Difference in the Types of Treated Cancer between Clinics and Small-to-Middle-Sized Hospitals in Rural Communities of Japan

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Resolution of regional disparities in cancer mortality is a global challenge. Establishing an equal system of cancer treatment throughout the country is required under the Cancer Control Act in Japan. The types of treated cancer may reflect practical experience at the institutions and cooperation to other institutions. This study investigated the types treated at the institutions in rural communities of Japan. A questionnaire survey was conducted for 811 public rural institutions (clinics and small-to-middle-sized hospitals [< 200 beds]) in 2013. The survey's items included the types of treated cancer (14 categories: stomach, colon, breast, liver, biliary tract, pancreatic, prostate, esophageal, lung, renal, urinary tract, testicular, hematopoietic, and others) and the first five types were defined as major cancers. The data were analyzed between hospitals and clinics. The response rate was about 60%, and of 177 hospitals and 281 clinics, 54 hospitals (30%) and 10 clinics (3%) reported the types of cancer. The median number of cancer types in hospitals was significantly greater than that of clinics (4 [interquartile range 3.0-7.8]) vs. 1 [1.0-1.8], \( P < 0.01 \). The prevalence of hospitals treating at least one of five major cancers was significantly greater than that of clinics (96% vs. 30%, \( P < 0.01 \)). The prevalence of clinics treating prostate cancer was significantly greater than that of hospitals (31% vs. 70%, \( P = 0.03 \)). In conclusion, most types of cancer are treated at small-to-middle-sized hospitals, except for prostate cancer, providing basic information about cancer treatment in rural communities of Japan.

Keywords: malignancy; neoplasm; prostate cancer; rural communities; rural health

Introduction

Regional disparities in cancer mortality have recently appeared in Japan (Ministry of Health, Labour and Welfare 2017). For instance, there is a 1.5-fold difference between prefectures with the highest and lowest mortality rates, while the impact on life prognosis was unclear (Ministry of Health, Labour and Welfare 2017). In the U.S., age-adjusted cancer mortality per 100,000 population is higher in rural than in urban regions (Kirkwood et al. 2014). Although 20% of the population live in rural regions in the U.S., only 3% of oncology professionals are in these regions (Kirkwood et al. 2014). In Japan, the number of oncology professionals is also higher in urban than in rural regions, which have hardly any (Ohba et al. 2010; Yamamoto and Tamura 2012; Fukuda et al. 2018). As the number of patients with cancer has been steadily increasing in Japan, with the aim to provide an equal cancer treatment throughout the country, the Japanese government approved the Cancer Control Act in 2007 and the Basic Plan to Promote Cancer Control program was launched (Ministry of Health, Labour and Welfare 2007).

Rural communities have fewer medical institutions (hospitals and clinics), leading to a disadvantage in access to healthcare facilities and/or services (Baldwin et al. 2008; Sabesan et al. 2011; Henley et al. 2017; Iglehart 2018). Cancer treatment requires a specialized experience (Ishioka 2008). For discussing regional disparity and functional cooperation, we should know the actual status of cancer treatment itself, e.g., the types of treated cancer which may reflect access to other institutions and experience at the institutions, in rural communities of Japan. It remains undetermined; therefore, the present study aimed to investigate the types of cancer treated in hospitals and clinics in such communities.

Methods

Japanese law in regard to sparsely populated areas involves...
maintenance in areas with a significant decline in population (Ministry of Land, Infrastructure, Transport and Tourism 2014; Ministry of Internal Affairs and Communications 2017; Ministry of Agriculture, Forestry and Fisheries 2019) and development of remote islands (Ministry of the Environment 2002; Ministry of Land, Infrastructure, Transport and Tourism 2008, 2013). The rural communities are defined under the Japanese laws. Further, hospitals with < 200 beds generally provide medicine that is not always specific for cancer and the hospitals are defined as small-to-middle-sized hospitals in Japan (Ministry of Health, Labour and Welfare 2010; Kitazawa 2011; Japan Medical Association 2012). The present study investigated a total of 811 public medical institutions, clinics and small-to-middle-sized hospitals (< 200 beds), in rural communities of Japan.

A self-administered questionnaire was sent by mail in June 2013 to the institutions. The Basic Plan to Promote Cancer Control program is updated every 5 years (Ishioka 2008), and after approximately 5 years of the Basic Plan, the present survey was planned for evaluating cancer treatment throughout the country.

The institutions were asked the following questions: 1) How many beds were there in your medical institution?, 2) How many full-time doctors, nurses, and pharmacists were there?, 3) What were the types of cancer treated in your institution (stomach, colon, breast, liver, biliary tract, pancreatic, prostate, esophageal, lung, renal, urinary tract, testicular, hematopoietic, and others)? A reply envelope was enclosed, and all institutions were requested to complete the questionnaires. For the institutions in which no response was obtained, a re-request was made by mail. The questionnaire asked about a total of 14 types of cancer and stomach, colon, breast, liver, and lung cancer were defined as the five major cancers according to the Ministry of Health, Labour and Welfare (2007). The study was permitted by the Jichi Medical University Ethics Committee. On the questionnaire form, the responding institution’s name was anonymized.

Differences between hospitals and clinics were analyzed using Mann-Whitney U and Fisher’s exact test using IBM SPSS Statistics (Ver. 25; IBM Corp., Tokyo, Japan). The level of significance was set at 5%.

### Results

Responses were received from 183 hospitals and 307 clinics (response rate of 60%), and 56% of the responses (177 hospitals and 281 clinics) were completed and eligible for analysis (32 institutions were excluded because 5 institutions went out of business (that is, disclosure) and 27 institutions had invalid responses).

A total of 54 hospitals and 10 clinics reported treating a patient with a specific type of cancer in their own institution. The number of hospitals treating cancer was significantly greater than that of clinics ($P < 0.01$). The number of medical workers and beds in hospitals was significantly greater than that in clinics (Table 1).

The median number of cancer types treated in hospitals (4 [interquartile range [IQR] 3.0-7.8]) was significantly greater than that treated in clinics (1 [IQR: 1.0-1.8], $P < 0.01$). Overall, at least one of the five major cancers were treated in 52 (96%) hospitals and three (30%) clinics (Table 2). The prevalence of hospitals, in which one of the five major cancers was treated, was significantly greater than that of clinics.

The most frequently treated cancers in hospitals and clinics were stomach cancer (51 hospitals, 94%) and prostate cancer (7 clinics, 70%), respectively (Table 2). Namely, the prevalence of clinics, in which prostate cancer was treated, was significantly greater than that in hospitals.

### Discussion

The present study revealed that the number of types of cancer treated in hospitals was significantly greater than that of clinics in rural communities of Japan. The five major cancers were more frequently treated in hospitals, and prostate cancer was the most frequently treated cancer in clinics in such communities. This was the first survey to show the rural status of cancer treatment in Japan and these findings would be notable information.

Cooperation between multiple medical workers is important for cancer treatment (Misaka 2007). Thus, cancer treatment in hospitals can be assumed superior to that in clinics as the number of medical workers in hospitals was

### Table 1. Numbers of medical workers and beds by medical institutions.

|                      | Hospitals (n = 54) | Clinics (n = 10) | $P$ value |
|----------------------|-------------------|-----------------|-----------|
| Doctors,             | 8 (5-11)          | 1 (1-1)         | < 0.01    |
| Nurses               | 76 (47-116)       | 2.5 (2-5)       | < 0.01    |
| Pharmacists          | 3 (2-4)           | 0 (0-0)         | < 0.01    |
| Beds                 | 110 (83-164)      | 0 (0-0)         | < 0.01    |

Data: median (interquartile range). $P$ value; Mann-Whitney U test.

### Table 2. Numbers of medical institutions by each cancer.

|                      | Hospitals (n = 54) | Clinics (n = 10) | $P$ value |
|----------------------|-------------------|-----------------|-----------|
| Five major cancers, n (%) | 52 (96)          | 3 (30)          | < 0.01    |
| Stomach              | 51 (94)           | 1 (10)          | < 0.01    |
| Colon                | 48 (89)           | 2 (20)          | < 0.01    |
| Breast               | 33 (61)           | 2 (20)          | 0.02      |
| Liver                | 26 (48)           | 1 (10)          | 0.02      |
| Lung                 | 14 (26)           | 1 (10)          | 0.26      |
| Biliary tract        | 26 (48)           | 1 (10)          | 0.02      |
| Pancreatic           | 26 (48)           | 2 (20)          | 0.10      |
| Prostate             | 17 (31)           | 7 (70)          | 0.03      |
| Esophageal           | 15 (28)           | 1 (10)          | 0.22      |
| Renal                | 7 (13)            | 1 (10)          | 0.64      |
| Urinary tract        | 6 (11)            | 0 (0)           | 0.34      |
| Testicular           | 6 (11)            | 0 (0)           | 0.34      |
| Hematopoietic        | 6 (11)            | 2 (20)          | 0.36      |
| Others               | 24 (44)           | 1 (10)          | 0.04      |

$P$ value for the prevalence of each cancer; Fisher’s exact test. Multiple answers were allowed. Five major cancers are stomach, colon, breast, liver and lung.
greater than in clinics. Cancer treatment may not be easy to provide with limited medical workers, especially pharmacists who play a crucial role in chemotherapy (Sakurai et al. 2013), in rural clinics where no pharmacists were found to be working (as shown in Table 1). In addition, patients with cancer were more likely to seek a cancer specialist working in hospitals than in clinics (Misawa 2011; Iida 2013). As free access to medical institutions is a characteristic of the Japanese healthcare system, patients seeking cancer treatment tend to visit hospitals over clinics (Moriwaki et al. 2016).

In the present study, prostate cancer was frequently treated in clinics than in hospitals. This is a meaningful finding because the number of patients with prostate cancer is increasing and patients expect to be seen at nearby clinics (Akakura 2017). Prostate cancer is relatively common among people of advanced age (Wakai 2005). In general, prostate cancer has a slow progression (Popiolek et al. 2013) and requires long-term follow-up (Parker 2003). Surgery for prostate cancer is not often required but hormone therapy is applied at the clinic level (Akakura 2014). In addition, physicians in clinics can monitor serum prostate-specific antigen levels to assess the disease progression (Kanemori and Nakagawa 2015). Therefore, treatment of prostate cancer might be suitable for clinics, even in rural communities.

The results of the present study suggest disparities in cancer treatment by medical institutions (a bias toward hospitals) within rural communities. One of the ways to expand access to various cancer treatments is to train physicians working in such communities. Training via online learning may be useful because medical workers in rural committees often wish to develop their expertise without having to leave their institutions (da Costa Vieira 2017; Okano et al. 2017). Further, it may be useful for patients with cancer in rural communities to be treated by cancer specialists working in urban areas using information and communication technology (ICT) (Charlton et al. 2015). Telemedicine and telehealth methods can assist patients and physicians with consultations without having to transfer to another medical institution (Saito 2002). Cancer treatment using ICT has been reported to be highly satisfying by both patients (Mair et al. 2000) and medical workers (Mooi et al. 2012; Sabesan et al. 2012).

The present study had several limitations. First, the response to the survey was not very high. A selection bias must carefully be considered, while requests for responses were repeatedly made for the institutions in which no response was obtained in order to lower the bias. Second, the questionnaire survey was self-administered. Third, this was a cross-sectional study, where the causality could not be inferred. Fourth, the treatment regimen, such as chemotherapy, surgery, or both, was not investigated. Fifth, the surveys did not examine information on clinical departments and the number of cancer specialists at each institution. Sixth, the data were collected in 2013 and some states of cancer treatment may have recently changed, while the investigation of rural communities is rarely conducted and the data of the present survey remain valuable for future research. Addressing these issues will be the next challenge; for instance, a survey with a completed or registered participation of all institutions, items including treatment regimens, departments, and cancer specialists, as well as a long-term follow-up period is needed.

In conclusion, the present survey has shown that most types of cancer are treated in small-to-middle-sized hospitals rather than in clinics in rural communities of Japan. Only prostate cancer was comparatively treated in clinics. The findings would be useful for a basis of cancer treatment (e.g., whether or not the difference is problematic) in rural communities of Japan.

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**Conflict of Interest**

The authors declare no conflict of interest.

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