
COMMENTARY

Why Did Cancer Deaths Increase in Japan after the Introduction of the Tenth Version of the International Classification of Disease? : Assessment Based on a Population-Based Cancer Registry

Manami Inoue^{1,2}, Kazuo Tajima¹, Suketami Tominaga³

Abstract

Considerable increase in cancer deaths has been observed since 1995, after when the tenth version of the international classification of disease (ICD) was introduced in Japan according with the revision of a death certificate form at the same time. We assessed the contributing factors for this unnatural fluctuation, using a population-based cancer registry data as a model. All deaths of the prefectural residents are collated with the cancer registry database in the registration process. For all Japanese deaths of Aichi Prefecture in 1994 (n=41,111) and in 1995 (n=42,944), the description of the death certificates were compared with the ICD classified as the cause of death. It was ascertained that 97-99% of cancer and 97-98% of non-cancer deaths classified by ICD were proper. Among those classified as cancer as the cause of death and stated as other than the direct cause of death (n=92 in 1994, n=428 in 1995), only 22% (1994) and 8% (1995) were considered to be classifiable to both cancer and non-cancer as the cause of death. Among those who were classified as non-cancer as the cause of death in spite of including cancer in the original statement (n=770 in 1994, n=638 in 1995), 24% (1994) 10% (1995) were considered to be non-cancer as the cause of death, and the rest were considered classifiable into both cancer and non-cancer. Even if all cancer deaths classifiable to non-cancer were classified as non-cancer deaths, change in the number of cancer deaths was inconsiderable in both years. Therefore, it is suggested that the increase of cancer deaths after introduction of the new ICD was caused not by the artifact such as change in selection rule of disease when classify the cause of death, but by the improvement of the description of death certificate by physicians as a result of revision of death certificate form.

Key Words: cancer deaths - increase - ICD-10 - Japan - population-based cancer registry

Asian Pacific J Cancer Prev, 2, 71-74

Introduction

Since the increase of cancer death is considered to affect both the incidence estimation and the quality of the cancer registry data in Japan, it is important to clarify contributing factors for this unnatural fluctuation of cancer deaths. In the data processing in population-based cancer registry, all deaths of the residents are collated with the cancer registry database. Thus, it is possible to approach this issue from the cancer registry aspect. In the present study, we assessed this issue using a population-based cancer registry data in Aichi Prefecture, Japan, as a model.

Methods

The study subjects consist of all Japanese deaths of Aichi

Prefecture in 1994 (n=41,111) and in 1995 (n=42,944). All Japanese deaths of the prefectural residents are collated with the cancer registry database on the annual basis, when the cause of death description in the death certificate for each case was looked over as well as the selected cause of death for the vital statistics. If cases have any description regarding cancer in their death certificates, the information on these deaths is kept in the cancer registry database.

Death certificate form in Japan complies with the international form of medical certificate of cause of death (World Health Organization, 1977, 1993). Thus, the following information was available for each case of all Japanese deaths in Aichi Prefecture in 1994 and 1995: 1) existence of cancer as one of the cause of death and 2) location of description on any cancer in the original death certificate form, and 3) ICD code designated as the

1. Division of Epidemiology and Prevention, Aichi Cancer Center Research Institute, Nagoya, Japan, 2 Aichi Cancer Registry, Nagoya, Japan, 3. Aichi Cancer Center Research Institute, Nagoya, Japan

Correspondence: Manami Inoue, M.D., Division of Epidemiology and Prevention, Aichi Cancer Center Research Institute, 1-1 Kanokoden Chikusa-ku Nagoya 464-8681 Japan Phone: +81-52-762-6111 Fax: +81-52-763-5233 E-mail: minoue@aichi-cc.pref.aichi.jp

Table 1. Recent Trend of Deaths in Aichi Prefecture ¹

Year	Number	All deaths		Number	Cancer deaths		
		Increase from the previous year	Increase rate (%)		Proportion among all deaths	Increase from the previous year	Increase rate (%)
1990	37,425	885	2.4	9,888	26.4	148	1.5
1991	38,326	891	2.4	10,271	26.8	383	3.9
1992	39,683	1,357	3.5	10,739	27.0	468	4.6
1993	40,595	912	2.3	10,829	26.7	90	0.8
1994	41,111	516	1.3	11,291	27.5	462	4.3
1995	42,944	1,833	4.5	12,369	28.8	1,078	9.5
1996	42,231	-713	-1.7	12,882	30.5	513	4.1
1997	42,787	556	1.3	12,996	30.4	114	0.9
1998	44,163	1,376	3.2	13,554	30.7	558	4.3
1999	45,878	1,715	3.8	13,767	30.0	213	1.5

¹ Deaths include Japanese deaths in Aichi Prefecture.

underlying cause of death for the tabulation of the vital statistics. For all cancer deaths by ICD code with description of cancer within Part I (disease or condition directly leading to death) and all non-cancer deaths by ICD code without any description of cancer in the form, the underlying cause of death selected was assumed to be appropriate. All other cases were reviewed by one of the authors skilled at the classification of diseases to assess if ICD code selected was proper as the underlying cause of death.

Results

Description of cancer among cancer deaths is shown in Table 2. Among 99.2% of cancer deaths in 1994 classified by ICD-9 and 96.5% of cancer deaths in 1995 classified by ICD-10, description of cancer was placed within part I. Classification of these cases was assumed to be appropriate. Among deaths classified as cancer as the underlying cause of death and whose cancer was stated as other than the direct cause of death in part I columns (n=92 in 1994, 0.8% of all cancer deaths; n=428 in 1995, 3.5% of all cancer deaths),

77.2% (1994) and 91.6% (1995) were considered to be reasonable, and remaining 22.8% (1994) and 8.4% (1995) were considered to be classifiable to both cancer and non-cancer as the underlying cause of death.

Description of cancer among deaths other than cancer is shown in Table 3. There was no description of cancer for 97.4% of non-cancer deaths in 1994 classified by ICD-9 and 97.9% of non-cancer deaths in 1995 classified by ICD-10. Classification of these cases was assumed to be appropriate. The rest of non-cancer deaths (n=770, 93.4% of all non-cancer deaths in 1994; n=638, 2.1% of all non-cancer deaths in 1995) were classified as non-cancer as the underlying cause of death in spite of including cancer in the original statement. Almost all deaths in this category were classified into diseases other than neoplasm. Among these deaths, 24.3% in 1994 and 10.3% in 1995 were considered to be non-cancer, and other 75.7% (1994) and 89.7% (1995) were considered classifiable into both cancer and non-cancer as the underlying cause of deaths.

Even if all cancer deaths classifiable also to non-cancer death (n=21 in 1994 and n=36 in 1995) were classified as non-

Table 2. Description of Cancer in The Original Death Certificates of 1994 and 1995 Among Cancer Deaths ¹ in Aichi Prefecture, Japan

Location of cancer description	1994				1995			
	n	(%)	n	(%)	n	(%)	n	(%)
	Total		Except cases with description within Part I columns		Total		Except cases with description within Part I columns	
Part I columns ²	11,199	(99.2)	-	-	11,941	(96.5)	-	-
Part II columns ³	92	(0.8)	92	(100.0)	428	(3.5)	428	(100.0)
No description	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Total	11,291	(100.0)	92	(100.0)	12,369	(100.0)	428	(100.0)
Cancer deaths except the cases with description within part I columns								
Obviously 'cancer'			71	(77.2)			392	(91.6)
Can be 'cancer' or 'non-cancer'			21	(22.8)			36	(8.4)

¹ Deaths include Japanese deaths in Aichi Prefecture.

² Disease or condition directly leading to death.

³ Other significant conditions contributing to the death, but not related to the disease or condition causing it.

Table 3. Description of Cancer in The Original Death Certificates of 1994 and 1995 Among Non-Cancer Deaths ¹ in Aichi Prefecture, Japan

Location of cancer description	1994				1995			
	n Total	(%)	n Except cases with no cancer description	(%)	n Total	(%)	n Except cases with no cancer description	(%)
Part I columns ²	51	(0.2)	51	(6.6)	1	(0.0)	1	(0.2)
Part II columns ³	719	(2.4)	719	(93.4)	583	(1.9)	637	(99.8)
No description	29,050	(97.4)	-	-	29,937	(97.9)	-	-
Total	29,820	(100.0)	770	(100.0)	30,575	(100.0)	638	(100.0)
(Distribution)					(Distribution)			
Carcinoma in situ			0	(0.0)	Carcinoma in situ		0	(0.0)
Benign neoplasm			0	(0.0)	Benign neoplasm		1	(0.2)
Neoplasm NOS			20	(2.6)	Neoplasm NOS		7	(1.1)
Non-neoplasm			750	(97.4)	Non-neoplasm		630	(98.7)
Non-cancer deaths except the cases with no description of cancer								
Can be 'cancer' or 'non-cancer'			583	(75.7)			572	(89.7)
Obviously 'non-cancer'			187	(24.3)			66	(10.3)

¹ Deaths include Japanese deaths in Aichi Prefecture.

² Disease or condition directly leading to death.

³ Other significant conditions contributing to the death, but not related to the disease or condition causing it.

cancer as the underlying cause of death, change in the number of cancer deaths was inconsiderable. Likewise, if all non-cancer death classifiable also to cancer death (n=583 in 1994 and n=572 in 1995) were classified as cancer as the underlying cause of death, further increase but not decrease in the number of cancer deaths was expected in both years (Table 4).

Discussion

From our results, we failed to observe any artifact caused by the introduction of ICD-10 such as change in the selection rule of disease when classified as the underlying cause of death. In other words, it is considered that the increase in the number of cancer death occurred by the actual increase and/or by the improvement of the description of death certificate by doctors as a result of revision of death certificate form according with the revision of the ICD.

The recent report from the Osaka cancer registry (Ajiki et al, 2000) mentions that change in the cancer deaths due to reassessment of classification and revision in the selection method of underlying cause of death (Takemura et al., 1996) was inconsiderable. The increment by revision from ICD-9 to ICD-10 was reported to be 2.5% (Ministry of Health and Welfare, 1997), of which the fraction caused by the reassessment of classification was negligible, and the number of death estimated from the death in the previous year taking natural increment by aging and this 2.5% increase into account is far less than the actual value. This can be also applied to the mortality trend in this prefecture.

The proportion of cancer deaths among all deaths increased from 27% to 30% after the introduction of ICD-10 and has become stable for several years after it reached to 30% (Figure 1). There was a rather unexpected increase of the

total number of deaths in 1995. This increase is explained partly by a big earthquake in Hanshin area and influenza epidemic (Health and Welfare Statistics Association, 1997). Similar trend could be observed in Aichi, although the influence of the earthquake was negligible in this area. It is suggested that the surplus increase in total deaths in 1995 kept the proportion of cancer deaths conservative than expected. Yet, elevation in the absolute number of cancer deaths was distinctive, and this sudden increase of cancer deaths in 1995 is unable to be explained by natural and actual increase. Therefore, the improvement of the description of death certificate by doctors by the revision of death certificate form is highly suspected as one of the most contributing factor for the increment of cancer deaths. The proportion of cancer deaths in 1995 was on the way of the increment but did not reach to the plateau level as

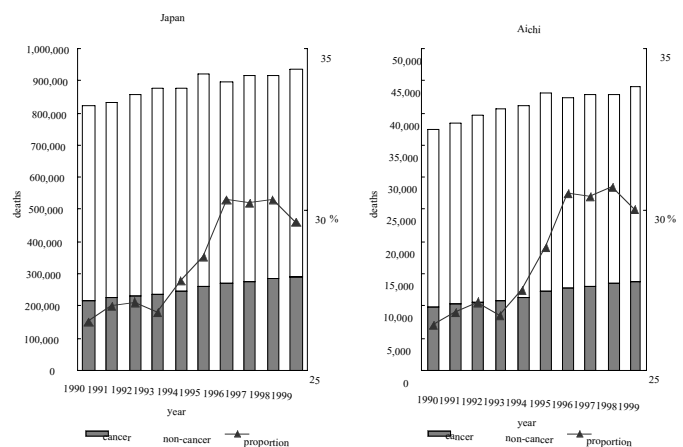


Figure 1. Recent Trend in the Proportion of Cancer Deaths among Total Deaths

Table 4. Theoretical Estimation of the Number of Deaths in 1994 and 1995 in Aichi Prefecture, Japan.

Cause of deaths	Distribution		Fact		Estimation	
	n	(%)	n	(%)	n	(%)
1994						
Cancer			Cancer ¹⁺²⁺³ 11,291	(27.5)	Cancer ¹⁺²⁺⁴ 11,853	(28.8)
(Description of cancer)						
Description in Part I columns ¹	11,199	(27.2)				
Obviously cancer ²	71	(0.2)				
Can be cancer or non-cancer ³	21	(0.0)				
Non-cancer			Non-cancer ⁴⁺⁵⁺⁶ 29,820	(72.5)	Non-cancer ³⁺⁵⁺⁶ 29,258	(71.2)
(Description of cancer)						
Can be cancer or non-cancer ⁴	583	(1.4)				
Obviously non-cancer ⁵	187	(0.5)				
(No description of cancer)						
No description of cancer ⁶	29,050	(70.7)				
1995						
Cancer			Cancer ¹⁺²⁺³ 12,369	(28.8)	Cancer ¹⁺²⁺⁴ 12,905	(30.1)
(Description of cancer)						
Description in Part I columns ¹	11,941	(27.2)				
Obviously cancer ²	392	(0.2)				
Can be cancer or non-cancer ³	36	(0.0)				
Non-cancer			Non-cancer ⁴⁺⁵⁺⁶ 30,575	(71.2)	Non-cancer ³⁺⁵⁺⁶ 30,039	(69.9)
(Description of cancer)						
Can be cancer or non-cancer ⁴	572	(1.4)				
Obviously non-cancer ⁵	66	(0.5)				
(No description of cancer)						
No description of cancer ⁶	29,937	(70.7)				

mentioned above. Deaths of the single year before and after the revision of ICD were observed in the present study, and it is one limitation of the present study. From our study results, however, further increase of the cancer deaths is expected which is not by the artifact of the revision of the ICD if the improvement of the description of death certificate by doctors continues in the same manner as in 1995.

In conclusion, it is suggested that the increase of cancer deaths after introduction of ICD-10 was caused unlikely by the artifact such as change in selection rule of disease when classify the cause of death, but likely by the improvement of the description of death certificate by doctors as a result of revision of death certificate form. In other words, it is highly suspected that we underrepresented cancer deaths before the revision of the death certificate form.

Acknowledgement

This work was supported in part by the Grant-in-Aid for Cancer Research (8-2) from the Japanese Ministry of Health and Welfare.

References

- Ajiki W, Tsukuma H, Oshima A (2000). Increase of cancer deaths along with the introduction of ICD-10 and its influence on the quality of cancer registry and cancer incidence. *Kosei no Shihyo*, **47**, 14-8 (In Japanese).
- Takemura K, Ueda H, Nakata T (1996). A New automated coding of diagnostic expressions and selection of underlying cause of death (ACSEL). *Kosei no Shihyo*, **43**, 9-16 (In Japanese).
- Ministry of Health and Welfare (1997) Vital statistics of Japan 1995. *Health and Welfare Statistics Association*, Tokyo (in Japanese).
- Health and Welfare Statistics Association (1997) Health statistics in Japan 1997. *Kosei no Shihyo*, **44** (9 supplement.) **48** (in Japanese).
- World Health Organization (1993). International statistical classification of diseases and related health problems, tenth revision. *World Health Organization*, Geneva.
- World Health Organization (1977). International classification of diseases, 1975 revision. *World Health Organization*, Geneva.