

RESEARCH ARTICLE

Possible Effect of Implementing a National Query Program on Site-Specific Cancer Mortality Rates in Taiwan

Ching-Yih Lin^{1,2}, Tain-Junn Cheng^{3,4,5}, Hua-Chun Peng⁶, Lea-Hua Chen⁶, Shiuh-Ming Huang⁷, Tsung-Hsueh Lu^{8*}

Abstract

Background: This study aimed to examine possible effects of implementing a national query program on site-specific cancer mortality rates. **Materials and Methods:** A total of 2,874 query letters were sent out by the Department of Statistics, Ministry of Health and Welfare of Taiwan between January 2009 and December 2011 to medical certifiers who reported “neoplasm with uncertain nature” on the death certificate asking for more detailed information for coding. **Results:** Of the 2,571 responses, in 1,398 cases (54%) medical certifiers were still unable to determine the nature of the neoplasm. There were four neoplasm sites for which more than 50% of the responses changed the category to malignant, the gastrointestinal system (73%), urinary system (60%), stomach (55%) and rectum (53%). The liver was the cancer site that showed the largest absolute increase in the number of deaths after the query; however, the brain showed the largest relative increase, at 12%. **Conclusions:** Different neoplasm sites showed different magnitudes of change in nature after the query. Brain cancer mortality rates exhibited the largest increase.

Keywords: Cause of death - death certificate - mortality - neoplasm - query

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Introduction

Examining site-specific cancer mortality across years or regions could help to generate epidemiological hypotheses or to evaluate cancer prevention programs. Given that site-specific cancer mortality is derived from information reported on the death certificate, if medical certifiers report poor-quality cancer-related cause-of-death statements, the validity of site-specific cancer mortality rates is threatened. For example, if a medical certifier reported only “tumor of the lung” on the death certificate, the coder would classify this case as ICD-10 code D38.1 “neoplasm of uncertain or unknown behavior of the lung” instead of ICD-10 code C34 “malignant neoplasm of the lung”. In other words, if a country or region has more death certificates reporting “neoplasm of uncertain nature” by medical certifiers, the quality of site-specific cancer mortality data is less assured.

One remedy to solve the above-mentioned problem is to query medical certifiers for more detailed information for coding purposes (National Center for Health Statistics, 2009). Because the availability of staff and resources used for querying varies across regions, the National Center for

Health Statistics of the US recommends different priority levels in the query program for regional vital statistics programs. The priority level of query ranges from level 1, indicating cases that should always be queried, to level 6, which is an optional category (Table 1). Priority level 1 is further subdivided into six categories, and neoplasm-related query is in the second category in level 1, which says “Always query neoplasm for a primary site and to determine if benign or malignant. When a malignant neoplasm is stated to be the underlying cause of death, it is important to determine the primary site.”

Several studies have examined the possible effects of querying on cause-specific mortality (Hopkins et al., 1989; Swerdlow, 1994; Hanzkuck, 1996; Lu et al., 2002; Lahti et al., 2003; Hoyert et al., 2005); however, only one study assessed the possible effects of querying on site-specific cancer mortality rates (Swerdlow, 1994). One limitation of this study was that no uniform systematic program was implemented for querying. The Department of Statistics, Ministry of Health and Welfare of Taiwan initiated a national query program since January 1, 2009, in which all medical certifiers who report “neoplasm of uncertain nature” on death certificates were queried for

¹Department of Internal Medicine, Chi Mei Medical Center, ²Department of Leisure, Recreation, and Tourism Management, Southern Taiwan University of Science and Technology, ³Department of Neurology, Occupational Medicine and Management in Medical Records and Information, Chi Mei Medical Center, ⁴Department of Occupational Safety / Institute of Industrial Safety and Disease Prevention, College of Sustainable Environment, Chia Nan University of Pharmacy and Science, ⁵Department of Occupational and Environmental Medicine, National Cheng Kung University Hospital, ⁶Institute of Public Health, College of Medicine, National Cheng Kung University, Tainan, ⁷Department of Statistics, Ministry of Health and Welfare, ⁸Biostatistics Center, Taipei Medical University, Taipei, Taiwan *For correspondence: robertlu@mail.ncku.edu.tw

Table 1. Priority Levels of Querying for the State Vital Statistics Program Set by the National Center for Health Statistics of the United States

Priority level 1 contains the minimum level of querying that all State vital statistics programs should use to promote basic integrity of State and national mortality data.

Level 1a: Always query if an infrequent or rare cause appears anywhere in the medical certification section.

Level 1b: Always query neoplasm for a primary site and to determine if benign or malignant. When a malignant neoplasm is stated to be the underlying cause of death, it is important to determine the primary site.

Level 1c: Always query trivial conditions, symptoms and signs, ill-defined conditions, or mechanisms of death are reported alone or as the underlying cause of death on the death certificate.

Level 1d: Always query for the reason for “surgery or medical care” when the underlying disease or condition is not reported anywhere on the death record.

Level 1e: Always query for an external cause when only nature of injuries, that is, codes classifiable to ICD-10 codes S00-T98, are reported alone on the death certificate.

Level 1f: Query when the sequence arrangement of the reported entries is questionable.

Level 1g: When any of the selected HIV-related conditions is reported, whether in part I or part II on the death certificate, and there is no mention of HIV (Human immunodeficiency virus) infection, query for HIV.

Priority level 2 includes conditions not usually considered as the underlying cause for which querying will help classify the underlying cause of death more specifically. (For example querying whether ‘peritonitis’ was due to ruptured appendix, ruptured peptic ulcer or others.)

Priority level 3 provides more detailed information that would enable the cause of death to be classified more accurately and to a more detailed ICD category. (For example querying whether ‘chronic liver disease’ was alcoholic or biliary cirrhosis or chronic hepatitis.)

Priority level 4 includes those cases in which the certifier may already provide a logical chain of events leading to death but determining the site or location of stated diseases or conditions will lead to a more precise code. (For example querying whether the specific site of ‘embolism’ was brain or lung or coronary arteries.)

Priority level 5 contains queries which would enable the cause of death to be coded to a more precise subcategory within the three-digit category. This level of detail is frequently required for specified special studies or research projects within a defined reporting area, but may not be necessary for general querying. (For example querying whether the specific site of ‘cancer of pancreas’ was body or head or duct.)

Priority level 6 reflects the most thorough recommended level of querying. The conditions in this category are queried for the purpose of obtaining even more explicit statements, thus eliminating the necessity of using the assumption which are allowed under ICD rules. (For example querying whether ‘tuberculosis’ was pulmonary.)

Table 2. Query Letter Used by the National Office of Statistics of the Department of Health of Taiwan

Dear Doctor _____

We are writing this letter to obtain additional information about the cause of death that you certified for _____, who died _____. (Please see the opposite page, which is a copy of death certificate you issued.)

Please indicate whether the “liver tumor” you reported on the b) line in Part I of the cause of death section was

malignant; benign; could not be certain whether it was malignant or benign.

Please also indicate whether the diagnosis was based on

Biopsy; cytology; image; history; other: _____

Please sign your name after you and mail it back to the Office of Statistics, Department of Health. If you have any questions, please contact _____. Thank you very much for your cooperation.

Doctor signature: _____ Date: _____ .

Notes:

1. Cause of death statistics are an important reference for health policy making and are based on the information reported by medical certifiers.
2. To improve the quality of cause of death statistics, the Office of Statistics will routinely query medical certifiers for clarification or further information for better coding. We want to assure you that the information you provide is confidential and will be handled accordingly.
3. Malignant neoplasm is the number one leading cause of death in Taiwan and accurate cancer mortality data are important in designing cancer prevention programs. If you reported “malignant neoplasm of the liver” or “liver cancer” on the death certificate, the case will be coded ICD-10 code C22. However, if you reported “liver tumor” on the death certificate, the case will be coded ICD-10 code D376 and would not be counted as the leading cause of death.

more detailed information for coding purposes. This study sought to examine possible effect of the implementing of national query program on site-specific cancer mortality rates.

Materials and Methods

National query program in Taiwan

Staffs of the Department of Statistics, Ministry of Health and Welfare have routinely queried all medical

certifiers who report “neoplasm of uncertain nature” on death certificates since January 1st, 2009. The format of the query letter was modified from the recommended query letter designed by the National Center for Health Statistics. We designed a specific query letter for specific neoplasm sites (please see the example of liver tumor in Table 2). The query letter was printed on the opposite side of a copy of the death certificate issued by the medical certifier. Besides the query regarding whether the nature of the neoplasm was begin or malignant, we further

Table 3. Number of Responses after Query Letters Were Sent by the Department of Statistics of the Ministry of Health and Welfare of Taiwan, January 1st 2009 to December 31st 2011

	Query letters sent		Responses	
	N	%	n	%
Total	2874	100.0	2571	89.5
Year				
2009	1040	100.0	926	89.0
2010	963	100.0	897	93.1
2011	871	100.0	748	85.9
Sex of deceased				
Men	1,687	100.0	1,506	89.3
Women	1,187	100.0	1,065	89.7
Age of deceased				
0-44 years	197	100.0	176	89.3
45-64 years	515	100.0	465	90.3
65-74 years	500	100.0	445	89.0
75+ years	1,662	100.0	1,485	89.4
Clinical setting				
Medical center	718	100.0	678	94.4
Regional hospital	738	100.0	685	92.8
District hospital	620	100.0	567	91.5
Clinic	310	100.0	190	61.3
Public health center	488	100.0	451	92.4
Region				
Northern	1,149	100.0	988	86.0
Central	719	100.0	665	92.5
Southern	912	100.0	831	91.1
Eastern	94	100.0	87	92.6
Neoplasm site				
Liver	883	100.0	778	88.1
Brain	608	100.0	541	89.0
Lung	435	100.0	385	88.5
Kidney	95	100.0	81	85.3
Pancreas	84	100.0	75	89.3
Peritoneum	65	100.0	61	93.8
Colon	56	100.0	50	89.3
Biliary	47	100.0	43	91.5
Bladder	46	100.0	44	95.7
Gastrointestinal	39	100.0	37	94.9
Other	516	100.0	476	92.2

asked medical certifiers to outline the evidence on which they based the diagnosis. We also added notes on the importance of the query in terms of the quality of cancer mortality data. If the medical certifier had left the hospital, the nosologists in the hospital were asked to provide the information according to the information recorded in the medical chart.

Analysis

We first computed the response rates by year, the demographic characteristics of the deceased, the clinical settings and the major neoplasm sites. We then calculated the percentages of malignancy, benign or uncertain nature among responses by neoplasm site. Third, we determined the change in the number of deaths after medical certifiers had responded to the query letter by cancer site.

Results

The number of death certificates with mention of "neoplasm of uncertain nature" was 1040 in 2009 and

Table 4. Results of Querying by Neoplasm Site among Those Who Responded to the Query Letter, Taiwan, January 1st 2009 to December 31st 2011

Neoplasm site	Responses		Malignant		Benign		Uncertain	
	n	%	n	%	N	%	n	%
Total	2571	100.0	1023	39.8	150	5.8	1398	54.4
Liver	778	100.0	383	49.2	6	0.8	389	50.0
Brain	541	100.0	182	33.6	74	13.7	285	52.7
Lung	385	100.0	111	28.8	6	1.6	268	69.6
Kidney	81	100.0	29	35.8	1	1.2	51	63.0
Pancreas	75	100.0	20	26.7	4	5.3	51	68.0
Peritoneum	61	100.0	15	24.6	0	0.0	46	75.4
Colon	50	100.0	16	32.0	5	10.0	29	58.0
Bladder	44	100.0	20	45.5	1	2.3	23	52.3
Biliary	43	100.0	17	39.5	4	9.3	22	51.2
Gastrointestinal	37	100.0	27	73.0	1	2.7	9	24.3
Stomach	29	100.0	16	55.2	1	3.4	12	41.4
Mediastinum	26	100.0	6	23.1	0	0.0	20	76.9
Pituitary	25	100.0	2	8.0	14	56.0	9	36.0
Esophagus	20	100.0	9	45.0	2	10.0	9	45.0
Urinary	20	100.0	12	60.0	0	0.0	8	40.0
Rectum	19	100.0	10	52.6	3	15.8	6	31.6
Other	337	100.0	148	43.9	28	8.3	161	47.8

Table 5. Changes in the Number of Deaths by Cancer Site Before and After the Query Letter was Responded, Taiwan, January 1st 2009 to December 31st 2011

Cancer site	Before query	After query	No. of changes	% change
Total	120,716	123,590	2,874	2.33
Lung	24,534	24,641	107	0.43
Liver	23,179	23,542	363	1.54
Colon	9,964	9,985	21	0.21
Stomach	6,819	6,831	12	0.18
Pancreas	4,540	4,558	18	0.39
Prostate	3,044	3,057	13	0.43
Bladder	2,266	2,282	16	0.70
Brain	1,293	1,474	181	12.28
Kidney	1,641	1,666	25	1.50
Other digestive	591	624	33	5.29
Other	44,735	44,930	195	0.43

decreased to 963 in 2010 and 871 in 2011. Of 2874 query letters sent by the Department of Statistics, Ministry of Health and Welfare from January 1st 2009 to December 31st 2011, 2571 letters were responded to, a response rate of 89.5%. The response rate did not differ by the demographic characteristics of deceased and was lowest in clinics, the Northern region and cases of kidney tumor (Table 3).

Among the 2571 responses, in 1398 cases (54%) medical certifiers were not able to determine the nature of the neoplasm (Table 4). There were four neoplasm sites of which more than 50% of the responses changed in nature into a malignant nature, i.e., the gastrointestinal system (73%), urinary system (60%), stomach (55%) and rectum (53%). On the contrary, there were two neoplasm sites with a noteworthy number of death certificates on which the nature of the neoplasm changed from an uncertain nature to a benign nature, the pituitary (56%) and brain (14%). Table 5 illustrates the number of cancer deaths added by cancer site after medical certifiers responded to the query letter. The liver was the cancer site that showed the largest absolute increase in the number of deaths after query, an

increase of 363 deaths between 2009 and 2011. However, the brain exhibited the largest relative increase, a 12% increase from 1293 to 1474 cases.

Discussion

The findings of this study indicate that among responses to the query letter, in more than half of cases medical certifiers were still not able to determine the nature of the neoplasm. The gastrointestinal system, urinary system, stomach and rectum were the four sites showing the largest change from an uncertain nature to a malignant nature, and the pituitary and brain were the two sites presenting the largest change from an uncertain nature to a benign nature. The liver was the cancer site that showed the largest absolute increase in the number of deaths after query; however, the brain exhibited the largest relative increase.

Five empirical studies have assessed the effects of the query program, three of which covered all causes of death (Hopkins et al., 1989; Lahti et al., 2003; Hoyert et al., 2005). Of 1033 death certificates queried Finland in 2005, 53 (5.1%) asked for specification of the nature (malignant or benign) of the neoplasm and 54 (5.1%) asked for specification of the primary site of a malignant neoplasm (Lahti et al., 2003). In Finland, the most often queried cancer sites were the liver, lung and peritoneum. However, the authors in the Finnish study did not present the sites most often queried in neoplasms of an uncertain nature. In Taiwan, the most often queried sites were the liver, brain and lung. In other words, medical certifiers are prone to report an uncertain nature for particular neoplasm sites (Lahti et al., 2003).

Regarding the fact that only in half of cases were medical certifiers able to provide detailed information on the nature of the neoplasm, one possible explanation was the high percentage of people who die at home in Taiwan. District public health physicians are assigned to issue death certificates in these cases, and on many occasions the information provided by the families is not specific enough for detailed certification (Lu et al., 2002).

In terms of the effect of querying on cancer mortality rates, the increase was 2% in Oregon State (Hopkins et al., 1989) and only 0.7% in Washington State (Hoyert et al., 2005). However, the two US studies did not illustrate the effect of querying on site-specific cancer mortality rates. A study in England and Wales suggested that the percentage increase in the number of deaths after enquiry was trivial for some cancer sites with a large number of deaths and was substantial for cancer of the eye at 35% and cancer of the body of the uterus at 31%, cancers of the thymus, heart and mediastinum at 18%, and pleural cancer at 17% (Swerdlow, 1994). Similarly, we found that the greatest absolute increase in the number of deaths was for liver cancer (an increase of 363 cases), but this only constituted a 1.8% increase. In contrast, there was an increase of 181 brain cancer deaths, which represented a 12% of increase because of the small denominator.

The strength of this study is that it was the first study to assess the possible effects of implementation of a nationwide systematic query program on national

site-specific cancer mortality. One of the limitations of this study was that we were unable to verify information provided by medical certifiers. Further studies are needed to link cause of death mortality data with the cancer registry in order to better estimate the underreporting of site-specific cancer mortality.

In conclusion, different neoplasm sites showed different magnitudes of change in the nature of the neoplasm after query. Brain cancer mortality showed the largest increase after query. The query program should be persistently implemented to ensure the comparability of site-specific cancer mortality across years or regions.

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