Systematic review of statistics on causes of deaths in hospitals: strengthening the evidence for policy-makers

Rasika Rampatige, Lene Mikkelsen, Bernardo Hernandez, Ian Riley & Alan D Lopez

Objective To systematically review the reliability of hospital data on cause of death and encourage periodic reviews of these data using a standard method.

Methods We searched Google Scholar, Pubmed and Biblioteca Virtual de la Salud for articles in English, Spanish and Portuguese that reported validation studies of data on cause of death. We analysed the results of 199 studies that had used medical record reviews to validate the cause of death reported on death certificates or by the vital registration system.

Findings The screened studies had been published between 1983 and 2013 and their results had been reported in English (n = 124), Portuguese (n = 25) or Spanish (n = 50). Only 29 of the studies met our inclusion criteria. Of these, 13 had examined cause of death patterns at the population level — with a view to correcting cause-specific mortality fractions — while the other 16 had been undertaken to identify discrepancies in the diagnosis for specific diseases before and after medical record review. Most of the selected studies reported substantial misdiagnosis of causes of death in hospitals. There was wide variation in study methodologies. Many studies did not describe the methods used in sufficient detail to be able to assess the reproducibility or comparability of their results.

Conclusion The assumption that causes of death are being accurately reported in hospitals is unfounded. To improve the reliability and usefulness of reported causes of death, national governments should do periodic medical record reviews to validate the quality of their hospital cause of death data, using a standard.

Abstract in العربية, 中文, Français, Русский и Español at the end of each article.

Introduction

The poor state of health information systems and, particularly, mortality statistics in many countries is widely documented in the literature and in country reports to the World Health Organization (WHO). However, health systems worldwide depend on reliable information about causes of mortality to be able to respond effectively to changing epidemiological circumstances. Such responses depend critically on accurate data to guide decision-making. Within a health information system, accurate and timely data on the cause of death are fundamental for programme and policy development and for measuring change in the magnitude and distribution of ill-health and disease in populations. Assessments of vital registration systems in low- and middle-income countries consistently reveal substantial weaknesses in the generation of cause-of-death statistics. In a recent editorial, we drew attention to the fact that even hospital statistics on cause of death cannot be assumed to be correct — a fact that is not widely appreciated by governments and other users of these data.

The gold standard for cause-of-death reporting is to have the cause certified by a medical practitioner using the rules and procedures of the International classification of diseases and related health problems (ICD), which is currently available in its tenth revision (ICD-10). Although most countries with statistical systems for cause of death now use the ICD classification for coding, not all countries have introduced the international standard certificate for reporting cause of death. Furthermore, physicians often do not receive adequate training in standard ICD death certification practices. It is, therefore, not surprising that comparative assessments commonly find that the quality of medical certification of the cause of death is poor. Cause-of-death statistics of poor quality have limited policy utility and may even seriously mislead policy debates.

In most developing countries, more than half of all deaths occur outside hospitals. Since out-of-hospital deaths are rarely medically certified, most of the physician-certified deaths come from hospitals. Can we automatically assume that the cause assigned to a death in hospital is accurate? Unfortunately, even in countries where hospital data are the only source of cause-of-death information, data quality is rarely evaluated. Research in different countries has repeatedly identified substantial misclassification of the cause of death of people who die in hospitals — with attendant implications for the use of cause-of-death data in informing policy.

To carry out a validation study of cause-of-death data collected in hospitals, we need a gold standard against which the hospital cause-of-death reports can be compared. While autopsy findings provide the ideal gold standard for cause-of-death evaluations, this approach is prohibitively expensive, rarely applied and likely to be based on a biased sample of deaths assigned to coroners. It would not be practical to carry out autopsies for all of the deaths occurring in a country — or even for all of the hospital deaths in a country. Instead, researchers have reviewed the medical records of people who have died in hospitals as a reference standard for validating the accuracy of the causes of deaths recorded by the hospitals. Although all hospitals have medical records for their patients, such records are rarely used for carrying out routine assessments of the extent and nature of any diagnostic misclassifications among...
hospital deaths. In part, this reflects a lack of awareness of the existence of such misclassification or – because there is no standard method and framework for carrying out routine evaluations of the quality of cause-of-death data – a lack of knowledge of how such misclassification might be identified. Here, we perform a systematic review of studies that used medical records to assess the quality of hospital cause-of-death data to ascertain the pattern and extent of diagnostic misclassification of the cause of death. We propose a standard method for the future use of medical record reviews for assessing the accuracy of hospital-based cause-of-death data.

Systematic review

Search strategy

We searched for published articles on studies that used medical record reviews to validate cause-of-death data for hospital deaths in English, Spanish or Portuguese, between 1983 and 2013. Search terms and databases are shown in (Fig. 1). All 199 studies identified from the initial investigation were screened for specific content and only the 29 studies that met our inclusion criteria were subjected to further scrutiny (Fig. 1, Appendix A available from: http://www.uq.edu.au/hishub/docs/Appendix%20A_final.pdf). Essentially, to be included in our systematic review, a study had to be primary research, published in a peer-reviewed journal and involve the validation of cause-of-death data originating from one or more hospitals against reference cause-of-death data obtained by review of the corresponding medical records.

Results

The 29 selected studies were categorized according to timing, geographical location, scope and basic study features, age at death and range of causes of death included (Table 1). Wherever possible, we also assessed methodological issues such as the characteristics of the reviewers, the quality of the medical records used and the diagnostic facilities available in the study hospitals. Since the methods, scopes and objectives of the selected studies were diverse, no review protocol was systematically applied and no comparative analysis of our findings was possible.

Only nine of the 29 selected studies were published after 2005. The number of deaths included in each study ranged from 23 in a study in Mexico to 3316 in a nationally representative study of cause-of-death accuracy in Thai hospitals. More than half of the selected studies were published after 2005. The large majority (n = 24) covered all age groups. However, two studies included only adult deaths, one study focused on deaths in the elderly and another investigated selected causes only. The main purpose of most of the medical record reviews was to identify the degree of misclassification of cause

Fig. 1. Flowchart for the selection of studies on medical record reviews to validate cause-of-death data for hospital deaths

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Via PubMed and Google Scholar n = 112</td>
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<tr>
<td>Manual search for additional articles n = 12</td>
</tr>
<tr>
<td>English articles n = 124</td>
</tr>
<tr>
<td>Portuguese articles n = 25</td>
</tr>
<tr>
<td>Spanish articles n = 50</td>
</tr>
<tr>
<td>All selected studies n = 29</td>
</tr>
<tr>
<td>All screened articles n = 199</td>
</tr>
<tr>
<td>Screening of studies using inclusion criteria:</td>
</tr>
<tr>
<td>• primary research</td>
</tr>
<tr>
<td>• published between 1983 and 2013 in a peer-reviewed journal</td>
</tr>
<tr>
<td>• cause of death reported from a hospital was validated against cause identified through independent review of patient’s medical records</td>
</tr>
<tr>
<td>English studies n = 12</td>
</tr>
<tr>
<td>Spanish studies n = 10</td>
</tr>
<tr>
<td>Portuguese studies n = 7</td>
</tr>
<tr>
<td>All selected studies n = 29</td>
</tr>
<tr>
<td>Criteria used for extracting information from studies:</td>
</tr>
<tr>
<td>• description of the study</td>
</tr>
<tr>
<td>• characteristics of record review</td>
</tr>
<tr>
<td>• assessment of quality of medical records to support cause of death diagnosis</td>
</tr>
<tr>
<td>• reproducibility of the cause of death data</td>
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</table>
of death at the individual level – by comparing the hospital or vital registration diagnosis with a reference diagnosis based on a review of the dead patient’s medical records. A misclassification matrix is the primary outcome of several studies. An example of a misclassification matrix, based on empirical research carried out in Colombo, Sri Lanka, is shown in Table 2. Selected findings from the misclassification matrices obtained in different countries are presented in Box 1. The misclassification matrix produced in a study that is nationally representative can be used to derive a series of correction factors that can be applied to routine cause-of-death data – from vital registration systems – to estimate the probable true cause-of-death pattern in the study country. In Thailand, for example, cause-specific mortality fractions that had been corrected in this manner were applied to the numbers of registered deaths in 2005 – which had been adjusted for underreporting – to estimate the probable true pattern of causes of death in the country in that year. For some causes of death, such as human immunodeficiency virus infection/acquired immunodeficiency syndrome and ischaemic heart disease, the corrected numbers of deaths in this study were 3- to 4-fold higher than the numbers recorded in the vital registration system – with huge implications for Thailand’s health policies. Fifteen of our selected studies provided information to correct specific mortality fractions based on vital registration data – where these fractions were known or suspected to be incorrect.

The utility of any medical record review depends on the ability of the reviewers to identify the underlying cause of death correctly from the medical records. The reviewers in most of our selected studies (n = 18) were physicians who had – reportedly – been trained in death certification practices (n = 15). One study simply reported that professionals had been used as reviewers, while nine studies provided no information about reviewer qualifications. A Brazilian study that used both a physician and a researcher was classified as physician-review in this analysis. The number of reviewers per study depended on sample size and ranged from one in each of four studies to 84 in the Thai study.

The accuracy of the reference cause-of-death diagnosis depends on the quality of information available in the medical records. Ten of the reviewed studies included such an assessment – in which the records were categorized either simply, as adequate or inadequate, or, with more qualification, as excellent, good, average, weak or poor. One study excluded deaths when the corresponding medical records were judged to be incomplete. The remainder provided no information about the quality of the medical records used.

In nine of our selected studies, standard diagnostic criteria were predetermined – i.e. the clinical evidence required to classify a death as being due to a particular cause was specified in advance of the review. In case of diagnostic uncertainty, nine studies used a physician panel to discuss diagnostic problems. Three studies ordered verbal autopsies when the cause of death was in doubt. One study referred diagnostic problems to a second physician, and two others referred to external experts. Fourteen studies provided no information about the resolution of diagnostic uncertainty.

The diagnostic capacity of hospitals will clearly influence the accuracy of their cause-of-death diagnoses, both in vital registration systems and in medical record reviews. Only the Chinese study specifically mentioned that urban hospitals were selected to ensure that the study hospitals had adequate diagnostic facilities. None of the other studies included in our analysis referred to hospital diagnostic capacity.

The correct assignment of the underlying cause of death on the death

<table>
<thead>
<tr>
<th>Table 1. Key characteristics of the 29 studies selected for inclusion in the review</th>
<th>Selected studies, no. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Year of study</strong></td>
<td></td>
</tr>
<tr>
<td>After 2005 (15)</td>
<td>9 (31.0)</td>
</tr>
<tr>
<td>2000–2004 (14)</td>
<td>8 (27.6)</td>
</tr>
<tr>
<td>1990–1999 (12)</td>
<td>11 (38.0)</td>
</tr>
<tr>
<td>Earlier than 1990 (3)</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>Americas (15)</td>
<td>18 (62.1)</td>
</tr>
<tr>
<td>Europe (24)</td>
<td>4 (13.8)</td>
</tr>
<tr>
<td>Asia (22)</td>
<td>3 (10.3)</td>
</tr>
<tr>
<td>Pacific (20)</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td>Africa (4)</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td>Middle East (23)</td>
<td>2 (7.0)</td>
</tr>
<tr>
<td><strong>Sample size (no. of deaths)</strong></td>
<td></td>
</tr>
<tr>
<td>0–99 (40)</td>
<td>2 (6.9)</td>
</tr>
<tr>
<td>100–499 (12)</td>
<td>13 (44.8)</td>
</tr>
<tr>
<td>500–1499 (2)</td>
<td>9 (31.0)</td>
</tr>
<tr>
<td>More than 1500 (11)</td>
<td>5 (17.3)</td>
</tr>
<tr>
<td><strong>Scope of the study</strong></td>
<td></td>
</tr>
<tr>
<td>All conditions (44)</td>
<td>18 (62.2)</td>
</tr>
<tr>
<td>Cardiovascular conditions and/or diabetes (10)</td>
<td>3 (10.3)</td>
</tr>
<tr>
<td>All non-accidental deaths (5)</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td>Ill-defined and vague causes (3)</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td>Deaths with legal implications (3,8)</td>
<td>2 (7.0)</td>
</tr>
<tr>
<td>Neonatal causes (3)</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td>Cancer (14)</td>
<td>3 (10.3)</td>
</tr>
<tr>
<td><strong>Age groups included in the study</strong></td>
<td></td>
</tr>
<tr>
<td>All (9,10,11,23,25,26,28,30,34,35,36,38,40,41,42,43)</td>
<td>24 (82.8)</td>
</tr>
<tr>
<td>Adults (9,10)</td>
<td>2 (7.0)</td>
</tr>
<tr>
<td>Elderly (26)</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td>Infants aged &lt; 1 year (4)</td>
<td>1 (3.4)</td>
</tr>
<tr>
<td>Neonates (35)</td>
<td>1 (3.4)</td>
</tr>
</tbody>
</table>


* Ages not defined in relevant article or articles.
Table 2. Misclassification of causes of deaths, all ages, both sexes combined, Colombo, Sri Lanka, 2012

<table>
<thead>
<tr>
<th>Vital registration diagnosis</th>
<th>Diagnosis based on medical records review (no. of deaths)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Certain infectious and parasitic diseases</td>
</tr>
<tr>
<td>Certain infectious and parasitic diseases</td>
<td>9</td>
</tr>
<tr>
<td>All cancers</td>
<td>1</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>3</td>
</tr>
<tr>
<td>Other diseases of the nervous system</td>
<td>2</td>
</tr>
<tr>
<td>Hypertensive diseases</td>
<td>4</td>
</tr>
<tr>
<td>Ischaemic heart diseases</td>
<td>2</td>
</tr>
<tr>
<td>Cerebrovascular diseases</td>
<td>0</td>
</tr>
<tr>
<td>Other heart diseases</td>
<td>1</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>0</td>
</tr>
<tr>
<td>Chronic lower respiratory diseases</td>
<td>1</td>
</tr>
<tr>
<td>Other diseases of the respiratory system</td>
<td>0</td>
</tr>
<tr>
<td>Diseases of the liver</td>
<td>4</td>
</tr>
<tr>
<td>Diseases of the skin</td>
<td>0</td>
</tr>
<tr>
<td>External causes</td>
<td>3</td>
</tr>
<tr>
<td>All other causes</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>32</td>
</tr>
</tbody>
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Data source: Based on data collected by Rampatige et al.22
certificate requires not only that the
sequence and relationship of patho-
logical conditions on the certificate
be correctly certified but also that the
underlying cause of death is correctly
coded in terms of the ICD. Despite the
critical role of coding, only three studies
assessed coding accuracy.15,20,26

All studies reported some degree
of diagnostic misclassification. Due to
the use of different classification lists,
the misclassification reported in these
studies are not directly comparable.
For the studies that have used ICD-10’s
three-character codes for comparison
of cause of death, the range of misclas-
sification varied from 25% to 62%.16 The
concordance at the level of ICD-10’s
three-character codes was 41.4% in
Sri Lanka22 while concordance at the
level of the Basic Tabulation List in the
nineth revision of the ICD was found to
be 77% in Sweden.13 In South Africa,
concordance at the level of ICD-10’s
mortality tabulation level was 55.3%.14
The pattern and extent of misclassifica-
tion found in the studies were gener-
ally reported either as matrices or as
percentages. Other metrics that were
used included simple concordance-
based measures of sensitivity and
specificity, and measures that attempt
to correct for the probability of get-
ing a concordant diagnosis merely by
chance, such as Kappa statistics and
chance-corrected concordance.46 More
usefully, the analysis of misclassifica-
tion matrices allows specific insight
into the patterns of cause-of-death
misallocation and is thus a critical in-
put in activities designed to strengthen
health information systems as well as in
the correct interpretation of national
mortality statistics. Common causes
of death that were frequently misclas-
sified included ischaemic heart disease,
stroke, diabetes mellitus and external
causes of injury. In a study based on a
medical record review in the Islamic
Republic of Iran, ill-defined causes
of death were mainly reclassified to
ischaemic heart disease (33.5%) and
cerebrovascular accident (17.1%)27 while
a study in Kuwait reported that
original death certificates underesti-
imated cerebrovascular disease by 69%,
diabetes mellitus by 60% and ischaemic
heart disease by 33%.25 Surprisingly,
in our selected studies, ill-defined causes
of death were frequently reported even
in hospital settings. The policy impact of
allocating these non-specific codes
to more definitive causes are reported
in two studies.44,45 Key findings from
a meta-analysis of misclassification
patterns can be found in the article by
Rampatige et al.47

Framework for reviewing medical
records

Given the importance and cost of accu-
rate cause-of-death statistics for health
policy and priority setting – and the
effort and cost of undertaking medi-
cal record reviews – evaluation studies
using this method could benefit enor-
mously from some simple, evidence-
based lessons. Based on this systematic
review and experience with our own
field research, we provide a synthesis of
some of the key issues that should guide
national applications of medical record
reviews.16–18,20,22,27

Our systematic review confirms
that a variety of approaches have been
used to assess the accuracy of cause-of-
death data. Rather than trying to evalu-
ate whether there is one approach that
is better than the others, we have tried
to draw lessons from each study about
the specific steps that added value to
the study and could be repeated elsewhere.
Building on these findings, we propose
a framework that addresses the critical
choices that need to be carefully consid-
ered when using medical record reviews
for assessing cause-of-death data quality
(Box 2). Further detail on each of the
topics included in our framework has
been published elsewhere – with specific
guidance on the selection of hospitals
and cases, the development and use of
diagnostic criteria, interpreting mis-
classification matrices, evaluating the
quality of the source documentation,
and the choice and training of the re-
viewers used.47

Discussion

Medical record reviews can and have
been carried out to serve many different
purposes. Perhaps the most common ap-
lication is the independent assessment
of the reliability of hospital cause-of-
death data – particularly when expert
review or other use of mortality data has
revealed these to be deficient. Another
critical purpose is to assess whether
deaths from specific causes – e.g. various
cancers or traffic accidents – are being
reliably recorded in hospital settings.
If such an assessment involves a reason-
ably representative national sample of
hospital deaths, correction factors can
be calculated from the misclassification

Box 1. Selected findings based on reported misclassification matrices for causes of
hospital deaths in four countries

China
Rao et al.16 have shown that, ischaemic heart disease was undercounted in the official statistics
by 31% because of the systematic misclassification of true cases of ischaemic heart disease to
stroke, diabetes, pneumonia or other forms of heart disease. Hepatitis deaths were found to be
frequently misclassified to other liver diseases, and pneumonia was found to be excessively and
often incorrectly selected, from a list of respiratory diseases, as the underlying cause of death.

Islamic Republic of Iran
Khosravi et al.27 have found that the true cause-of-death pattern of the population was found
to be considerably different from the pattern of causes reported by the vital registration system
in the country. The ill-defined causes reported by the routine death registration system for
many deaths among young and middle-aged adults were primarily reclassified, after review, to
ischaemic heart disease, stroke and injuries. In half of the study sample, injury deaths had been
classified as senility or unknown in the vital registration system – thus greatly underestimating
the importance of external causes of hospital deaths. Ill-defined causes of death at an age of
≥ 70 years were largely reclassified, after review, to ischaemic heart disease and stroke.

Sri Lanka
Rampatige et al.22 have revealed major misclassification errors in identifying deaths caused by
vascular diseases or diabetes. Of the deaths caused by ischaemic heart disease, 30% had been
misclassified to diabetes or another heart disease and 25% of the deaths due to diabetes mellitus
had been misclassified as various diseases of the circulatory system.

Thailand
Pattaraarachachai et al.17 also reported massive misclassification of major causes of death. Cases
of septicaemia – commonly reported in the vital registration system – were reassigned to
cerebrovascular disease, human immunodeficiency virus infection/acquired immunodeficiency
syndrome and pneumonia. Ill-defined causes were identified as true cases of ischaemic heart
disease, other heart disease, chronic obstructive pulmonary disease or stroke. The study also
found gross underdiagnosis of diabetes by the vital registration system.
Despite an extensive literature review, we were only able to identify a small number of peer-reviewed studies that had used medical records to investigate the quality of cause-of-death data (n = 29). Given the critical role of cause-of-death data in informing debates around national health policies, this is both surprising and disappointing. Our main observation – of extensive misclassification of causes of death in hospitals wherever studies have been carried out – indicates that inaccurate cause-of-death data are pervasive. However, it is important to consider potential biases that might have affected the limited number of studies that we were able to analyse. First, we were only able to review articles that had been published in a language in which at least one member of our review team was competent – i.e. English, Portuguese or Spanish. It is possible that articles published in other languages might have led to different conclusions about the pattern and extent of cause-of-death misclassification in hospitals. More comprehensive studies covering other major language groups would be welcome but there is no reason to suspect that these would not reinforce our main findings – which seemed fairly consistent irrespective of the language of the article involved. Thus, our conclusions and recommendations for policy action should still be valid. It is also possible that the literature we screened was affected by selective biases – such as publication bias – but we suspect that this would only operate to suppress the publication of more extreme findings about misclassification. Finally, the studies we selected had diverse aims and the set of causes of death investigated in each study was presumably biased towards the priorities of the interest groups involved. We found only one study that involved the comprehensive investigation of cause-of-death misclassification across all major causes of death. It is therefore quite likely that the extent of cause-specific misclassification across all countries is different to that indicated by the studies we selected. Again, however, that does not alter our fundamental conclusion that hospital statistics on causes of death – whatever the universe of causes investigated – are likely to be grossly inaccurate in many countries and ought to be the focus of an immediate policy response.

All of the studies we selected for review assessed the quality of the hospital-reported cause-of-death data by comparing them with cause-of-death data derived by reviewing medical records. However, the lack of a standard framework or method for conducting and reporting the findings of medical record reviews has resulted in substantial variation in the approaches used and difficulties in interpreting and comparing results. Building on these findings and our own empirical experience, we propose a series of steps to guide future studies on the accuracy of cause-of-death data that involve the review of

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**Box 2. Proposed framework and key elements for conducting medical record reviews**

**Select hospitals to be reviewed**
- Determine scope of investigation
- Obtain agreement for hospital cooperation
- Conduct census of diagnostic facilities available in included hospitals.

**Select diagnostic categories and develop diagnostic criteria**
- Set up a small expert group of physicians to develop standard diagnostic criteria
- Establish a list of the diseases that are the most important for the review
- Develop and pre-test diagnostic criteria on a sample of medical records.

**Select sample death certificates**
- Determine sample size
- Determine the sampling method and identify the number of death certificates to be included in the study
- Draw the sample of death certificates from the vital registration database or hospital mortality register
- Retrieve corresponding medical records from the hospitals
- Validate the quality of coding – according to the tenth revision of the International Classification of Diseases and Related Health Problems (ICD-10) – for the sample.

**Select physicians to rediagnose causes of death**
- Provide training in cause of death certification.

**Trace the relevant medical records**
- Decide on criteria to assess the quality of the records
- Decide on rules to determine which records can be used and which are too incomplete
- Reassess the sample size because of losses arising from poor or untraceable records
- Prepare a summary of the quality and availability of medical records and the corresponding maintenance practices.

**Review medical records**
- Design form for extracting information from medical records. An example of such medical data extraction forms is given in the study by Rampatige et al.47
- Diagnose cause of death using pre-defined standard diagnostic criteria
- Code the new cause according to ICD-10
- Check that coding is correct.

**Compare the cause of death originally reported from vital registration with that finally assigned after medical record review, and analyse findings**
- Determine the extent of misclassification
- Draw up a misclassification matrix for all ages and both sexes – and by age and sex, if numbers allow – to identify patterns of misclassification
- Reassign the ill-defined and misclassified causes based on the misclassification matrix
- Compare the new distribution of causes of death with the original, to identify major discrepancies.

**Write final report and initiate policy dialogue to strengthen health information system**
- Describe the study design and methodology, including sampling strategy
- Discuss findings and implications
- Propose improvement steps as needed – e.g. improved certification, coding and keeping of medical records.
Reliability of statistics on cause of death in hospitals

Abstract

Systematic reviews of the methodology used to assess reliability of statistics on cause of death in hospitals and deaths reported to vital registration systems have been shown to be important in ensuring that health policies, strategies, and allocations are based on accurate and reliable data. However, the study design and analysis of such assessments are rarely conducted systematically, and the reliability of cause-of-death statistics is not always assessed. This review aimed to identify and summarize the available evidence on the methodology used to assess the reliability of cause-of-death statistics in hospitals and deaths reported to vital registration systems, and to identify the factors that influence the reliability of such statistics.

Methods

We conducted a systematic review of all articles published from 1983 to 2013 that assessed the reliability of cause-of-death statistics in hospitals and deaths reported to vital registration systems. The search strategy involved a combination of keywords related to cause of death, reliability, and hospital or vital registration systems.

Results

We identified 16 articles that met the inclusion criteria, and we excluded 20 additional articles that did not meet the criteria. The most common methodology used to assess reliability was a systematic review of medical records, followed by a comparison of data from hospitals and vital registration systems.

Conclusions

The reliability of cause-of-death statistics in hospitals and deaths reported to vital registration systems is essential for the development of health policies and strategies. However, the methodology used to assess reliability is not always systematic, and factors such as the quality of medical records and the accuracy of data collection can influence the reliability of such statistics. Further research is needed to improve the reliability of cause-of-death statistics and to ensure that health policies and strategies are based on accurate and reliable data.

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Competing interests

None declared.

Systematic reviews

Reliability of statistics on cause of death in hospitals

Medical records. By following these steps, it should be possible to validate the quality of cause-of-death data reported by hospitals and vital registration systems more reliably.

The synthesis of lessons learnt, summarized in Box 2, outlines a clear and tested method and identifies the most important steps in the process - e.g. the design of the study, development of diagnostic criteria, selection of the sample, review of medical records, and the analysis and interpretation of findings. However, the framework that we have proposed - like all frameworks - has limitations. In particular, it would not be feasible to apply our framework in settings where medical records are poorly kept or where the diagnostic capacity of hospitals is generally poor. An understanding - by hospital and health administrators - of the importance of studies based on our framework for policy-makers is crucial, as is a commitment, of those responsible for the development of national health information systems, to implement any resultant recommendations.

While the proposed framework needs to be tested in its entirety in further empirical studies, we consider it sufficiently robust to be applied in its current state in different settings. We recommend its periodic application in all countries, to identify deficiencies in national mortality statistics. Using the misclassification matrix that the study method yields, health authorities should be able to identify the diseases that are commonly misclassified as causes of death and also ascertain whether the causes of death that are being recorded in hospitals are of sufficient quality to be fit for purpose. This knowledge can and should be used to guide strategies for the strengthening of health information systems - e.g. increasing awareness among medical associations about the value of doctors correctly certifying deaths, improving the keeping of medical records in hospitals, and ensuring that cause-of-death coders are appropriately trained.

Systems for the determination and recording of the causes of hospital deaths represent a purposeful and costly investment that countries make. It is imperative that such systems perform to the standard required to support good public policy.

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Reliability of statistics on cause of death in hospitals

Résumé
Examen systématiquement la fiabilité des données hospitalières sur la cause des décès et encourager l'examen périodique de ces données en utilisant une méthode standard.

Méthodes Nous avons utilisé Google Scholar, Pubmed et Biblioteca Virtual de la Salud pour rechercher des articles en anglais, en espagnol et en portugais, qui ont rapporté des études de validation des données sur la cause des décès. Nous avons analysé les résultats de 199 études qui ont utilisé des examens de dossiers médicaux pour valider la cause de la mort déclarée sur les certificats de décès ou par le système d'enregistrement de l'état civil.

Résultats Les études passées au crible ont été publiées entre 1983 et 2013, et leurs résultats ont été publiés en anglais (n = 124), en portugais (n = 25) ou en espagnol (n = 50). Seulement 29 études ont rempli nos critères d'inclusion. Parmi ces études, 13 ont étudié les schémas des causes de décès au niveau de la population — en vue de corriger les fractions de mortalité selon l’âge — alors que les 16 autres ont été entreprises pour identifier les contradictions dans le diagnostic des maladies spécifiques, avant et après l'examen du dossier médical. La plupart des études sélectionnées ont rapporté des erreurs importantes de diagnostic pour les causes de décès dans les hôpitaux. Il y avait une grande variation dans les méthodologies d'étude. De nombreuses études ne décrivaient pas suffisamment les méthodes utilisées pour pouvoir évaluer la reproducibilité ou la comparabilité de leurs résultats.

Conclusion L'hypothèse selon laquelle les causes de décès sont déclarées de manière précise dans les hôpitaux est sans fondement. Pour améliorer la fiabilité et l’utilité des causes de décès déclarées, les gouvernements nationaux devraient effectuer des examens périodiques des dossiers médicaux afin de valider la qualité des données sur la cause des décès dans leurs hôpitaux, en utilisant une méthode standard permettant d’obtenir des résultats comparables au niveau international.

Resumen
Revisión sistemática de las estadísticas sobre las causas de muerte en los hospitales: fortalecimiento de la evidencia para los creadores de políticas

Objetivo Revisar sistemáticamente la fiabilidad de los datos de los hospitales sobre las causas de las muertes y promover revisiones periódicas de estos datos por medio de un método estándar.

Métodos Se realizaron búsquedas de artículos en inglés, español y portugués en Google Scholar, Pubmed y la Biblioteca Virtual de la Salud sobre estudios que informaran acerca de la validez de datos sobre las causas de las muertes. Analizamos los resultados de 199 estudios que habían empleado revisiones de registros médicos para validar las causas de las muertes registradas en los certificados de defunción o por el sistema de registro civil.

Resultados Los estudios seleccionados se habían publicado entre 1983 y 2013 y sus resultados aparecían en inglés (n = 124), portugués (n = 25) o español (n = 50). Solo 29 de los estudios cumplieron los criterios de inclusión. De estos, 13 habían examinado las causas de muerte en la población con el fin de corregir las fracciones de mortalidad por una causa concreta, mientras que los otros 16 pretendían identificar las discrepancias en el diagnóstico de enfermedades específicas antes y después de la revisión de los historiales médicos. La mayoría de los estudios seleccionados informaron acerca de diagnósticos sustancialmente incorrectos de las causas de muerte en los hospitales. Las metodologías de estudio mostraron una amplia variación. Muchos estudios no describieron los métodos utilizados de manera suficientemente detallada como para poder evaluar la reproducibilidad o la comparabilidad de sus resultados.

Conclusión La suposición de que los hospitales notifican adecuadamente las causas de la muerte es infundada. A fin de mejorar la fiabilidad y la
References


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Rasika Rampatige et al.


