Research paper

Medical death certification by forensic physicians in the Netherlands: Validity and interdoctorvariation

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ABSTRACT

The aim of the study was to assess interdoctorvariation and validity in death certification by forensic physicians using 19 written scenarios. The scenarios described typical cases from forensic-medical practice. Physicians were asked to determine the manner of death (natural/unnatural) and to provide an ICD-10 code for the cause of death. In contrast to most studies on this topic, the measure of agreement among physicians was chance-corrected and a standard was used to assess the correctness of the assigned cause and manner of death. Forty-seven physicians participated in the survey. The study demonstrated that forensic physicians varied widely in their conclusions. With respect to manner of death, adequate agreement (defined as kappa>0.70) was achieved in six scenarios (32% of all scenarios). Concerning the underlying cause of death, adequate agreement was reached in three cases (16% of all scenarios). Furthermore, predictors for the correctness of manner and cause of death were studied using logistic regression. Years of experience as a forensic physician significantly predicted the correctness of cause of death (p < 0.05). Other predictors remained insignificant. With regard to manner of death, none of the studied predictors proved to be significant. To conclude, there appears to be a lack of consistency among forensic physicians regarding death certification. The ICD-10 coding of causes of death applied by forensic physicians is questionable. Less experienced physicians need supervision by more experienced colleagues when making judgments concerning the cause of death. Altogether, there is an urgent need to work out consensus-based guidelines for forensic physicians on how to certify deaths.

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1. Introduction

The importance of high quality cause-of-death information has been emphasized extensively in the past.[1–4] Cause-of-death information is used in many ways to evaluate population health, which has an impact on the allocation and distribution of resources within the health sector. Also, it can help guide priorities for intervention programs and epidemiological research. Mortality data thus have an important role for public health.

As autopsy rates are declining in most Western countries, the majority of diagnoses on death certificates are based on an external examination of the descendent. External post-mortems do not always provide conclusive evidence for manner and cause of death.[5,6]

Ideally, the outcomes of an external post-mortem examination should not vary between doctors. From professional practice and numerous research reports, it is evident however, that conclusions drawn by physicians are not unequivocal. Several studies have shown considerable differences in the way that physicians handle death certification. Many studies have analyzed death certification by non-forensic specialties.[7–11] The number of studies on inter-doctorvariation among forensic physicians is limited, however, and a 'gold standard' for evaluating the 'correctness' of manner of death certification is seldom used.

In the Netherlands, forensic physicians are in charge of performing external post-mortem examinations in case of unexplained and/or unnatural deaths. They are appointed by the municipality as medical examiners. Currently, there are approximately 340 forensic physicians in the Netherlands. The large majority of these forensic physicians are employed by local Public Health Services. Next to their role as medical examiner, these physicians provide medical care to detainees and collect and evaluate forensic evidence in the case of sexual and physical

assault. In Amsterdam and surroundings, forensic physicians employed by the local Public Health Service examine approximately 1100 decedents per year. The main goal of the external examination is to clarify the cause and manner of death. The cause of death relates to a specific disease, injury or abnormality that initiated physical and biological events that directly led to death. The manner of death, which explains how the cause of death arose, can be either natural or unnatural. After the examination, forensic physicians document the case using an electronic registration system. Next to a description of the case, the physicians are asked to provide an ICD-10 code for the cause of death (three positions). This ICD-coding was introduced in order to facilitate research based on the registration and to allow for efficient searching throughout the database. We therefore were interested whether forensic physicians are applying the ICD-10 coding system in a uniform manner. In addition, we were interested in the question whether these doctors arrive at the same conclusions concerning the manner of death.

Therefore, the present study was undertaken to examine issues of validity and interdoctervariation in death certification by forensic physicians in the Netherlands. To shed light on the issue, this paper aims to

(1) quantify interdoctervariation among forensic physicians regarding the certification of manner of death and coding of causes of death according to the ICD-10
(2) assess the validity of physicians' reports by comparison with a 'gold standard'
(3) analyze factors explaining deviation from this gold standard, using a case-vignette approach.

2. Material & methods

2.1. Study design

A self-administered online questionnaire was spread by e-mail among all forensic physicians working in the communities Amsterdam (n = 29) and Leiden/Gouda (n = 16). Physicians were instructed to respond independently from each other and not to discuss results with other respondents beforehand. Non-respondents were sent a reminder two months after the deadline for returning the questionnaire. Additionally, participants of national training courses for forensic physicians were asked to fill in the survey at the end of the course (n = 21). The training course was meant for practicing forensic physicians aiming to be (re-) accredited as forensic physicians by the Dutch Forensic Medical Association. All participants minimally held a Doctor of Medicine-degree. The course took six full days and required approximately 12 h of self-study. The response rate for Amsterdam physicians was 61% (18 out of 29) and 50% for physicians from the Leiden/Gouda area (8 out of 16), resulting in an overall response rate of 58%. The response rate in participants of the training course (n = 26) was 100% since participation was obligatory for passing the course.

2.2. Survey instrument

The instrument consisted of two sections. Section 1 contained questions on background characteristics of respondents (age, sex, area of practice, medical qualifications, and experience). Section 2 comprised 19 scenarios, typical for the 'grey area' often encountered in forensic medical practice (Table 1). These scenarios were created in co-operation with experienced forensic physicians and had been pre-tested and adjusted accordingly. The cases were described in brief so that they would be representative of the cases

seen by forensic physicians. For each scenario, respondents were asked to state the most probable manner and cause of death. Concerning manner of death, three possibilities were provided: (1) natural, (2) unnatural and (3) undetermined. The unnatural category could comprise cases deemed evidently unnatural (e.g. hanging) or cases with 'indications' for unnatural death. The underlying cause of death was coded by respondents using an ICD-10 pick list. The pick list was composed of ICD-10-chapter headings (3 position codes).

2.3. Statistical analysis

We compared differences between participants and non-participants of the training course concerning gender, community of practice (using one-way ANOVAs), age in years, number of death certificates completed annually, experience as forensic physician in years, number of hours per week working as forensic physician (using linear regression analyses). These outcomes are presented in Table 2.

In addition, observed frequency distributions across the three types of manner of death (Table 3) and cause of death (Table 4) were compiled for each scenario. In order to quantify interdoctervariation, we calculated the percentage of agreement between respondents per scenario, accompanied by Randolph's free-marginal multi-rater kappa. This kappa statistic provides a chance-adjusted measure of agreement. Values can range from −1.0 to 1.0, with −1.0 indicating perfect disagreement below chance, 0.0 indicating agreement equal to chance, and 1.0 indicating perfect agreement above chance. A rule of thumb is that a kappa of 0.70 or above indicates adequate interrater agreement.[12] In the last column in Tables 3 and 4, the percentage agreement with the answers given by nosologists from Statistics Netherlands is provided.

Finally, two logistic regression analyses with correct cause of death and correct manner of death as outcome variables were performed (Table 5). An answer was deemed 'correct' if it was in accordance with the answers given by nosologists from Statistics Netherlands. Correct answers were coded as 1; incorrect answers were coded as 0. As predictors, we studied gender, experience as forensic physician in years, and whether the respondent had filled in the survey as part of a training course. Number of death certificates completed annually, number of hours per week working as forensic physician and age were not included in the regression analyses because of high intercorrelations with experience as forensic physician. Community of practice was not included either because participants of the training course predominantly practiced outside of Amsterdam. In order to control for the dependency of observations (clustering of scenarios within physicians), the SPSS GENLIN (Generalized Estimating Equations) procedure was applied to fit the logistic regression model (SPSS version 21). As n = 47 respondents rated n = 19 scenarios, n = 893 cases were included in the analyses.

3. Results

Table 2 displays the characteristics of respondents. The majority was male (64%) and above the age of 40 (75%). Most respondents held part-time jobs as forensic physician. Nineteen percent completed more than 50 death certificates annually. Thirty-eight percent of respondents worked in the Amsterdam area, 17% in the Leiden/Gouda region and 45% in other regions. More than half (55%) of the respondents were participating in the context of national training courses for forensic physicians. Participants of the training course had significantly less experience than the other respondents in terms of number of hours per week working as forensic physician (one-way ANOVA, p = 0.001), number of death