

Figure 1. Flow diagram of the study.

Table 1. Characteristics of each article

Article number covered	Word count	Table in the article	Year	Article types	Number of points
1	4462	No ranking	2008	Article + comment	10
2	1888	No ranking	2008	Article + comment	7
3	6295	Ranking	2008	Article + comment	8
4	2474	Ranking	2008	Article	4
5	621	Ranking	2008	Article	5
6	3465	Ranking	2007	Article + comment	6
7	478	Ranking	2007	Article	3
8	2517	Ranking	2007	Article	4
9	698	Ranking	2007	Article	3

DEVELOPMENT OF A SURVEY INSTRUMENT

Because performance information ultimately influences the consumer’s hospital selection, we constructed survey questions according to the consumer choice model as suggested by Hibbard et al. (15) This model incorporated four stages from ‘awareness’, ‘knowledge’, ‘attitude’, to ‘behavior’ to explain

the process of how consumers use information to select healthcare providers. In our survey instrument, we skipped the ‘awareness’ stage because we actively presented and made participants aware of the data.

To identify the necessary knowledge that readers of the data should learn from the public reporting program, we first conducted an interview with the leader of the ACCC public report program. We then constructed a questionnaire that consisted of a total of 27 items, including 5 questions of the participant’s background, 10 questions on knowledge about cancer survival rate, 6 questions on impression of the article, 4 questions on attitude to cancer survival rate and 2 questions on hospital selection. To ensure wording clarity and appropriate capturing of the intended outcomes, the survey instrument was refined through multiple pilot tests with cognitive interviews with 15 laypersons. The final version was used for the web survey.

OUTCOME MEASURES

The primary outcome was the participants’ understanding of the survival reporting program as measured by the 10-item knowledge question about cancer survival. These 10 items were selected based on the key points listed in the press release of the public reporting program in 2008 and the personal interview with the leader of the public reporting

program as mentioned above. For each question, participants answered from the three options, 'true', 'false' and 'do not know'. Scores were presented in the number of correct answers among the 10 questions. We categorized the answer of 'do not know' as incorrect because it represents suboptimal understanding of the issue. We classified the respondents who gave 70% or more correct answers as respondents with 'sufficient understanding', which was decided a priori among coauthors before the survey was conducted.

Secondary outcomes included measures of impression and attitude to the survival report, and behavioral intent of using survival data in choosing hospitals. The full question set is shown in Supplementary data, Table S1. For the question of impression and attitude, participants rated their agreement with the statement presented on a five-point Likert scale. To answer the question of behavioral intent, participants chose one of the options listed in Figs 4 and 5.

#### STATISTICAL ANALYSES

Based on a pilot study, we anticipated that the difference in the proportion of sufficient understanding would be 20% between the group assigned with the most informative article (i.e. have the highest proportion of persons with sufficient understanding) and the group assigned with the least informative article (i.e. have the lowest proportion of persons with sufficient understanding). We calculated that 91 participants would be needed to gain a statistical power of 80% with a two-sided alpha level of 0.05. Allowing for 10% of participants to return an incomplete answer, we aimed to recruit 101 participants in each group.

We used the  $\chi^2$  test to compare differences in the proportion of participants with sufficient understanding and in the distribution of answers for attitude and behavioral intent across the groups assigned with each newspaper article. For continuous variables, we used the Kruskal–Wallis tests to compare the groups. We performed all analyses on an intention-to-treat basis. A two-sided *P* value of <0.05 was used to define statistical significance. All analyses were conducted using Stata version 12.1 (STATA Corporation, College Station, TX, USA).

## RESULTS

#### PARTICIPANTS

Among 41 196 registered members who received screening questions, 20 892 answered (response rate of 51%) and 17 016 met the inclusion criteria. From these eligible members, we randomly selected 1950 persons and invited them to answer the questionnaire. Finally, 1262 (65%) participants completed the questionnaire (Fig. 1). Table 2 summarizes the participants' characteristics. The mean age was 43 years (SD: 12, range: 20–79 years), which was close to the Japanese average of 45 years based on the 2010 Japanese census (16). Almost an equal number of males and females were included. Slightly less than half of the participants had a college or higher

degree. Participant characteristics were generally balanced across all article reader groups. Only 15% of participants answered that they particularly paid attention to cancer survival rate information in newspapers or magazines.

#### LEVELS OF UNDERSTANDING

Figure 2 shows the levels of readers' understanding of the program as measured by the knowledge test. The proportion of participants with sufficient understanding, defined as correctly answering seven or more questions, was only 11.3% overall. The mean number of correct answers was 3.8 (range: 0–9). The proportion of participants with sufficient understanding varied across the article readers' groups ( $P < 0.001$ ). The readers assigned with the ACCC web site achieved the largest proportion of sufficient understanding [22.1%, 95% confidence interval (CI): 15.2–30.3%], which was similar to the proportion for the best newspaper article (21.8% sufficient understanding, 95% CI: 14.9–30.1%). However, among the readers with the lowest sufficient understanding, presumably for the least informative paper, only 0.8% (95% CI: 0.02–4.4%) of the readers had sufficient understanding. The two items answered least frequently that were answered correctly were about the fact that survival data were not adjusted for patient baseline comorbidities, and regarding the bias due to patients' loss to follow-up (censoring) (20.4 and 23.3%, respectively) (Fig. 3). More than half of the participants answered correctly that the aim of the study program was to emphasize the importance of familiarizing and educating the public regarding survival data.

#### IMPRESSIONS AND ATTITUDES

The readers' impressions and attitudes toward cancer survival are shown in Table 3. The distribution of answers was remarkably similar across the assigned groups (Supplementary data, Table S2). There were no significant differences in the distribution of answers across the article group in impressions and attitudes, except for the item stating that survival mostly represents the facility's technical quality level, for which the readers of article 8 were significantly more likely to disagree (8%) than other groups (0–3%). Only 5% of the participants thought that the difference in survival rate between facilities was larger than expected. The proportion of participants who felt that the difference in survival rate across facilities was large did not vary across articles. Only 19% of participants were confident in having sufficiently understood how to interpret the survival reports, and this was similar across all of the groups. Nevertheless, the majority (65%) of participants wanted to have survival information similar to what was made public by the ACCC in the future.

#### BEHAVIORAL INTENT

Figure 4 shows the participants' answers about the factor that would most influence their hospital selection. Answers did not

**Table 2.** Participants' characteristics

	Web pages	Article 1	Article 2	Article 3	Article 4	Article 5	Article 6	Article 7	Article 8	Article 9	<i>P</i>
<i>N</i>	127	124	127	125	125	128	126	129	126	125	
Age (years)											
Mean (range)	41 (20–79)	43 (20–76)	43 (20–75)	42 (20–76)	44 (20–75)	44 (20–71)	43 (20–69)	44 (21–75)	43 (20–74)	43 (20–73)	0.60
Sex (%)											
Female	46	52	46	50	54	46	42	50	48	50	0.78
Education (%)											
Junior or high school graduate	24	40	32	29	26	31	34	29	32	31	
Junior college or professional school	24	23	22	21	27	23	21	26	20	18	
College degree	47	34	34	46	42	40	39	40	44	46	
Postgraduate degree	6	2	12	5	6	6	6	5	4	5	0.33
Work (%)											
Office worker	29	33	35	34	32	27	29	33	30	37	
Out of work	38	33	30	30	38	34	32	29	29	38	
Part-time job	12	19	17	22	18	13	23	16	13	12	
Others	21	15	19	15	13	27	17	23	27	13	0.12
Household income (10 000 yen) (%)											
<300	20	23	21	14	22	22	21	19	23	22	
300–499	26	31	24	29	29	24	32	31	24	26	
500–999	43	35	47	42	35	42	41	43	44	43	
>1000	10	10	7	15	14	12	6	7	10	10	0.69
Family history of cancer (%)											
Yes	72	77	69	70	68	66	76	71	69	74	
Inhabited area (%)											
Over 1 000 000 population city	36	27	34	34	29	42	32	36	29	32	0.34
Time required to answer (min)											
Median (range)	8 (1–1462)	6 (2–1346)	7 (2–1376)	6 (1–1191)	7 (2–1291)	7 (2–2082)	6 (2–1639)	6 (2–2826)	4 (2–1456)	7 (2–1113)	0.27
Do you usually pay attention to survival rate information in newspapers or magazines?											
No, not at all	35	31	38	27	32	26	35	29	29	38	
No	32	38	34	46	39	41	37	45	40	31	
Uncertain	17	10	13	14	14	21	17	15	14	14	
Yes	14	21	16	12	14	11	10	12	15	17	
Yes, a lot	1	0	0	1	1	1	1	0	2	0	0.52

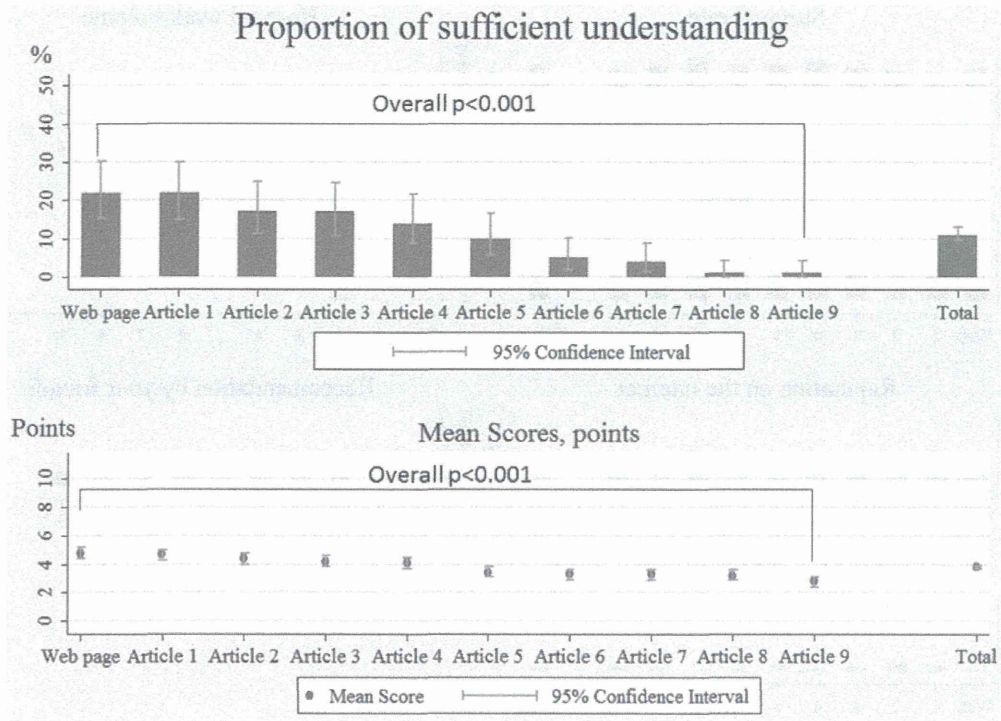


Figure 2. Results of the knowledge test for cancer survival rate.

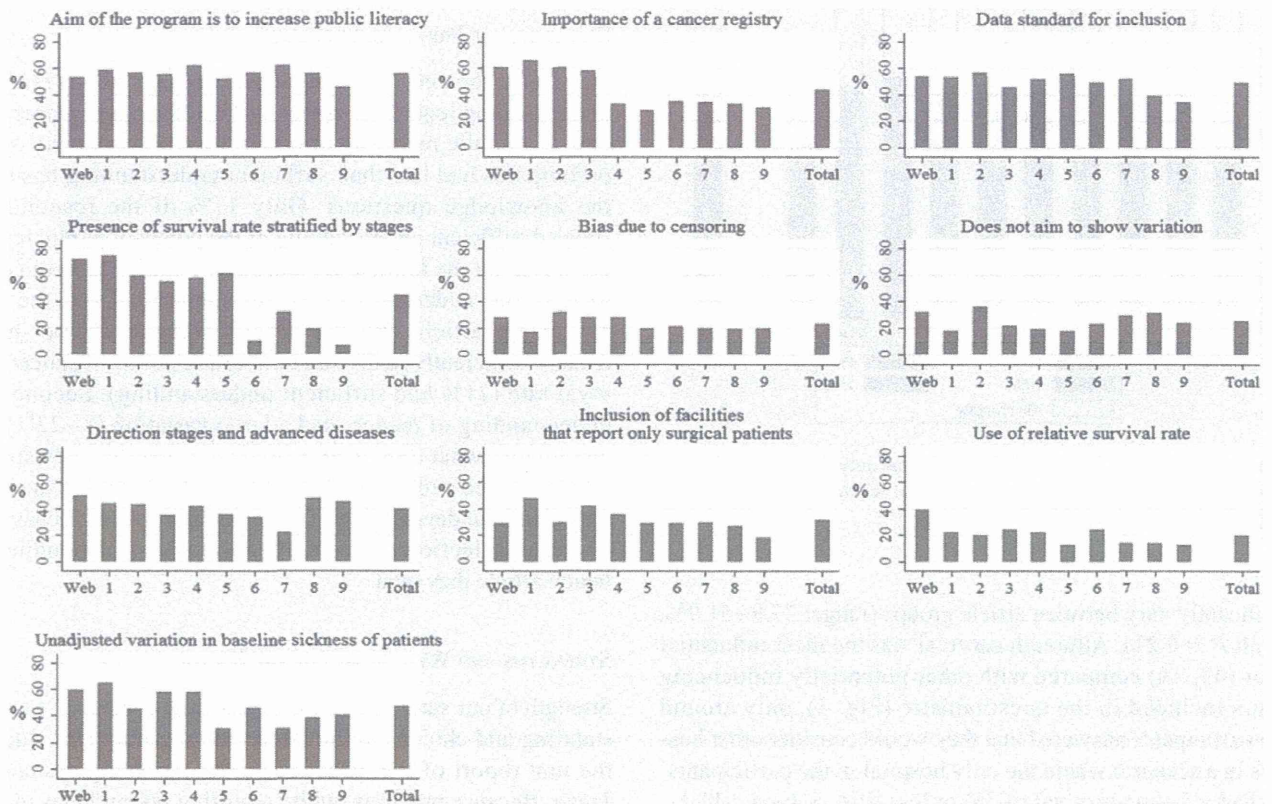


Figure 3. Results of each item of the knowledge test.

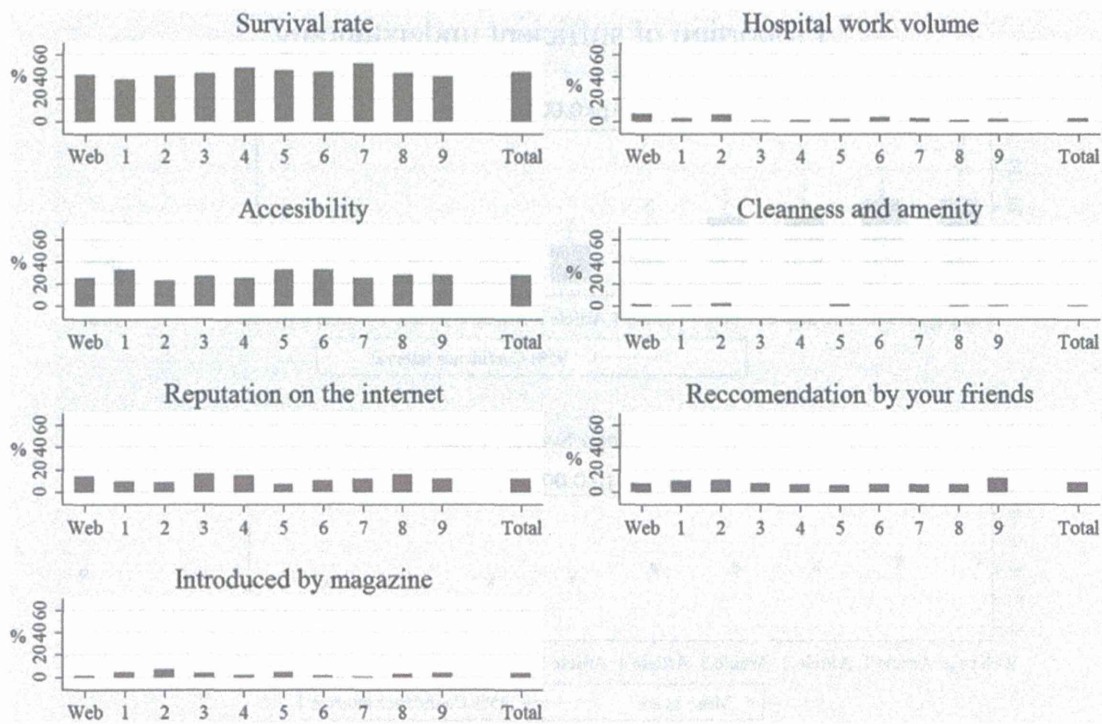


Figure 4. Factors affecting respondents' hospital selection.

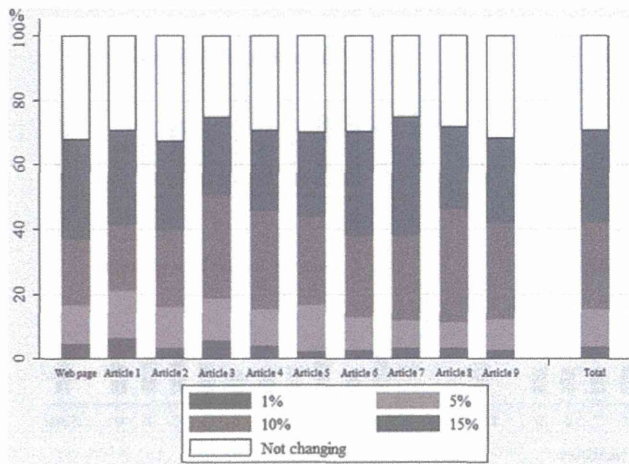


Figure 5. Answers to the question: 'if there was only one hospital in your community, how much below average survival would make you consider going to other hospitals outside your community?'

significantly vary between article groups (range: 37.9–51.9%, overall  $P = 0.21$ ). Although survival was the most influential factor (43.7%) compared with other potentially influencing factors included in the questionnaire (Fig. 4), only around 15% participants answered that they would consider other hospitals in a scenario where the only hospital in the participants' area had a 5-year survival of 5% or less (Fig. 5, range: 11.1–21.0%, overall  $P = 0.77$ ).

## DISCUSSION

### STATEMENT OF PRINCIPAL FINDINGS

Our study showed three important findings about readers' understanding regarding cancer survival from newspaper articles of a public reporting program. First, the majority of the participants had less than sufficient understanding based on the knowledge questions. Only 11% of the respondents showed sufficient understanding of the points of public reporting based on the knowledge questions, and 19% were confident in the understanding of the material. Even the best newspaper article and the official website did not make readers sufficiently understand important points of cancer survival rate (21% had sufficient understanding). Second, the understanding of readers had a large variation (1–22%) depending on what they read, which indicated that newspaper articles played a role in understanding. Third, despite the large variation in understanding of survival rates, patient behavioral intent on selection of hospitals did not vary depending on which article they read.

### STRENGTHS AND WEAKNESSES OF THE STUDY

Strength of our study is that we targeted the consumer's understanding and choices in the intervention group. Our study is the first report of the effect of public reporting systems in Japan. Because previous public reporting research has mostly been from the USA, Ketelaar et al. (6) suggested that

**Table 3.** Readers' impressions and attitudes toward cancer survival

Impression	Total (N = 1262)
The difference in survival rate was larger than expected (%)	
Strongly disagree	2
Disagree	16
No opinion	38
Agree	38
Strongly agree	5
The difference in survival rate depends on the difference in the level of therapeutic technique (%)	
Strongly disagree	2
Disagree	18
No opinion	37
Agree	37
Strongly agree	6
I will look out for information similar to this cancer survival report (%)	
Strongly disagree	2
Disagree	14
No opinion	40
Agree	36
Strongly agree	8
I sufficiently understand the contents of this report (%)	
Strongly disagree	4
Disagree	26
No opinion	52
Agree	18
Strongly agree	1
I will visit the original websites of this report (%)	
Strongly disagree	6
Disagree	25
No opinion	45
Agree	24
Strongly agree	1
I think that magazines and individual hospital web pages that report survival rates fulfill data quality criteria similar to this report (%)	
Strongly disagree	5
Disagree	22
No opinion	55
Agree	18
Strongly agree	1

evaluation of a variety of reporting systems outside the USA to evaluate the effect of public reporting is required. Our study is from East Asia, and is expected to add a different angle to the current knowledge. Our results still confirmed the suboptimal understanding of the general public for medical information. This indicates that the difficulty of conveying medical

data to the public is a common issue in Eastern and Western countries.

To appropriately interpret our findings, some important limitations need to be discussed. First, our respondents were persons registered as a survey panel with an internet market research company. Such people registered with this company were naturally more experienced with the Internet system and presumably more comfortable and skillful than the average person searching for information on the internet. Our study population had a relatively higher education than the general population, with 40% of participants having a college degree in contrast to 19.8% in the national census data (16). Although our study showed that understanding of the cancer survival reporting program was suboptimal, it may still have overestimated understandability among the general public. Second, our results may have understated the real level of understanding because study participants may not have had sufficient baseline knowledge to understand the article. Cancer patients or their families, who are the real consumers of the information, will read articles more thoroughly and may understand newspaper articles better than the general public. Nonetheless, this bias is expected to have influenced all the groups, and there will be variation observed across newspapers. Third, we did not measure participants' behavior directly because participants without a cancer history were targeted in this study.

#### COMPARISON WITH OTHER STUDIES

Given that current newspapers or websites appear to fail to adequately convey sufficient information to the readers, the strategy of public reporting should be reconsidered. Details of survival data may be too difficult for the general public to understand. In particular, presenting limitations of data is difficult. Therefore, this presentation method may be confusing to consumers. Our study suggests that presenting data with limitations cannot help consumers make hospital choices. Some researchers attempted to use mathematical methods to accurately convey information, such as CIs and Bayes estimation, for better understanding (17,18). However, numeracy skill is required to understand healthcare information rather than literacy (19,20). Another idea for better understanding is to reduce information conveyed by focusing only on the important points that can help consumers make better choices (21,22). A recent randomized controlled trial suggested that report cards, which are easy to for interpreting quality information, could help consumers choose hospitals better than traditional hospitals (22). Use of relative information, such as 'better than average', rather than complex numbers, may help the general public understand cancer survival data.

#### MEANING OF THE STUDY

This study showed that the current form of survival information disclosure in newspapers and websites generally failed to make readers sufficiently understand the important points of cancer survival data, and the level of understanding varied by

variation in media reporting. At the current level of understanding, however, attitude and behavioral intent did not differ between articles. To ameliorate the large variation in readers' understanding, newspaper articles need to be improved. The first step in this purpose may be to increase the knowledge and understanding of the media reporters themselves. If reporters do not understand the information, more attention should be paid to help reporters interpret the numbers. Stamm et al. (23) reported detailed strategies for physicians to help journalists obtain correct data (e.g. a method of preparing for good press release and interviews). Healthcare providers should collaborate more closely with journalists when public performance data are disclosed.

#### CONCLUSION AND FUTURE RESEARCH

These findings raise the question of whether it is useful to publicly report performance data. In addition, healthcare providers have considerable anxiety about media coverage of comparative healthcare quality (24). If these providers are assigned with lower grades than their competitors, they may lose their patients. A concern from a different angle may be that healthcare providers may select healthier patients to improve their mortalities (2,25), limiting access for sick patients who urgently require care. However, Marshall et al. (2) mentioned that there is another reason for disclosing performance data to the public. Public reporting can increase the accountability of health care organizations, professionals and managers. Therefore, our findings should not discourage public reporting of performance data, per se. Patients should not be left uninformed or with suboptimal knowledge. The best form and methods of public reporting to achieve the maximum benefit for society and medical professionals needs to be explored in a future study.

#### Supplementary data

Supplementary data are available at <http://www.jjco.oxfordjournals.org>.

#### Authors' contributions

All authors contributed to the conception and design of the study. F.N. and T.H. contributed to the analysis. F.N., T.H. and N.S. contributed to interpretation of data. F.N. and T.H. drafted the article. All authors revised the article critically for important intellectual content. All authors provided final approval of the version to be published. F.N. and T.H. are the guarantors.

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#### Conflict of interest statement

No support from any organization for the submitted work; no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years; and no other relationships or activities that could appear to have influenced the submitted work.

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# Prescription trends of prophylactic antiemetics for chemotherapy-induced nausea and vomiting in Japan

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## Abstract

**Purpose** This study aimed at identifying prescription trends for the recommended antiemetic therapies before and after the publication of the first guidelines for antiemetic therapy in Japan.

**Methods** Claims data of 20 Japanese health insurance societies were analyzed. Claims for patients 18 years old or older who received chemotherapy with high or moderate emetic risk were extracted. The rate of patients who were prescribed the recommended antiemetic drugs was calculated.

**Results** From 2005 to 2011, prescriptions for prophylactic antiemetics increased. These prescriptions included the three-drug combination (an NK<sub>1</sub> antagonist, a 5-HT<sub>3</sub> antagonist, and a corticosteroid) and the two-drug combination (a 5-HT<sub>3</sub> antagonist and a corticosteroid). For chemotherapy patients with high emetic risk, these prescriptions increased from 81.1 to 95.5 %. For those with moderate emetic risk, these prescriptions increased from 78.5 to 89.9 %. After approval of an NK<sub>1</sub> antagonist at the end of 2009, the prescription rate for the three-drug combination increased from 37.0 % in 2010 to 60.1 % in 2011 in the high emetic risk group.

**Conclusion** A gradual increasing trend was identified in the rate of prescribing antiemetic drugs from 2005 to 2011. This trend was observed in insurance claims data from a wide variety of health-care providers. However, only 60.1 % patients of the high emetic risk group received the recommended three-drug combination in 2011. Further research will be useful to evaluate patients' experiences with their chemotherapy and the effectiveness of the prophylactic antiemetic therapy for cancer treatment and patients' quality of life.

**Keywords** Chemotherapy-induced nausea and vomiting · Antiemesis · Quality of health care · Neoplasms · Practice guidelines

## Introduction

Nausea and vomiting are the common and feared side effects of chemotherapy [1]. Morran et al. [2] reported that approximately 70 to 80 % of cancer patients who receive chemotherapy experience nausea and/or vomiting. Chemotherapy-induced nausea and vomiting (CINV) negatively affects quality of life for these patients [3, 4]. CINV treatment also requires additional resources and costs. Prophylactic antiemetic therapy is crucial for chemotherapy patients to continue treatment without compromising quality of life.

Over the past two decades, more effective and better tolerated antiemetic agents have been developed to prevent CINV [5]. In general, to achieve maximum prevention against CINV, the prophylactic antiemetic therapy should be initiated with corticosteroids before the chemotherapy [6]. Several antiemetic guidelines for chemotherapy patients recommend these antiemetic prophylaxes, based on the emetic risk of the chemotherapy agent [6–8]. Aapro et al. [9] suggest that guideline-consistent antiemetic therapy offers a significant benefit to alleviate CINV. Recent clinical trials of a neurokinin-1

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(NK<sub>1</sub>) receptor antagonist show that this new drug provides additional relief in CINV [10–12] and that it is associated with a higher rate of completion of chemotherapy [12]. Despite these potential benefits, several studies indicate that physicians' adherence to antiemetic guidelines is limited [13–17].

In 2010, the Japan Society of Clinical Oncology published the first antiemetic guidelines for CINV: Guidelines for Appropriate Antiemetic Prophylaxis [18]. These guidelines are based on previous guidelines in other countries, including the 2009 National Comprehensive Cancer Network Clinical Practice Guidelines (Antiemesis). To ensure good quality of cancer care for chemotherapy patients, it is important to monitor their adherence to the recommended antiemetic therapy. Our prior study at a Japanese rural city from 2008 to 2010 showed that the recommended antiemetic therapy (i.e., the combination of 5-hydroxytryptamine 3 (5-HT<sub>3</sub>) antagonists and corticosteroids) was provided for 61.9 % of the chemotherapy patients of high or moderate emetic risk [19]. An NK<sub>1</sub> antagonist (e.g., aprepitant) and a second-generation 5-HT<sub>3</sub> antagonist (e.g., palonosetron) were approved for use in Japan in 2009 and 2010, respectively. This study aimed at identifying trends in prescriptions for recommended antiemetic therapies for patients who received chemotherapy with high or moderate emetic risk between 2005 and 2011 in Japan.

## Materials and methods

### Data source

We analyzed health insurance claim data. Japan has a mandatory universal health insurance system that is divided into two main categories: the employees' (and their dependents') health insurance and the governmental health insurance. We obtained insurance claims data of patients who were diagnosed with cancer and covered by one of 20 employee's health insurance societies. The claims data were derived from data from a managing company, Japan Medical Data Center, Co., Ltd.

Health-care providers in Japan are usually reimbursed on a fee-for-service basis. Some hospitals that participate in the diagnosis procedure combination/per-diem payment system (DPC/PDPS) receive reimbursement for inpatient care on a per-diem basis, as determined by the DPC categories. When hospitals adopt the DPC/PDPS program, the per-diem payments cover chemotherapy and antiemetic drugs. Before 2009, DPC per-diem claims did not contain service details, such as medications used. Starting in 2009, the DPC per-diem claims contain the same information as fee-for-service claims. Outpatient services are reimbursed on a fee-for-service basis for all providers.

Each health-care provider submits monthly insurance claims. In Japan, patients sometimes receive medications from

multiple health-care providers. For example, a patient who receives chemotherapy drugs at the hospital may also receive antiemetic drugs at the pharmacy or other clinics/hospitals. For the purpose of our analysis, we combined these claims into one unit, using person-month as our unit of analysis.

### Identification of chemotherapy claims

We identified claims that included chemotherapy with high or moderate emetic risks, based on the Japanese guidelines [18]. Table 1 shows the list of identified chemotherapy drugs used in this study. The emetic risk of cyclophosphamide depends on its dosage (e.g., dosages of more than 1,500 mg/m<sup>2</sup> have high emetic risk). Although the information about patient's body surface area was not available from the claims, we classified patients with cyclophosphamide dosages of greater than 1,500 mg as high emetic risk. We classified any dose of intravenous busulfan, intravenous melphalan, methotrexate, or oxaliplatin as moderate emetic risk. We classified claims with two or more chemotherapy drugs based on the highest emetic risk in the claim. We included all patients who were aged 18 years or older at treatment time.

### Data analysis

We examined the adherence to the recommended antiemetic prophylaxis for chemotherapy patients. According to Japan's Guidelines for Appropriate Antiemetic Prophylaxis [18], patients who receive chemotherapy with high emetic risk should receive the three-drug combination of an NK<sub>1</sub> antagonist (e.g., aprepitant), a 5-HT<sub>3</sub> antagonist, and dexamethasone. Patients who receive chemotherapy with moderate emetic risk should receive the two-drug combination of a 5-HT<sub>3</sub> antagonist and dexamethasone, in order to prevent acute nausea and vomiting. When specific drugs for moderate emetic risk (e.g., irinotecan, carboplatin, methotrexate) are used for chemotherapy, the guidelines recommend using a three-drug combination. Although dexamethasone is the first choice for antiemetic therapy in the guidelines, it should be omitted when the chemotherapy regimen already includes a corticosteroid [6, 18]. Therefore, we regarded any corticosteroid prescriptions as antiemetic prescriptions. Before the NK<sub>1</sub> antagonists entered the market in 2009, the two-drug combination was recommended for both high and moderate emetic risk groups.

We calculated the proportion of prescribing the recommended antiemetic therapy to high or moderate emetic risk patients. The rate of each year was statistically tested using chi-squared test. The standard errors, and thus the statistical significance levels, were adjusted by clustering the patients using Huber–White estimators. Since the information about medications prescribed in DPC/PDPS hospitals was not