specific example, mortality statistics are frequently used in studies on the epidemiology of dementia.^{3–6} Studies such as these are limited by concerns over inaccuracy of reporting of dementia in death certificates. In fact in one study it was found that dementia was included on the death certificates of only 53.6% of cases of clinically diagnosed dementia, rendering them an inaccurate source of data for mortality statistics in dementia.⁷ Data from our study was likewise particularly poor in relation to documentation of an established dementia diagnosis. While it was not addressed as part of our current project, the issue of incorrect causal sequence in documentation, as highlighted in studies on patients with diabetes mellitus and hypertension is an important contributor to inaccurate and misleading death certifications.^{8,9} Moreover, some recent literature had focused on multiple causes of death (MCO) analyses of common diseases such as diabetes mellitus¹⁰ and Parkinson's Disease¹¹ and both suggest increased accuracy relating to identifying the information gleaned from death certificates, using this method.

Moreover, a US study compared cause of death data from death certificates to Medicare data and found significant discrepancies. The study demonstrated that, of 2074 inpatient deaths, only 36.6% of death certificate's cause of death was in keeping with the reason for terminal hospitalization.¹² In contrast, some studies have concluded that death certification can provide accurate data for specific conditions. For example, one study found that prostate cancer was accurately recorded as a cause of death in death certificates when compare to an independent expert committee's estimation of cause of death. This study concluded that death certificates were a reliable source of mortality data in prostate cancer.¹³

Our findings may reflect an overemphasis on correctly documenting the actual cause of death and, probably due to a lack of education re the enormous potential of death certification as a source of valuable epidemiological data and information to aid healthcare planning, the documentation of comorbid conditions is neglected. While it was anticipated that this would mainly be a problem of older deceased patients, it was a surprise to note that it is equally problematic in the younger cohort. There is data supporting the benefits of active education in the area of death certification^{2,14–16} and the authors recommend that this should be instituted on the basis of our study findings. While not addressed in the current study, incorrect causal sequence of common conditions such as diabetes mellitus and hypertension has been reported as a potential source of inaccuracies in death certification.^{8,9} More recent literature suggests that multiple cause of death (MCO) analysis can increase the accuracy of death certification for chronic conditions such as diabetes mellitus¹⁰ and Parkinsons disease.¹¹

Completion of death certificates, both accurately and in a comprehensive fashion will provide useful information on prevalence of diseases and conditions as well as facilitating the compilation of accurate mortality statistic relating to those conditions. Enhancement of the quality of death certification with appropriate education should reap a significant reward to those planning our health services into the future.

Conflicts of interest

The authors have no conflict of interest to report.

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