ORIGINAL ARTICLE

Assessing the Quality of Tuberculosis-related Underlying Cause of Death Assignment in Taiwan, 2001–2005

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Background/Purpose: Assignment of underlying cause of death (UCOD) might be inconsistent among coders if physicians do not properly record cause of death on death certificates. This study aimed to assess the changes in the quality of tuberculosis-related UCOD assignment in Taiwan after interventions by the Center for Disease Control (CDC).

Methods: The reference (gold standard) we used to assess the quality of UCOD assignment by coders was the UCOD selected by the Automated Classification of Medical Entities (ACME) computer program. The agreement, over- and under-coding rates between coders and the reference were calculated by years before and after the CDC interventions.

Results: An abrupt decrease in tuberculosis death rates according to the UCOD assigned by coders was noted from 2003 to 2004, but no such decrease was noted according to the reference. The agreement in UCOD assignments between coders and ACME decreased from 0.75 in 2001 to 0.67 in 2005. We found a significant decrease in the over-coding rate from 0.21 in 2003 to 0.11 in 2004, and a prominent increase in under-coding rates from 0.08 in 2003 to 0.24 in 2004.

Conclusion: The abrupt decrease in the official published tuberculosis mortality rate from 2003 to 2004 was due to significant changes in the practice of UCOD assignment of official coders, which might have been a response to interventions initiated by the CDC. [*J Formos Med Assoc* 2008;107(1):30–36]

Key Words: cause of death, coding, epidemiology, mortality, tuberculosis

The underlying cause of death (UCOD) is defined by the World Health Organization as "the disease or injury which initiated the train of morbid events leading directly to death" and is the cause of death used for tabulating official cause of death statistics in most countries.[1] Ideally, the attending physician of the deceased should determine the UCOD for each death and properly report the causal relationship between cause of death on death certificates.[2,3] In reality however, many physicians do not properly report the cause of death, which makes the assignment of UCOD inconsistent among coders.[4–7]

Cause of death statistics is an important reference for national tuberculosis (TB) control policy planning and evaluation. For example, of 55 statistical tables in the appendix of the *Tuberculosis Annual Report 2001* published by the Center for Disease Control (CDC) of Taiwan, 18 were based on mortality data.[8] Many scholars also use mortality data to examine the epidemiologic profiles of TB problems in Taiwan.[9–12] If the quality of TB

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mortality data cannot be ensured, then the validity of the conclusions derived is threatened.

The determination of TB-related UCOD has become progressively more difficult because many elderly people have recurrent TB and comorbid diseases.[13–15] For example, when an elderly person has chronic obstructive pulmonary disease and recurrent TB that is under treatment, and then dies from acute myocardial infarction, it is sometimes very difficult for the attending physician to determine whether the elderly person had died *from* TB or *with* TB. If the physician thought the elderly person had died *from* TB, then the UCOD would be recorded as TB. In contrast, if the physician thought the elderly person had died *with* TB, the UCOD would not be recorded as TB. A previous study indicated that half of the 2129 death certificates that mentioned TB was inappropriately certified by physicians and that 16% had an inaccurately assigned UCOD by official coders in Taiwan.[16]

To improve the quality of the TB-related cause of death certification behavior of physicians and TB-related UCOD assignment of official coders, the Taiwan CDC initiated several interventions in 2002. The aim of this study was to assess the changes in the quality of TB-related UCOD assignment of official coders before and after the CDC interventions.

Methods

Interventions

Since 2002, the Taiwan CDC has asked the Office of Statistics of the Department of Health to mail all TB-related death certificates to them on a monthly basis for quality assurance *before* the official cause of death statistics are published. The CDC can thus assess the accuracy of certification by certifiers, identify the questionable cases and mail them back to the Office of Statistics to consider modifying the UCOD assignment. About 10–15% of death certificates in which TB was originally assigned as the UCOD by official coders were queried by the CDC from 2002 through 2005. The Office of Statistics organized a panel to improve the reliability of UCOD assignment between coders, and did not respond to the queried cases until 2004, when the official coders then changed half of the original UCOD assignments in the queried cases. The change rate decreased to 12% in 2005 because the coders had by then changed their habits with regard to assigning TB-related UCOD.

Reference for assessment

The reference (gold standard) we used to assess the accuracy of TB-related UCOD assignment by official coders was the UCOD assigned by the Automated Classification of Medical Entities (ACME) computer program. ACME was developed by the National Center for Health Statistics of the United States to standardize the processes of UCOD assignment. ACME is now used by more than 20 countries and was introduced to Taiwan in 2000.[17]

To prepare for the implementation of the ICD-10 version for cause of death statistics, the Office of Statistics initiated a double coding system in 2001. Each death certificate was assigned the ICD-9 UCOD code manually by official coders and the ICD-10 UCOD code by ACME, which provided us with a good opportunity to assess the quality of UCOD assignment of official coders from 2001 through 2005.

Analysis

All the death certificates of people who died between 2001 and 2005 on which TB was assigned as the UCOD either by official coders (ICD-9 codes 010–018) or by ACME (ICD-10 codes A16–A19) were included in this study. We first calculated the age-standardized death rates and age-specific death rates for TB according to the UCOD assigned by official coders and by ACME. The 95% confidence intervals (CI) for death rates were also computed to examine the differences between the official coders and ACME.

Using the UCOD assigned by ACME as the reference (gold standard), we calculated the rates of agreement, over-coding and under-coding by