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Statistical Bulletin

EXPERIMENTAL STATISTICS

Death Certification Reform: A Case Study on the Potential Impact on Mortality Statistics, England and Wales

Coverage: **England and Wales**
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Geographical Area: **Country**

Key findings

- A case study on medical examiner scrutiny of death certificates found that in 78 per cent cases the underlying cause of death remained unchanged.
- The broad underlying cause of death (as defined by International Classification of Diseases chapter) changed after medical examiner scrutiny in 12 per cent of cases.
- In the remaining 10 per cent of cases the underlying cause changed but remained in the same International Classification of Disease chapter.
- Following scrutiny by the medical examiner, there were 1 per cent more death certificates with an underlying cause of cancer (neoplasm), and an increase of 6 per cent in the proportion that were attributed to diseases of the circulatory system.
- The percentage of deaths attributed to a respiratory disease underlying cause decreased by 7 per cent after medical examiner scrutiny.
- In general, more conditions were mentioned on the death certificate as a result of scrutiny by medical examiners.

Summary

Introduction

Changes to the death certification process were proposed following the Third Review of the Shipman Inquiry (Smith, 2003) and the Fundamental Review of Death Certification carried out by the Home Office (Luce, 2003). These Reviews highlighted a lack of transparency and inconsistencies in the cause of death information provided.

Responsibility for completing the Medical Certificate of Cause of Death (MCCD) often falls to a junior medical practitioner, who in many cases has received little or no formal training in death certification. Under new legislation introduced in Health and Social Care Act 2012, due to be implemented in April 2014, all deaths that do not require investigation by a coroner will undergo the independent scrutiny of a locally appointed Medical Examiner (see Background Note 1).

Deaths are reported to a coroner for further investigation when the death has been as a result of an accident, suicide, violence, neglect (by self or others), or industrial disease and deaths for which the cause is not known. Around 40 per cent of deaths are reported to the coroner. If the coroner decides not to investigate further, the deaths are referred back to the doctor for certification. Coroners certify around 21 per cent of deaths

It is estimated that around 500 medical practitioners, typically experienced senior doctors or senior GPs will be appointed to 170 full-time equivalent posts medical examiner posts across England and Wales, providing full geographic coverage. Medical examiners will confirm or certify the cause of all deaths in a local area that are not investigated by a coroner.

They will carry out an independent and proportionate scrutiny of relevant health records, examining the deceased person's body (in most cases) and in all cases discussing the death with a relative or other appropriate person. It is expected that this intervention will strengthen safeguards for the public, make the process simpler and more open for the bereaved and increase the quality of certification and data about causes of death (Department of Health, 2012).

Data Collection and Cause of Death Coding

Data were collected from five pilot areas: Sheffield, Gloucestershire, Powys, Mid Essex and Brighton and Hove (See Background Note 2). The pilot areas implemented the proposed system in slightly different ways in order to test the process in different contexts and local configurations.

Although there were differences in the processes for gathering the information between the pilots, each met the core requirement that the medical examiner carried out an independent and proportionate scrutiny of deaths to either confirm the cause or to identify cases that needed to be notified or referred to a coroner.

For each death record, two Medical Certificates of Cause of Death (MCCD) (see Background Note 3) were collected:

- Cause of death proposed by the certifying medical practitioner before scrutiny by a medical examiner – proposed cause.

- Cause of death confirmed by a medical examiner after scrutiny – confirmed cause.

The proposed and confirmed cause(s) of death submitted were not independent as the confirmation process required the doctor and medical examiner to discuss and agree the confirmed cause(s) and in some cases the certifying doctor contacted the medical examiner for advice before submission of the proposed causes.

Data on 5,112 deaths occurring in 2010 and 2011 were collected and analysed for this case study report. This represents approximately one per cent of all deaths that occur annually in England and Wales. The pilot areas chosen by the Department of Health were not statistically representative of England and Wales.

Deaths recorded in the study did not cover all types of establishment, since they were heavily weighted to hospital settings. In addition, all deaths occurring in infants aged under 28 days were excluded from the analysis as these deaths are recorded on a special death certificate.

Every cause of death stated on each of the MCCDs (both proposed and confirmed) was coded according to the International Classification of Diseases, Tenth Revision (ICD-10). Each ICD-10 code is an alphanumeric format of three or four characters.

The first letter represents a broad cause grouping - Chapter, for example ‘C’ is ‘Cancer’ and the last digit gives the most specific information, for example the site of occurrence. The number of conditions or diseases written on the MCCD is not always equal to the number of ICD-10 codes generated. For example, cause of death certificates which mention alcoholism and liver disease will be coded to a single ICD-10 code, K70 Alcoholic liver disease.

For each set of causes (proposed and confirmed) the underlying cause of death was selected using ICD-10 coding rules. The underlying cause of death is defined by the World Health Organisation as:

a) the disease or injury that initiated the train of events directly leading to death, or

b) the circumstances of the accident or violence that produced the fatal injury

The lowest line used on the MCCD (see background note 3) is generally the underlying cause of death but internationally agreed ICD-10 coding rules can select a different cause depending on the order that conditions are written on the MCCD.

Comparisons of both the underlying cause of death and all the causes mentioned on death certificates provided by the medical practitioner – the proposed cause - and following scrutiny by the medical examiner – the confirmed cause - were undertaken.

Results

Comparison of the underlying cause of death

Table 1 shows the percentage of records with a matching underlying cause of death before and after medical examiner scrutiny for each pilot area.

Deaths where the underlying cause stated by the medical practitioner and the medical examiner were within the same ICD-10 chapter (broad grouping) can be considered to be of a similar nature; generally they affect the same bodily system, although the specific cause can still be very different.

Causes that matched on all four digits were coded to the same specific condition suggesting that the same or very similar wording was used by both the medical practitioner and the medical examiner.

Inspection of the coded certificates revealed that any difference in the information stated on death certificates that matched to the third digit compared with those that matched all four digits was often negligible. Change at the 4 digit level was generally instances where the medical examiner added more specific information.

For example, the fourth character changed from a 9 (unspecified) to a different number, indicating additional information. For example from ‘Alcoholic liver disease, unspecified (K70.9)’ to ‘Alcoholic cirrhosis of liver (K70.3)’.

Table 1: Percentage of records with matching proposed and confirmed underlying cause of death by pilot area

Pilot Area	Number of coded records	Matching ICD-10 chapter (per cent)	Matching ICD-10 code at 3 digits (per cent)	Matching ICD-10 code at 4 digits (per cent)
Brighton	787	85	73	69
Mid Essex	1,200	98	95	94
Gloucestershire	615	87	77	73
Powys	349	96	90	88
Sheffield	2,161	83	74	72

Table source: Office for National Statistics

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(27.5 Kb)

Overall the proposed and confirmed underlying cause of death matched at ICD chapter level in 88 per cent of cases. There was exact agreement (to 4 digits), in 78 per cent of cases, rising to 80 per cent when records matching to 3 digits were included.

Mid-Essex had the highest proportion of agreement between medical practitioner and medical examiner. The area with the lowest proportion of matching certificates was Brighton, where just under 70 per cent of death certificates were submitted with identical underlying causes.

Table 2 lists the underlying causes of death by ICD-10 chapter stated on the 5,112 certificates in this study by both the medical practitioner (proposed cause) and by the medical examiner (confirmed cause). The percentage change has only been calculated for chapters with over 100 records. Figures for chapters with low numbers of deaths should be treated with caution, since they will be more affected by random fluctuations than those with more deaths.

Table 2: Underlying cause of death by ICD-10 chapter, proposed and confirmed cause, all pilot areas

ICD-10 chapter		Number of records		Overall change	
		Proposed	Confirmed	Net	Percentage
I	Certain infectious and parasitic diseases	94	62	-32	:
II	Neoplasms	1,455	1,474	19	1
III	Diseases of the blood and blood forming organs	11	6	-5	:
IV	Endocrine, nutritional and metabolic	80	72	-8	:
V	Mental and behavioural disorders	264	269	5	2
VI	Diseases of the nervous system	220	250	30	14
VII	Diseases of the eye and adnexa	1	1	0	:
IX	Diseases of the circulatory system	1,375	1,454	79	6
X	Diseases of the	879	821	-58	-7

ICD-10 chapter		Number of records		Overall change	
		Proposed	Confirmed	Net	Percentage
	respiratory system				
XI	**Diseases of the digestive system**	344	343	-1	0
XII	**Diseases of the skin and subcutaneous tissue**	33	33	0	:
XIII	**Diseases of the musculoskeletal system**	92	117	25	:
XIV	**Diseases of the genitourinary system**	159	134	-25	-16
XVII	**Congenital malformations**	8	10	2	:
XVIII	**Symptoms, signs and ill-defined conditions**	55	37	-18	:
XX	**External causes**	42	29	-13	:
	Total	5,112	5,112		

Table source: Office for National Statistics

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Following scrutiny by a medical examiner, there were 1 per cent more death certificates with an underlying cause of cancer (neoplasm), and an increase of 6 per cent in the proportion that were attributed to diseases of the circulatory system. While the percentage of deaths that were attributed to a respiratory disease underlying cause decreased by 7 per cent.

Reference Table 1 (62.5 Kb Excel sheet) provides an illustration of the movements between the ICD-10 chapters of proposed and confirmed underlying causes of deaths following scrutiny by the medical examiner.

The 1 per cent increase in deaths with an underlying cause of cancer was due to deaths being reclassified by the medical examiner from nearly all the other ICD chapters; 24 deaths from diseases of the respiratory system and a further 47 deaths from a variety of other causes. Conversely there were 52 deaths originally classified as being as a result of a cancer that were reclassified by the medical examiner, which resulted in a net increase of 19 deaths to deaths where the underlying cause was cancer.

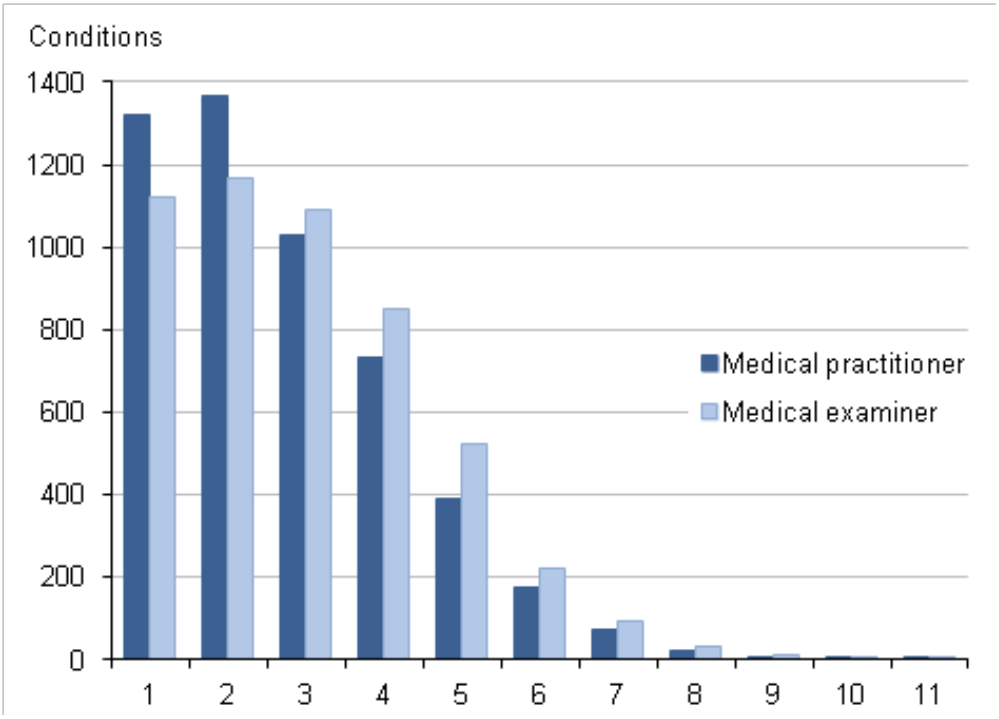
The largest movement between chapters were 64 deaths with a proposed underlying cause of disease of the respiratory system (Chapter X), which were subsequently reclassified to diseases of the circulatory system (Chapter IX) by the medical examiner. However this was partly countered by 33 records moving in the opposite direction, from Chapter IX to Chapter X, following scrutiny by the medical examiner.

Diseases of the respiratory system were also recoded to several of the other chapters following scrutiny by the medical examiner – for example 24 records were reclassified to neoplasms (II) and 19 each to mental and behavioural disorders (V and to diseases of the nervous system (VI).

Number of conditions mentioned

It was most common for both the medical practitioners and medical examiners to mention two conditions on the death certificate. However medical practitioners were more likely to report just one or two underlying causes on the death certificates compared with medical examiners (Figure 1). Conversely, medical examiners were more likely than the medical practitioner to state three or more conditions on the death certificate.

Figure 1: Number of conditions mentioned by the medical practitioner and the medical examiner, all pilot areas



Source: Office for National Statistics

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Order of conditions mentioned

There were 179 death certificates (4 per cent of the total analysed) in which the same conditions were mentioned by both the medical practitioner and the medical examiner but in a different order.

A different order was defined as;

- A change to the order of the conditions on a line.
- Conditions mentioned on different lines in the same sequence.
- Conditions mentioned on different lines and in a different order.

Almost 30 per cent of these (51 records) resulted in a change to the underlying cause (Reference table 2 (62.5 Kb Excel sheet)), while the underlying cause of the remaining records remained the same following scrutiny by the medical examiner (Reference Table 3 (62.5 Kb Excel sheet)).

Cases where only one condition was proposed

Death certificates where only one condition was mentioned by either the medical practitioner or the medical examiner are presented by the underlying ICD-10 chapter in Table 3.

Table 3: ICD-10 chapter of underlying cause of death on certificates where only one condition was mentioned, all pilot areas

		Number of certificates	
ICD-10 Chapter		**Proposed cause**	**Confirmed cause**
I	**Certain infectious and parasitic diseases**	8	0
II	**Neoplasms**	701	687
IV	**Endocrine, nutritional and metabolic**	9	3
V	**Mental and behavioural disorders**	45	31
VI	**Diseases of the nervous system**	55	44
IX	**Diseases of the circulatory system**	211	133
X	**Diseases of the respiratory system**	199	166
XI	**Diseases of the digestive system**	43	28
XIII	**Diseases of the musculoskeletal system**	15	1
XIV	**Diseases of the genitourinary system**	13	1
XVII	**Congenital malformations**	1	0
XVIII	**Symptoms, signs and ill-defined conditions**	21	25
XX	**External causes**	2	0

Table source: Office for National Statistics

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(27.5 Kb)

Cancer (neoplasms) was the most common underlying cause (by ICD chapter) when either the medical practitioner or the medical examiner mentioned only one condition. Medical practitioners were more likely than the medical examiner to list the single cause of death as a disease of the respiratory or circulatory system.

Table 4 shows the number of records where the medical practitioner only proposed one cause, whether the medical examiner added more conditions and whether the underlying cause changed.

In 999 cases (75 per cent) where the medical practitioner only mentioned a single cause the medical examiner also only recorded one cause of death. In the majority of these cases the medical examiner made no changes at all to the proposed causes.

In nine of these cases the medical examiner gave a completely different cause of death to the cause proposed by the medical practitioner. In a further 64 cases the medical examiner made changes to the death certificate that resulted in a different underlying cause but that was classified to the same ICD-10 chapter implying that the medical examiner gave more specific details regarding the cause of death.

Table 4: Number of records wehere only one cause of death was proposed by the medical practitioner by whether the medical examiner added conditions and the impact on the underlying cause of death, all pilot areas

		Extra conditions addded by the medical examiner		
		Yes	No	Total
Change in underlying cause	No change	132	926	1,058
	Broad ICD-10 chapter the same	82	64	146
	ICD-10 chapter different	110	9	119
	Total	324	999	1,323

Table source: Office for National Statistics

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(18 Kb)

In 324 cases (24 per cent) the medical examiner added at least one extra condition to the death certificate. These additional conditions changed the broad underlying cause of death chapter to a different chapter in 110 cases. In a further 82 cases, the addition of the extra conditions meant that the underlying cause chapter remained the same but the specific cause was different.

More details on the specific causes proposed and confirmed can be obtained from the underlying dataset (2.21 Mb Excel sheet).

Limitations

The pilot areas implemented the proposed system in slightly different ways in order to test the process in different contexts and local configurations. However these slight differences in process mean that the data are not statistically comparable across the study sample.

Although the medical examiner carried out an independent scrutiny of the deaths submitted in each case, the proposed and confirmed cause(s) of death were not statistically independent as the confirmation process requires the doctor and medical examiner to discuss and agree the confirmed cause(s) and in some cases the certifying doctor contacted the medical examiner for advice before completion of the proposed causes.

Records with missing data were excluded from the analysis. Particular problems occurred when the medical practitioner's cause of death statement was blank. In these cases a blank cause of death either implied that the doctor was unsure of the cause of death, and so did not submit any information separate from the medical examiner, or that the cause of death was unknown and was reported to a coroner.

In both cases the ICD code R99 'Unknown cause of mortality' was assigned, making it difficult to distinguish between the blank or missing causes and true unknowns. This means that it is not possible to use the case study data to comment on any potential impact of medical examiner scrutiny on the number of deaths referred to a coroner.

The pilot areas were not a statistically representative sample of deaths that occur in England and Wales. Deaths recorded in the study did not cover all types of establishment, since they were heavily weighted to hospital settings. Each year around 49 per cent of people die somewhere other than a hospital, for example in their own home (22 per cent); a hospice (5 per cent); a care home (19 per cent) or elsewhere (ONS, 2012).

Conclusion

The results of this study suggest that the introduction of medical examiner scrutiny of all medical practitioner certified deaths will impact on mortality statistics. Almost one fifth of death certificates had a different underlying cause of death following scrutiny by a medical examiner.

Medical examiner scrutiny can change the number, sequence and type of conditions mentioned on the medical certificate of cause of death. This suggests that medical examiners' analysis of the information relating to the cause of death, obtained both from the medical notes and in discussion with relatives, results in better understanding of the sequence of conditions that led to the death.

If the conditions and sequence are recorded more fully, this may lead to a change in the underlying cause of death. The results of this case study indicate that the medical examiner scrutiny is likely to affect trends in causes of death reported in mortality statistics

Improved data on the underlying cause of death and other conditions leading to death is important for medical researchers and other users. This study gives an indication of the impact on mortality statistics when two clinical opinions are given and agreement reached. However multiple clinical opinions do not always result in more accurate information (Byass, 2011).

More information recorded on the MCCD may even increase the number of errors (Swift and West, 2002). Without a comparison of the registered causes against autopsy results, as has been done in other studies (Ravakhah, 2006; Mckelvie, 1993) it is not possible to conclude with certainty from this small case study that more accurate information was being recorded on the MCCD following medical examiner scrutiny.

Results on the Office for National Statistics website

Data used in this case study of pilot areas implementing death certification reform can be downloaded in the Reference Tables workbook (62.5 Kb Excel sheet).

The workbook contain the following tables:

Reference Table 1: Proposed and confirmed underlying cause of death by ICD-10 chapter , all pilot areas

Reference Table 2: ICD-10 chapter changes to the underlying cause of death as a result of the order of the conditions being changed medical examiner, all pilot areas

Reference Table 3: ICD-10 chapter of the underlying cause of death where the change in order of conditions made no difference, all pilot areas

The underlying dataset (2.21 Mb Excel sheet)containing the medical practitioner proposed causes of death and medical examiner confirmed causes of death by pilot area is also available to download from the website.

Authors

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References

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4. Mckelvie PA (1993) ‘Medical certification of causes of death in an Australian metropolitan hospital. Comparison with autopsy findings and a critical review’ Medical Journal of Australia, **158**(12):816-8, 820-1. Accessed on 23 November 2012

5. ONS (2012) ‘Mortality Statistics: Deaths registered in England and Wales (Series DR) - 2011'. Accessed on 23 November 2012

6. Ravakhah K (2006) ‘Death certificates are not reliable: revivification of the autopsy’. South Med J **99**(7): 728-33. Accessed on 23 November 2012

7. Smith J (2003) 'The Shipman Inquiry Third Report: Death Certification and the investigation of death by coroners'. TSO. Accessed on 23 November 2012

8. Swift and West (2002) ‘Death certification: an audit of practice entering the 21st century’. Journal of Clinical Pathology **55**:275-279. Accessed on 23 November 2012

Background notes

1. **Medical examiner training**

2.

3.

Medical practitioners are required to complete the MCCD to the best of their knowledge and belief using their clinical judgement

4. **Quality Information on Mortality Statistics**

   www.ons.gov.uk/ons/guide-method/method-quality/quality/quality-information/social-statistics/index.html

5.

   mortality@ons.gsi.gov.uk

   ONS charging policy

6. **Health and Life Events user engagement strategy**

   www.statistics.gov.uk/downloads/theme_health/hled-user-engagement-strategy.pdf

7.

8. Details of the policy governing the release of new data are available by visiting www.statisticsauthority.gov.uk/assessment/code-of-practice/index.html or from the Media Relations Office email: media.relations@ons.gsi.gov.uk

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