Look at Life on the Job for Mortality Data Reporters

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Mortality statistics are used for research and public health management throughout the world. The data from which such statistics are derived can be traced back to the coding personnel reporting mortality data. In this article, we take a look at the training and educational background of these professionals-and whether it is equivalent to their responsibilities.

Numerous studies have shown that coding accuracy affects data quality.[1] In the public health field, mortality statistics are an important comparison measure dependent on data quality. When state or national mortality statistics are compared, inconsistent data could lead to false conclusions. Meanwhile, data accuracy may depend on the qualifications and training of the coding personnel reporting the mortality data.

Three questions arise regarding the training needs and preparation of the personnel who report cause-of-death statistics.

- What level of training and/or certification do the nosologist and the data entry personnel who assign cause-of-death codes from the death certificate data in state health departments currently have?
- Are there steps in the process that could be enhanced with additional training, and if so, in what areas?
- What level of training will be required in the future to handle changing job functions?

Although the manuals for the MICAR (Mortality Medical Indexing, Classification, and Retrieval) data entry system describe the desirable user qualifications briefly, the above questions have not been studied. Changes in the field have resulted in some disparities in job procedures and responsibilities. The switch to ICD-10 from ICD-9 in 1999 has allowed for greater detail in data collection, but the querying process requires personnel who are knowledgeable about medical causality and coding.

To determine the educational requirements, specialized training, and job duties of the personnel reporting cause-of-death data, we conducted a descriptive study via a mailed survey questionnaire. The results showed a distressing lack of standardization of job titles, job procedures, training, and specialty certifications in this field. Because of the importance of cause-of-death data, those charged to process it should possess appropriate training and certification.

Mortality Data's Sphere of Influence

Mortality data is a primary indicator used by all nations to assess public health by describing causes and circumstances of death. In the US, mortality data is collected on all deaths that occur in the United States as part of the vital registration system. Each state uses ICD-10 to process and code cause-of-death information from death certificates (legal documents filed to establish the fact of death for each death in the US) to produce mortality statistics.[2] This data is then collected and compiled by the National Center for Health Statistics (NCHS), where national mortality statistics are prepared, and the World Health Organization (WHO) for research purposes, public health management, monitoring the health situation, and assessing the effectiveness of interventions and health services.[3] WHO also compiles mortality statistics for more than 70 countries for publication in the World Health Statistics Annual and maintains the WHO Mortality Database.[4] The information is useful for a multitude of purposes in studying mortality by location, cause of death, age of death, and circumstances of death.

The importance of accurate data entry for research, health statistics, public health priorities, and resource allocation cannot be overstated. The significant role these personnel play in cause-of-death reporting has the ability to affect mortality statistics for

our nation. This study showed a nationwide lack of standardization of job titles, job procedures, training, and specialty certifications among this group of personnel. Although NCHS has a job definition for a nosologist and a medical coder, many states use varying job titles with different responsibility levels and pay scales.

In most states, entry-level requirements appear to be minimal, resulting in new personnel feeling unprepared for the job responsibilities. On-the-job training is the primary method for learning many of these positions and the norm for entry-level workers. With the majority of respondents at a high school educational level, there is little chance for advancement into other positions with more responsibility. Job procedures involving software and computerization seem to vary, possibly depending on funding, priorities in the department, and the state's population.

Although NCHS offers several certification options, many states do not require personnel to be certified. The findings from this study indicate that the qualifications and training agreed on as a prerequisite to perform this work have not been mandated for implementation in many states. The impact on cause-of-death data quality may be significant.

It is also troubling that although coding and classification systems change over time and computerization of job functions has been pronounced, continuing education is not consistently required for this group. It is not clear if all personnel are able to demonstrate and maintain competency in job functions, particularly those related to computer software. Because some states do not have a nosologist, there is dependency on knowledge of the software to assist in coding data. When the coding system changes, software must be updated along with coding guidelines and knowledge. Staff can attend local and national workshops but they may not be available in all regions. Some respondents indicated that they feel isolated because several states have only one or two people who work in this area and would like to see more networking at a regional or national level.

Study Examines All Facets

An inquiry mailing allowed us to locate the nosologist or designated person in 48 states (two were used for a pilot survey) and Washington, DC, and New York City (death records are processed separately from the states). The total population, based on the input from the participants, was 162. The return rate for the pilot and actual survey combined was 90, or 55.5 percent. Thirty-nine states, Washington, DC, and New York City participated, meaning at least one person from the state or area returned a questionnaire. Based on the initial inquiry to the state or district registrars, 39 out of the 52 said they had at least one nosologist in their department, five said they did not, and eight were unknown. The survey participants were asked to list their job title and among the 37 different job titles identified were administrative specialist, data entry operator, records technician, statistician, coding clerk, vital records technician, mortality coder, and mortality coding clerk. Only 12 states actually had the word "nosologist" in the job title.

Personnel Demographics

The number of cause-of-death personnel employed in each state based on mean number of deaths per year in the state was a consideration. "Mean Number of Personnel by Number of Deaths" displays the findings with a mean number of personnel per state overall of 3.0. Two states reported they had no personnel performing this function, and the number of personnel in two other states was unknown.

Of the respondents, 85 percent were female, 8 percent were male, and 7 percent didn't answer the question. The overall mean age was 48.0 years. The overall mean number of years employed in this field was 13.8, while the mean number of years employed in the present position was 10.1. For 71 percent of the participants, the highest educational level achieved was a high school diploma or GED; 12 percent had an associate degree; 7 percent had a bachelor's; and 8 percent had other degrees. The most frequent annual salary range overall was $25,000 to $29,999. See "Salary of Personnel Reporting Cause of Death" for a breakdown of annual salary by range.

Data Quality and Job Satisfaction

To assess the survey participants' perceptions of data quality issues, we used a Likert scale of 1 (low) to 5 (high). The quality of the death information received from the physician had an overall mean score of 3.2. The quality of the training manuals and guidelines for coding had an overall mean score of 3.9. The quality of the software product edits had an overall mean score of 3.6. The quality of death certificate information that is sent to NCHS had an overall mean score of 4.2.

We also used a Likert scale to assess job satisfaction. Categories and overall means were:

- how prepared survey respondents felt when they first started the job: 2.3
- how competent they feel in their job now: 4.4
- satisfaction with pay and benefits: 2.4
- satisfaction with job tasks performed: 4.1
- satisfaction with up-to-date procedure manuals and references available: 3.9
- satisfaction with computerization of job functions: 3.3
- satisfaction with continuing education opportunities: 3.0

Training and Certification

Our analysis of the respondents' current specialty training revealed that overall, 57 percent of the participants had training in medical terminology, 31 percent of the participants had training in anatomy and physiology, 71 percent of the participants had training in ICD-10, 62 percent had training in MICAR, and 30 percent of the participants had database software training.

The survey also examined the location of training and found that 82 percent of the participants received at least a portion of their training on the job. Thirty-one percent of the participants have gone to local classes for training, and 80 percent of the participants have attended national classes for training. Only 1 percent have received training via the Internet. Continuing education (CE) was required for 42 percent. Of the participants for whom continuing education was required, 89 percent said their employer paid for it. Overall, 82 percent of employers pay for CE. The type of CE was decided by the employer for 49 percent of the participants with 4 percent being allowed to choose themselves, and 43 percent making a mutual decision with their employer.

A special certification or credential was required for 62 percent of the participants, recommended for 14 percent, will be required in the future for 1 percent, not required for 6 percent, and unknown for the remaining percent. Of those with a special credential, 71 percent had underlying cause of death certification, 52 percent had MICAR certification, and 43 percent had multiple cause of death certification from NCHS. None of the participants had AHIMA credentials.

Job Functions and Accuracy

We analyzed job procedures and functions nationally and by census divisions for comparisons on how states handle death information. Many states use a combination of methods, depending on the complexity of the case and the training of the person entering data. Overall, 54 percent of the states said at least some or all of the codes were assigned manually, MICAR was used by 41 percent of the states, SuperMICAR was used by 54 percent, 49 percent mailed photocopies of death certificates to NCHS, and 30 percent said they had an automated registration system in which information was entered locally and transmitted to the state for processing. Participants were also asked to describe job duties they perform by circling items on a list (see "Personnel Performing Specific Job Duties".)

Next, we asked participants to identify how accuracy was measured for their data entry job functions. The three most common measures of accuracy were NCHS checking a sample of the records, edit checks in the software, and the return of submitted information with error messages. Overall, 2 percent said accuracy was not measured (see "Use of Accuracy Measures").

Participants were asked to circle statements that they felt applied to their job regarding satisfaction, opportunities, organizational climate, and other issues. The most frequent problems cited by participants were low pay scale (75 percent), followed by little chance of advancement (68 percent), lack of recognition (56 percent), minimal opportunities for CE (35 percent), and poor work environment or organizational climate (33 percent). Unclear job functions and poor supervision were selected by 12 percent of the respondents, while inadequate training and inadequate benefits were selected by 11 percent and 7 percent, respectively.

When asked to identify training they would like in the future, the top areas that participants identified for training were ICD-10 (50 percent), database management (37 percent), medical terminology and pathophysiology (36 percent), Internet (24 percent), and statistical software analysis tools (21 percent). Training in cancer and trauma registries, networks, and morbidity statistics were selected by 19 percent, 18 percent, and 13 percent, respectively.

Study Limitations

There were several limitations to this study. The goal was to survey the entire population, although the total population was unknown at the start. Due to the large number of job titles, it is not clear if all of the targeted personnel had the opportunity to participate in the survey and that the estimated total population number is accurate. Further, all of the data collected is self-reported. The findings from the survey can be generalized only to the states and respondents that participated. Some respondents did not answer all of the questions, accounting for missing data on some questions. Participants were asked to return the questionnaire individually to protect their privacy and possible supervisor influence. Self-selection bias is possible if only those who wanted to voice concerns or comments about their job answered the survey.

Put Data First

Data quality must become the primary concern when considering the training and education of cause-of-death personnel. Multiple studies on coded data submitted for reimbursement reveal that discrepancies in coding and coding procedures impact data quality. A reabstraction study that examined coded data from 974 patients in California revealed that at least one clinical risk factor was missing for 65.0 percent of patients and 31.5 percent contained at least one unsupported risk factor.[5] Variability in coding, whether for reimbursement, statistical databases, or facility use, most likely affects accuracy and data quality. The following recommendations address this concern:

- All factors that potentially affect **data quality** related to cause-of-death reporting should be identified for consideration, such as personnel training, coding system changes, software changes, and reporting procedure variability. An ongoing quality improvement plan should then be developed for each factor. In healthcare areas where coding is used for reimbursement, quality improvement methods have been widely used to assess and improve data quality. This mortality reporting arena could greatly benefit from a similar approach.
- The **education and training** of practitioners in this field should be standardized and strengthened by mandating certain backgrounds, degree requirements, or designated training. The entry-level requirements should follow NCHS recommendations outlining expected job knowledge and skills. Essential courses, such as medical terminology and ICD-10, should be required for employment with other courses added after employment as appropriate for job functions. NCHS certifications should be mandatory after an initial training period for all personnel who perform specified functions.
- Pay increases should be awarded to practitioners who gain **specialty certifications**. A comparison study of pay, education, and training levels for similar positions in hospitals, clinics, and insurance companies should be conducted to determine an equitable pay level commensurate for the training and skills needed.
- **All states** should consider employing **at least one qualified nosologist** to oversee their cause-of-death reporting. *The Proceedings of the International Collaborative Effort on Automating Mortality Statistics* recommended creating a standardized definition of a nosologist strengthening the nosological skill and expertise of coders and also strengthening the status of nosologists by creating an international society of nosologists recognized by WHO.[6]
- As systems are automated, more skilled nosologists should be employed to encourage **accurate and in-depth analysis** of mortality data. Data analysis opportunities are greatly increased with automation and utilization of interrelated database systems.
- **Continuing education** should also be mandatory because of the significant changes in healthcare and the increased opportunities for data analysis due to computerization. Practitioners should be encouraged to conduct self-assessment to determine their educational needs. Continuing education creates a prepared work force as well as providing opportunities for advancement.
- Mortality reporting practitioners should explore ways to **network** with others in this field or related fields. NCHS is currently investigating the need for a national association. Another possibility would be to create a partnership with an existing association with a similar focus, such as AHIMA. As an established health information management organization, AHIMA could reach out to this population through the many avenues currently available to members, such as publications, workshops, Web sites, electronic mailing lists, and bulletin boards. This would greatly contribute to networking opportunities, particularly for those in more isolated areas.

The quality of mortality data in our nation reflects the importance we attach to the structure and process of the data gathering. The death certificate is a widely used tool for epidemiological and clinical investigations and for mortality statistics. Its quality is greatly dependent on the physician and his or her understanding of the guidelines for reporting. Data input personnel are limited by the certificate data and the accuracy of the software product. The querying process, when conducted by experienced nosologists, enhances the quality of mortality data.

As a data collection tool, the death certificate could be greatly expanded to provide many more opportunities for data analysis and data mining. Additional fields could be added to create a much more detailed database in which to investigate the relationships between variables. As we move toward an electronic death registration system, the job functions of state personnel reporting cause-of-death data may evolve to include data analysis processes if the personnel are adequately prepared and can be proactive to the changes at hand.

Mean Number of Personnel by Number of Deaths

Number of Deaths[i]	Number of States	Mean Number of Personnel
10,000 or less	11	2.0
10,001 to 25,000	7	1.8
25,001 to 40,000	11	2.6
40,001 to 55,000	8	2.7
55,001 to 70,000	4	4.5
70,001 to 85,000	1	6.0
85,001 to 100,000	2	did not report
100,001 to 115,000	1	5.0
115,001 or more	5	6.6

Salary of Personnel Reporting Cause of Death

Salary Per Year	% Overall
Less than $20,000	19
$20,000-24,999	23
$25,000-29,999	30
$30,000-34,999	17

$35,000-39,999	5
$40,000-44,999	1
$45,000-49,999	1
Non-responders	5

Personnel Performing Specific Job Duties

Job Duty	**% of respondents**
Select and assign cause of death codes manually	50
Use MICAR software	50
Process MICAR and ACME rejects	36
Query physicians to improve accuracy	68
Provide training on how to complete death certificate	30
Analyze death data for trends, rates, etc.	8
Prepare and disseminate data files	10
Assist in preparing annual files and reports	24
Conduct periodic studies on death data quality	8

Use of Accuracy Measures

Accuracy Measure	**% of respondents**
Edit checks in the software	54
Testing with sample materials	6

Coworkers review each other's work	33
Information submitted is returned with error messages	38
Supervisors checks work and returns if errors	24
NCHS checks a sample of records	80
Accuracy not measured	2

[i] Murphy, Sherry L. *Deaths: Final Data for 1998*. Division of Vital Statistics. National Center for Health Statistics, Centers for Disease Control and Prevention, DHHS, 2000.

What's a Nosologist?

A nosologist analyzes and interprets disease and procedure classifications and terminologies for the accurate translation of healthcare data.[7]

Reporting Systems: ACME, MICAR, and SuperMICAR

The National Center for Health Statistics' (NCHS) movement to automatically code causes of death began with the development of the Automated Classification of Medical Entities (ACME) in 1967, which became effective with deaths occurring in 1968. This made the process easier and more standardized by automating the entry, classification, and retrieval of cause-of-death information.[8] ICD codes were manually assigned based on information from the death certificate and then WHO rules were applied using ACME to select the underlying cause. In 1983, software began to be developed to automate the instructions, rules, and code assignments. In 1992 MICAR (Mortality Medical Indexing, Classification, and Retrieval) was certified for use.[9]

With MICAR there are two methods of data entry: PC-MICAR and SuperMICAR. PC-MICAR, the original version, requires the person entering data to translate the causes of death into text, abbreviations, or reference numbers for cause-of-death terms. This person must understand medical terminology and anatomy. The software then matches the data with more than 100,000 entries in its dictionary and stores it in standardized nomenclature in electronic form. An entity reference number (ERN) is assigned to each matched term. ICD codes are then assigned by converting the ERNs to ICD codes. If a code cannot be assigned, the record is rejected and sent for manual review by the state's nosologist. If information is unclear, the attending physician may be contacted to improve the accuracy of the reported cause of death. About 10 percent of the cases are rejected by the software and require manual coding (see "The MICAR Process").[10] Once the certificate is coded and processed by ACME, a third software program, TRANSAX, is used to convert the data into a fixed format that is translated into a statistical form using the linkage provisions of ICD. TRANSAX stands for "Translation of Axis" and generates two sets of multiple cause codes-entity-axis and record-axis. According to the MICAR instruction manual, the data entry operator does not need to know ICD-9 or 10 but has to be knowledgeable in anatomy and medical terminology.[11] SuperMICAR is an enhanced version that allows the entry of literal information from the death certificate with more automatic processing.

NCHS offers specialized certification in using MICAR, SuperMICAR, underlying cause of death classification, and multiple cause of death classification. Experienced employees can voluntarily acquire these credentials if they pass specified tests of competence. No general ICD-10 coding credential is offered through NCHS. The World Health Organization (WHO) has recently created a Subgroup on Training and Credentialing for mortality and morbidity coding and nosology.[12] The subgroup is in the process of conducting a needs assessment on the skills and training resources of medical coders and nosologists. It is also exploring national and international organizations with which these skilled professionals might affiliate or initiating an association for the purpose of credentialing mortality medical coders and nosologists.

When MICAR was first implemented, it was considered an excellent investment because the automated coding allowed for reduced personnel requirements, improved accuracy and consistency, and a simplified ICD revision process. Further, it supposedly allowed for data entry personnel that did not need to know or keep abreast of ICD coding changes because the software determines the codes. However, a small percentage of the records have to be coded manually and the complicated cases still require well-trained coders. At a recent convention, Donna E. Glenn from NCHS concluded, "even with automated coding systems, we require specially trained nosologists not only to code any rejected records, but also to provide the specifications that make these systems work."[13]

Changes in the Field

In 1999, all US cities, states, and districts were required to switch from ICD-9 to ICD-10 for mortality reporting and as a result, greater detail is available in assigning codes.[14, 15] State health departments are encouraged to conduct more cause-of-death querying with a larger number of codes being recommended for querying than when ICD-9 was utilized.[16] The querying process involves personnel at the state level contacting the medical certifier responsible for completing the cause-of-death statement and asking for clarification or further information to ensure the mortality statistics are as complete and accurate as possible.

There are two goals in querying: to obtain information to properly code and classify the cause of death and to educate the medical certifier regarding the proper method of completing the certification of

death. According to the ICD-10 cause-of-death querying manual, "querying is one of the most important ways to improve the quality of cause-of-death data...it must be viewed as an integral part of any State's vital statistics activity."[17] The person who performs the querying must be familiar with medical terminology, pathology, the etiology of morbid conditions, and how ICD-10 works with MICAR.

In the past, nosologists have performed querying, but because automated systems are now common, fewer states employ nosologists. The manual estimates that Level 1 (minimal level) querying should be performed on five percent of a state's death records, and the person performing the query needs to have an understanding of coding rules and medical causality.[18] Higher levels of query, from 1 to 6, are desirable to ensure specificity and completeness. States are asked to query at the maximum level consistent with their resources.

Electronic death registration is on the horizon. In September 1999, an 18-month contract was signed by the National Association of Public Health Statistics and Information Systems with the Social Security Administration to develop an electronic death registration (EDR) process.[19] California, New Jersey, Minnesota, New Hampshire, New York and New York City are currently experimenting with such systems. Standards for the system are being developed so that states and interested vendors can prepare compliant products. Considerations for cause-of-death reporting specify that it be under the control of the certifier and that there be a tie in to a SuperMICAR process that checks the terminology with the SuperMICAR dictionary.

Notes

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