

## RESEARCH COMMUNICATION

# 5-Year Survival Rates for Primary Cancer Sites at Cancer-Treatment-Oriented Hospitals in Japan

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### Abstract

In Japan, The Japanese Association of Clinical Cancer Centers (JACCCs) was established in 1965 by systematizing cancer-treatment-oriented hospitals. The core center of JACCCs is the National Cancer Center in Tokyo. In 1984, JACCCs created The "Improvement for Clinical Cancer Centers in Japan" Study Group (The Study Group) which has subsequently routinely evaluated the effectiveness of the therapy that is provided. In general, the 5-year (relative) survival rate is employed as an indicator of the treatment efficacy. The present survey used the PC software program KAP developed by Chiba Cancer Center in Japan, to calculate 5-year observed survival rates and the 5-year relative survival rates using Ederer II methods. The overall 5-year relative survival rates in patients with stomach (15,353 patients), colon (5,054), rectum (3,695), lung (10,153), breast (11,302) and cervix of the uterus (6,336) were 68.7%, 72.2%, 69.4%, 28.1%, 86.1% and 81.1%, respectively. The survival rates discussed so far are principally observed survival rates. The 5-year relative survival rate for those institutions that specialize in cancer treatment should become an index for Japanese cancer treatment.

**Key Words:** Cancer-treatment-oriented hospital - 5 year relative survival rate - stomach cancer - colon cancer - rectal cancer - lung cancer - breast cancer - cervical cancer

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### Introduction

In Japan, The Japanese Association of Clinical Cancer Centers (JACCCs) was established in 1965 by systematizing some cancer-treatment-oriented hospitals. The core center of JACCCs is the National Cancer Center in Tokyo. As of 31 March 2004, a total of 30 institutes throughout Japan belonged to the JACCCs. Eight of these cancer centers are supported by the National Government, while the others are supported by local prefectural governments or by a private foundation. Executive board members of JACCCs evaluate cancer centers for suitability, prior to allowing membership.

In 1984, JACCCs created The "Improvement for Clinical Cancer Centers in Japan" Study Group (The Study Group) which has subsequently, routinely evaluated the effectiveness of the treatment that is provided. In general, the 5-year (relative) survival rate is used as an indicator of the

effectiveness of cancer treatments (Esteve et al., 1994). The Study Group uses the method of cumulative survival analysis (Cutler & Ederer, 1958) for its calculations. Frequently in clinical medicine, this indicator is calculated in relation to each cancer site within the body so that a comparison can be made between different stages of cancer or between different treatments (for example surgery, chemotherapy or radiation therapy) for each site (Watanabe et al., 1995).

There are two key aspects that are of interest when examining the effectiveness of cancer treatment. Firstly it is important to demonstrate that 5-year survival rates in Japan have risen from past to present so as to attain a true evaluation of the progress of cancer treatment in this country. This requires information to be collected on a nationwide basis. Secondly, it is useful to make comparisons between survival rates at different hospitals. This is especially relevant today because there is increasing concern among the Japanese

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public about the differences in cancer survival rates between teaching hospitals and general hospitals.

In this paper, we examine the 5-year (relative) cancer survivals in patients who were admitted to JACCCs between 1988 and 1992. The purpose of this study is to obtain baseline site and stage specific 5-year (relative) survival rates from these JACCCs. The data will help clarify the current situation and contribute to the continued monitoring of cancer treatment at these institutions in Japan.

## Materials and Methods

In 1996, the Study Group embarked on a survey to collect data on cancer patients who had been treated at JACCCs seven years beforehand, in order to calculate relative survival rates. This survey collected data over a period of 5 years, from 1996 to 2000. This survey collected data relating to in-patient primary cases of cancer of the stomach (ICD9-No. 151), colon (153), rectum (154), lung/trachea (162), breast (174), and cervix of the uterus (180), where treatment had taken place during a 5-year period from January 1, 1988 to December 31, 1992. The data collected included the following: 1) patient number, 2) gender, 3) date of birth (or age at time of diagnosis), 4) date of confirmed diagnosis, 5)

primary site (ICD9-No.), 6) clinical stage, 7) survival confirmation date, and 8) survival status (alive or dead). The stage was classified in accordance with the current guidelines of each relevant academic society, at 1988-1992 of the data under medical treatment period (Japanese Research Society for Gastric Cancer, 1985; Japanese Society for Cancer of the Colon and Rectum, 1988; The Japanese Lung Cancer Society, 1989; The Japanese Breast Cancer Society, 1989; Japanese Society of Obstetrics and Gynecology, 1988).

It was the aim of the survey to include patient follow-up that took place more than 5 years after treatment. In view of this, this survey considered the data of any patient, who underwent follow-up in under 1825-days, to be censored. The expected survival rate, which was used in the calculation of the relative survival rate, was based on the Japanese life expectancy used by the Survey Department of the National Cancer Center in its own studies (Arimoto, 1985). The relative survival rate was calculated based on the following formula:

$$\text{Relative survival rate} = \frac{\text{Observed survival rate}}{\text{Expected survival rate}} \times 100$$

This survey used the PC software program KAP to

**Table 1. The Number of Collected Cancers by Major Site**

Institution	Years of admission	Stomach (151)	Colon (153)	Rectum (154)	Lung (162)	Breast (174)	Cervix (180)	Total
Cancer Center Group (CCG)	-	8,154	2,409	1,914	5,394	7,466	4,013	29,350
1. Miyagi Cancer Center	1989-92	451	118	82	254	117	68	1,090
2. Tochigi Cancer Center	1988-92	578	158	146	419	292	112	1,705
3. Gunma Cancer Center	1988-92	369	108	111	326	333	314	1,561
4. Saitama Cancer Center	1988-92	1,007	196	223	795	976	641	3,838
5. Chiba Cancer Center	1988-92	607	180	107	283	422	332	1,931
6. National Cancer Center	1988-92	1,281	448	389	968	1,136	381	4,603
7. The Cancer Institute Hospital	1988-90	833	220	141	245	1,263	336	3,038
8. Kanagawa Cancer Center	1988-92	834	258	175	682	671	617	3,237
9. Aichi Cancer Center	1988-92	1,056	381	259	657	1,037	541	3,931
10. Shikoku Cancer Center	1988-92	783	158	184	333	617	490	2,565
11. Kyushu Cancer Center	1990-92	355	184	97	432	602	181	1,851
Cancer Center with General Hospital (WGH)	-	2,254	647	522	1,895	1,790	815	7,923
12. Hokkaido Cancer Center	1988-92	326	115	102	508	702	406	2,159
13. Ibaragi Prefectural Center Hospital	1991-92	105	44	31	36	37	7	260
14. Niigata Cancer Center	1988-92	1,284	285	239	1,002	805	298	3,913
15. National Kure Medical Center	1988-92	539	203	150	349	246	104	1,591
Hospitals Specialized in Geriatric Diseases (SGD)	-	4,230	1,499	968	2,232	1,663	1,166	11,758
16. Yamagata Medical Center for Cancer & LRD*1	1988-92	1,257	376	299	340	234	127	2,633
17. Fukui Medical Center for Geriatric Diseases	1988-92	1,496	441	284	274	308	114	2,917
18. Shiga Medical Center for Geriatric Diseases	1991	79	42	26	50	43	32	272
19. Osaka Medical Center for Cancer & CVD*2	1988-92	802	463	236	801	603	405	3,310
20. Hyogo Medical Center for Geriatric Diseases	1988-92	596	177	123	767	475	488	2,626
Regional Teaching Hospitals (RTH)	-	715	499	291	632	383	342	2,862
21. Aomori Prefectural Central Hospital	1990-92	288	124	79	301	73	46	911
22. Iwate Prefectural Central Hospital	1990-92	109	163	111	110	73	120	686
23. Nagoya Medical Center	1991-92	172	97	33	72	108	107	589
24. Yamaguchi Grand Medical Center	1990-92	146	115	68	149	129	69	676
Total	-	15,353	5,054	3,695	10,153	11,302	6,336	51,893

\*1: LRD; Life-related Diseases, \*2: CVD; Cardiovascular diseases

**Table 2. Numbers and Percentages of Cancers by Site and Stage**

Site (ICD No.)	Stage (%)							Total (%)
	I	II	III	IV	V	unknown		
Stomach (151)	6,938 (45.2)	1,353 (8.8)	2,025 (13.2)	2,518 (16.4)	- (-)	2,519 (16.4)	15,353 (100.0)	
Colon (153)	1,166 (23.1)	801 (15.8)	793 (15.7)	552 (10.9)	395 (7.8)	1,347 (26.7)	5,054 (100.0)	
Rectum (154)	911 (24.7)	587 (15.9)	616 (16.7)	387 (10.5)	235 (6.4)	959 (26.0)	3,695 (100.0)	
Lung (162)	2,282 (22.5)	513 (5.1)	4,180 (41.2)	1,086 (10.7)	- (-)	2,092 (20.6)	10,153 (100.0)	
Breast (174)	3,784 (33.5)	4,412 (39.0)	1,180 (10.4)	329 (2.9)	- (-)	1,597 (14.1)	11,302 (100.0)	
Cervix (180)	2,340 (36.9)	1,004 (15.8)	789 (12.5)	240 (3.8)	- (-)	1,963 (31.0)	6,336 (100.0)	
Total	17,421 (33.6)	8,670 (16.7)	9,583 (18.5)	5,112 (9.9)	630 (1.2)	10,477 (20.2)	51,893 (100.0)	

calculate 5-year observed survival rates and the 5-year relative survival rates using Ederer II methods (Esteve, 1994). KAP was developed by the Chiba Cancer Center in Japan and is based on the Kaplan-Meier Method (Kaplan and Meier, 1958).

## Results

Table 1 shows the institutions that co-operated with this survey. This survey covered 11 institutions that specialized in cancer treatment (referred to as CCG), 4 institutions that specialized in cancer treatment working together with a general hospital (WGH), 5 institutions specializing in geriatric diseases (SGD) and 4 institutions affiliated with regional teaching hospitals (RTH).

The total number of annual discharges from these institutions, over the 5 years from 1988 until 1992, was about 450,000 and cancer patients accounted for about 200,000 (44.4%) of this total (Okamoto, 2004). Some 24 (90.5%) of the 27 institutions cooperated in providing patient information. Patient information without the patient's name and address was collected for 51,893 cases (Table 1). This figure was broken down by site as follows: the stomach was the most affected site with 15,353 cases (29.6%), followed by the breast with 11,302 cases (21.8%), the lungs with

10,153 cases (19.6%), the cervix of the uterus with 6,336 (12.2%), the colon with 5,054 cases (9.7%) and the rectum with 3,695 cases (7.1%).

The data, which was collected by site classification, was then further classified by clinical stage, as shown in Table 2. It was not possible to determine the stage for 10,477 cases (20.2%), a very high proportion. The number of censored cases was 4,698 (9.0%).

Table 3-1 shows the observed survival rate and Table 3-2 shows the relative survival rate by primary site and by stage. The overall 5-year relative survival rates in patients with stomach, colon, rectum, lung, breast and cervix of the uterus were 68.7%, 72.2%, 69.4%, 28.1%, 86.1% and 81.1%, respectively (Table 3-2). For the stomach, the 5-year relative survival rates by stage were 98.0% for Stage I, 80.9% for Stage II, 51.5% for Stage III and 9.6% for Stage IV. Very similar trends were observed in the 5-year relative survival rate by stage for the colon, the rectum, the breast and the cervix of the uterus. However, different results were obtained for cancer of the lung, with the overall 5-year relative survival rate, a very low 28.1%. In addition, for lung cancer, there was an apparently greater difference in relative survival rates between stages than was observed in the other primary sites (67.1% for Stage I, 39.7% for Stage II, 15.0% for Stage III, 4.2% for Stage IV).

**Table 3-1. Five-year Crude Survival Rates (%) and Standard Error by the Site and by the Stage**

Site (ICD No.)	Stage (%)							Total (%)
	I	II	III	IV	V	unknown		
Stomach (151)	89.1 (0.00)	73.2 (0.03)	46.9 (0.06)	8.7 (0.45)	- (-)	47.8 (0.04)	62.3 (0.00)	
Colon (153)	87.7 (0.01)	79.2 (0.03)	68.0 (0.06)	36.0 (0.36)	11.4 (2.07)	63.4 (0.04)	65.4 (0.01)	
Rectum (154)	87.5 (0.02)	76.5 (0.06)	64.4 (0.10)	35.1 (0.50)	13.6 (2.77)	55.7 (0.09)	63.4 (0.02)	
Lung (162)	62.4 (0.03)	35.6 (0.37)	13.5 (0.18)	3.9 (1.74)	- (-)	17.8 (0.23)	25.2 (0.03)	
Breast (174)	94.4 (0.00)	87.7 (0.00)	66.7 (0.04)	24.4 (1.02)	- (-)	70.5 (0.03)	83.5 (0.00)	
Cervix (180)	92.4 (0.00)	67.6 (0.01)	45.5 (0.16)	15.7 (2.42)	- (-)	88.3 (0.01)	78.4 (0.00)	

**Table 3-2. Five-year Relative Survival Rates (%) and Standard Errors by the Site and Stage**

Site (ICD No.)	Stage (%)							Total (%)
	I	II	III	IV	V	unknown		
Stomach (151)	98.1 (0.00)	80.9 (0.03)	51.5 (0.06)	9.6 (0.05)	- (-)	53.4 (0.05)	68.7 (0.00)	
Colon (153)	96.5 (0.01)	89.4 (0.04)	74.7 (0.07)	41.8 (0.34)	12.5 (2.27)	69.6 (0.05)	72.2 (0.01)	
Rectum (154)	95.8 (0.02)	84.9 (0.06)	70.7 (0.11)	38.1 (0.54)	14.2 (2.88)	60.2 (0.09)	69.4 (0.02)	
Lung (162)	67.1 (0.04)	39.7 (0.04)	15.0 (0.20)	4.2 (1.88)	- (-)	19.9 (0.26)	28.1 (0.03)	
Breast (174)	97.2 (0.00)	90.5 (0.00)	69.0 (0.05)	25.5 (1.06)	- (-)	72.9 (0.03)	86.1 (0.00)	
Cervix (180)	94.7 (0.00)	71.8 (0.05)	49.2 (0.11)	17.8 (2.74)	- (-)	90.4 (0.00)	81.1 (0.00)	

## Discussion

The ultimate objective of all cancer strategies is to eliminate deaths from cancer, which in reality is close to impossible. However, by investigating the effectiveness of both the medical care itself and the associated activities of this medical care, cancer prevention and treatment measures can be significantly improved. The calculation of 5-year or 10-year (relative) survival rates plays an important role in measuring effectiveness and thus achieving this objective. However it is difficult to find statistics that enable easy comparisons. To start with, relative survival cancer statistics are not available in Japan at the national level. Some information has been collated from the site-specific registries that are run by academic societies in Japan (Watanabe et al., 1995). However, studies only calculate the observed survival rate and omit to calculate the relative survival rate. Another problem is that the study periods used in the survival calculations differ from study to study and therefore vary across primary sites of the cancer. This causes difficulty in determining survival rates that relate to a particular period.

In this discussion, stomach cancer is used as a representative primary site for discussion purposes because of the stomach cancer leading in cause of death in Japan. The survey found the 5-year observed survival rate for this site to be 62.3% and the relative survival rate to be 68.8%. This observed survival rate is consistent with the 5-year observed survival rate of 57.8% for patients (in whom cancer had been diagnosed from 1979 through 1982) reported by one of the site-specific registries in Japan (The Japanese Research Society for Gastric Cancer, 1995). Another study conducted by the Osaka Medical Center for Cancer and Cardiovascular Diseases, determined this survival rate to be 68.1% (relative) for in-patients (1987-1990), using the hospital cancer registry data (Tanaka, 1997).

The survival rates discussed so far are principally observed survival rates. They are calculated, in many cases, without any regard for the composition of gender, age or earliness of detection rate of the targeted patient group. It is thus difficult to compare survival rates geographically or chronologically between target groups that differ in terms of gender, age or earliness of detection rate. Even if the survival rates are calculated taking into account gender and age, another major problem arises. It is often unclear whether the calculation includes patients who died from causes other than the cancer in question. Furthermore, if the survival rate is calculated considering gender and age, in many cases the number of subjects drops dramatically, making it difficult to obtain a reliable survival rate. The relative survival rate is thus a way of eliminating these comparison problems. (Parkin, 1991).

The results of this study on JACCCs were calculated from data that contained a relatively high percentage of censored cases (9%). It is important to note that the higher rate of censored cases in this study is likely to overestimate survival, especially for patients with a less favorable prognosis.

The Study Group plans to accurately track and tabulate the relative survival rate annually and, as of 2005, they are in the process of defining guidelines for the standardization of data collection, data processing, and publication of survival rates. With these guidelines in mind, the Study Group aims to collect reliable data from participating institutions and monitor cancer survivals in future. The 5-year relative survival rate for these institutions that specialize in cancer treatment will become an index for Japanese cancer treatment.

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