—Regular Article—

Use of Anonymous Web Communities and Websites by Medical Consumers in Japan to Research Drug Information

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In this study, we investigated the status of researching drug information online, and the type of Internet user who uses anonymous Web communities and websites. A Web-based cross-sectional survey of 10875 male and female Internet users aged 16 and over was conducted in March 2010. Of 10282 analyzed respondents, excluding medical professionals, about 47% reported that they had previously searched the Internet for drug information and had used online resources ranging from drug information search engines and pharmaceutical industry websites to social networking sites and Twitter. Respondents who had researched drug information online ($n=4861$) were analyzed by two multivariable logistic regressions. In Model 1, the use of anonymous websites associated with age (OR, 0.778; 95% CI, 0.742–0.816), referring to the reputation and the narrative of other Internet users on shopping (OR, 1.640; 95% CI, 1.450–1.855), taking a prescription drug (OR, 0.806; 95% CI, 0.705–0.922), and frequent consulting with non-professionals about medical care and health (OR, 1.613; 95% CI, 1.396–1.865). In Model 2, use of only anonymous websites was associated with age (OR, 0.753; 95% CI, 0.705–0.805), using the Internet daily (OR, 0.611; 95% CI, 0.462–0.808), taking a prescription drug (OR, 0.614; 95% CI, 0.505–0.747), and experience a side effect (OR, 0.526; 95% CI, 0.421–0.658). The analysis revealed the profiles of Internet users who researched drug information on social media sites where the information providers are anonymous and do not necessarily have adequate knowledge of medicine and online information literacy.

Key words——drug information; Internet; medical consumer; medical informatics; consumer health information; information seeking behavior

INTRODUCTION

In 2009, approximately 78.0% of the Japanese population aged 6 and over was reported as having Internet access.[1] Moreover, the number of Internet users is increasing each year in Japan. This makes the Internet a useful resource for the medical consumer to quickly and easily access medical and health information.

Recently, the use of medical and health information websites in Japan has been reported, for example, ''Minds'' (minds.jcqhc.or.jp), which is a website where the Japan Council for Quality Health Care provides medical guidelines for both medical professionals and consumers,[2] and websites that assist medical consumers in selecting hospitals.[3] Other sites such as the Community for Patient Participation in Japan (www.kanjyakai.net/index.html), Tobyo (www.tobyo.jp), and DIPEx-Japan (www.dipex-j.org), are currently attracting a lot of attention from medical consumers. There are also several disease communities in Mixi (mixi.jp), which is the social networking site with the largest number of users in Japan.[4]

Various research papers have reported detailed information on medical consumers who use the Internet to gather medical and health information in Japan.[4–11] The 2008 World Internet Project Japan reported that about 55% of Internet users use health and medical information obtained from websites,[12] and the use of such sites is becoming more common. However, it has also been reported by researchers both in Japan and abroad that medical and health information varies in terms of reliability and quality between websites.[13–20]

The Health on the Net Foundation, a non-governmental organization, is internationally recognized as the leading authentication body regarding the quality and trustworthiness of medical and health websites (www.hon.ch/home1.html). The Japan Internet Medical Association, a non-profit organization, offers the same authentication services (www.jima.or.jp/jimalink.html), but unfortunately only 17 websites have been certified as of May 2010. Such systems

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have not yet permeated the Japanese Web.

In Japan, a full-fledged information literacy program was introduced into the revised Education Ministry guidelines. The program was approved for the 2002 school year at elementary and junior high schools and for the 2003 school year at senior high schools.[21] The new guidelines stipulated that Information and Computer Science should be made a compulsory subject at junior high school and Information Science should be made a compulsory subject at senior high school. The guidelines also stipulated the use of computers and communication networks, such as those for subject timetables and overall learning, at elementary schools.

Education on the proper use of medicines in Japan will be implemented in the near future. A revised Education Ministry guideline for junior high schools, which will become effective in the 2012 school year, details the proper use of medicine and will be included in the health and physical education curriculum. In addition, a guideline for senior high schools, which will become effective in the 2013 school year, will include specific content regarding the proper use of medicine. This guideline will address that medicine is judged on their effectiveness and safety and limited to sales, and the prevention of adverse health effects and the recovery from disease, it is still useful for understanding the correct use of medicine correctly.[22] To date, a program that combines medical education and information education has not yet been implemented.

Recently, Internet devices have become more versatile and the Internet can be accessed on a range of devices, from mobile phones and smart phones to tablet and netbook personal computers. With the Internet becoming a part of daily life, it is believed that more people will use the Internet to gather medical and health information. Because information related to healthcare and medicine can directly affect health, the reliability and appropriate application of this information are important. Careful selection and use of accurate drug information should improve compliance, early detection of side effects, and self-medication. But to do this, consumers must first obtain information from a website that possesses high reliability and a means of verifying whether the information is correct, and whether the information is up to date.

We have considered various potential problems for medical consumers who use Internet-based drug information. However, studies of this issue are few. For example, many questions about medicine are asked at Yahoo! Chiebukuro (the Japanese version of Yahoo! Answers) (chiebukuro.yahoo.co.jp/), where anyone can post a question and anyone can answer.[23,24] The best answer is then evaluated by only the questioner. The reliability and quality of information varies widely in communities for knowledge sharing such as Yahoo! Chiebukuro, and on social networking sites and bulletin board system, where information is often provided anonymously. We view such information acquisition as undesirable because the medical consumer obtains drug information from Web communities that may not have the suitable expertise or information literacy.

This study was therefore designed to discover the type of Web communities and websites that are currently used to research drug information. In addition, we aimed to uncover the type of Internet users who utilize resources where information is provided anonymously. These findings can then be considered for promoting the proper use of drug information on the Internet.

METHOD

Study Design We conducted a web-based cross-sectional survey from 19–23 March, 2010. Male and female Internet users aged from 16 years and older were sampled and surveyed by NetMile, Inc. (research.netmile.co.jp), an online research company with more than 4.2 million Japanese Internet users. We set a quota on the number of responses. The quota of approximately ten thousand responses was made out according to the Internet utilization rate in age and sex,[1] and the population density of residential areas.[25] Age was divided into five groups: 16–29, 30–39, 40–49, 50–59, and 60 and above. The residential areas were divided into nine groups: Hokkaido, Tohoku, Shinetsu, Kanto, Tokyo, Tokai and Hokuriku, Kinki, Chugoku and Shikoku, and Kyushu and Okinawa. Finally, the targeted number of responses was 10875. The survey was finished, when the response quota was met. Only completed questionnaires were counted.

A total of 10282 Internet users, excluding health professionals from 10875 respondents, were included in the experience ratio for researching drug information in Internet.

The first screen of the survey informed the participants that no personal information would be

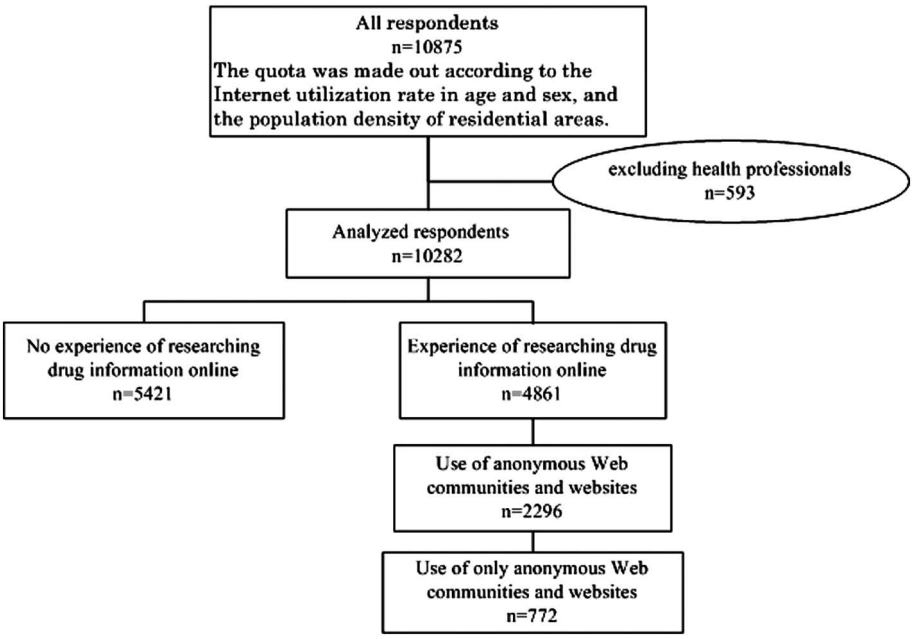

Fig. 1. Flowchart of Respondents to the Analysis

released to third parties and that only a summary of the survey would be presented at a conference and published in a paper. All respondents gave their consent.

Figure 1 shows the number of respondents used for the analysis and the reasons for non-inclusion.

Measures The first page of the survey stated that the type of Internet device used to research drug information in the questions should not be considered. Self-report measures were obtained for the type of online resource used to research drug information, the type of drug researched, the type of drug information obtained, health-related behavior, Internet use patterns, and education level.

The types of Web communities and websites were assessed by a multiple-choice question with 24 choices to select all appropriate choices. The survey questioned participants on their use of drug information search engines (10 sites), social media (4 subcategories), pharmaceutical company websites, healthcare provider or public administration websites, personal websites, blogs, and other resources with the option of providing a free response. In the social media category, the 4 subcategories were knowledge-sharing communities (5 communities in total, 2 of which were pay sites that provided answers from medical professionals), social networking sites (3 communities), a bulletin board system (1 community: 2channel), and a microblogging service (1 community: Twitter).

In the survey, free communities for knowledge sharing such as social networking sites and bulletin board systems were categorized as anonymous sites because the information providers were anonymous.

Questions about the respondents' research on types of drugs were multiple choices to select all appropriate choices. The respondents could select from ''prescription drug'', ''over-the-counter drug'', and ''unapproved drug within the country'' as choices. The question on the types of drug information sought had 16 choices, one of which was other content with the option of providing a free response.

To prevent biases by sort choices, the choices of the multiple-choice questions were displayed in random order.

In 8 questions about health-related behavior and 5 questions about Internet use patterns, the respondents were given the choice between responding yes or no.

Demographic variables were sex, age, marital status (married or unmarried), residential area, and education. The data without education level was from the registry dataset of NetMile, Inc. Education was categorized as ''high school degree or less'', ''college education or postgraduate education''.

Analytical Strategy Two multivariable logistic regression models were used to evaluate the association of demographic variables, health-related behaviors, and experience using the anonymous websites

and Web communities as drug information resources. A total of 4861 Internet users, excluding health professionals and people who had not researched drug information on the Internet, were included in the multivariable logistic regression.

Independent variables regarding demographic content, health-related behavior, and Internet use were screened for model selection by two comparisons that used the chi-square (χ^2) test as a categorical predictor.

First, we compared Internet users who had not collected drug information from anonymous websites with users who had used such websites. Then, we compared Internet users who had collected drug information from only the anonymous websites with the other users.

Before logistic analysis, it was confirmed by the ϕ coefficient that no strong relationship existed between the independent variables. The first multivariable logistic regression model included the dependent variable of whether or not anonymous websites were used. The second multivariable logistic regression model included the dependent variable of whether only anonymous websites. All variables except for age were dichotomized. Odds ratio for age corresponded to change in five categories (16–29 years, 30s, 40s, 50s, and 60 and above).

We considered the logistic odds ratios to be significant at $p<0.01$ to reduce the likelihood of type 1 error resulting from the numerous predictor variables considered in the logistic regression. For all data analyses, we used SPSS statistical software version 18.0 for Windows.

RESULTS

A total of 10875 Internet users responded to the survey. However, 593 (5.5%) were health professionals; therefore, they were not included in the analysis.

Analyzed respondents numbered 10282 and included 5314 (51.7%) males and 4968 (48.3%) females. The mean age was 42.5 (S.D.=14.0) years. The percentage of respondents with less than 12 years of formal education was 33.0% (3391 out of 10282), and the percentage with college education (technical college, two-year college, and college graduate) or postgraduate education was 66.9% (6875 out of 10282). Table 1 presents the demographic characteristics of the analyzed respondents and comparative data regarding the use of the Internet to search drug information.

Table 1. Distribution of Respondent Characteristics

	Total (n=10282) n (%)	Researching drug information online	
		Yes (n=4861) n (%)	No (n=5421) n (%)
Sex			
Male	5314 (51.7)	2353 (48.4)	2961 (54.6)
Female	4968 (48.3)	2508 (51.6)	2460 (45.4)
Marital status			
Married	5931 (57.7)	2833 (58.3)	3098 (57.1)
Unmarried	4351 (42.3)	2028 (41.7)	2323 (42.9)
Area			
Hokkaido	441 (4.3)	212 (4.4)	229 (4.2)
Tohoku	745 (7.2)	356 (7.3)	389 (7.2)
Shinetsu	421 (4.1)	199 (4.1)	222 (4.1)
Kanto	2416 (23.5)	1117 (23.0)	1299 (24.0)
Tokyo	1069 (10.4)	549 (11.3)	520 (9.6)
Tokai and Hokuriku	1453 (14.1)	616 (12.7)	837 (15.4)
Kinki	1681 (16.3)	833 (17.1)	848 (15.6)
Chugoku and Shikoku	909 (8.8)	429 (8.8)	480 (8.9)
Kyushu and Okinawa	1147 (11.2)	550 (11.3)	597 (11.0)
Education			
High school or less	3391 (33.0)	1418 (29.2)	1973 (36.4)
College or postgraduate	6875 (66.9)	3434 (70.6)	3441 (63.5)
Refused	16 (0.2)	9 (0.2)	7 (0.1)
Age			
16–29	2536 (24.7)	1109 (22.8)	1427 (26.3)
30–39	2252 (21.9)	1120 (23.0)	1132 (20.9)
40–49	1935 (18.8)	990 (20.4)	945 (17.4)
50–59	2010 (19.5)	970 (20.0)	1040 (19.2)
≧60	1549 (15.1)	672 (13.8)	877 (16.2)
mean±S.D.	42.5±14.0	42.5±13.5	42.4±14.5

Experience of Researching Drug Information Online Overall, 47.3% (4861 of 10282) of Internet users had used the Internet to research drug information. The breakdown according to age is as follows: 43.7% (1109 of 2536) in the 16–29 years group, 49.7% (1120 of 2252) in the 30–39 years group, 51.2% (990 of 1935) in the 40–49 years group, 48.3% (970 of 2010) in the 50–59 years group, and 43.4% (672 of 1549) in the 60 and above group. Searching the Internet for drug information occurred more often in the case of females (2508 of 4968; 50.5%) than male

(2353 of 5314, 44.3%; $\chi^2=39.646$, $p<0.001$). Searching the Internet was more prevalent in users with academic backgrounds of ''college or postgraduate'' (3434 of 6875; 49.9%) than for those with ''high school or less'' (1418 of 3391, 41.8%; $\chi^2=60.258$, $p<0.001$).

A total of 29.0% (2986 of 10282) of users were taking prescription drugs and 60.1% (1795 of 2986) of these users had used the Internet to research drug information.

The following analyses of Web communities and websites, researched medicine type, and information, were conducted among the 4861 users who had previously obtained drug information online.

Web Communities and Websites Table 2 lists the Web communities and websites used to obtain drug information. The average number of Web communities and websites used by a respondent was 2.5 (S.D.=2.0) and the median was 2; 79.9% (3884 of 4861) of users used from one to three Web communities and websites.

The most widely used resources were Yahoo! Chiebukuro, Isha Kara Moratta Kusuri Ga Wakaru (translation: Understand Medicine Prescribed by Your Doctor; a search engine for prescription drugs), and pharmaceutical company websites (37.9% (1844 of 4861), 24.2% (1178 of 4861), and 23.3% (1131 of 4861), respectively). For free answers, Wikipedia was most reported (20 users), while 117 users specified search engines such as Google and not remember.

In two website categories, 57.4% (2790 of 4861) used search engines for medicine and 51.0% (2478 of 4861) used social media sites.

Of the 10 search engines, Isha Kara Moratta Kusuri Ga Wakaru was most widely used (24.2% (1178 of 4861)), followed by Okusuri Wo Sagasu (translation: Search for Medicine; part of Yahoo! Healthcare; 21.4% (1038 of 4861)), and lastly, Pharmaceuticals and Medical Devices informational website (1.6% (77 of 4861)). Of the 10 search engines, only the Pharmaceuticals and Medical Devices informational website is run by a public institution, Pharmaceuticals and Medical Devices Agency.

Of the four types of social media, ''community for knowledge sharing'' had the most utilization (47.1% (2288 of 4861)), followed by the bulletin board system (8.9% (433 of 4861)), social networking sites (5.7% (276 of 4861)), and lastly, the microblogging service (1.3% (65 of 4861)). Of the ''community for knowledge sharing'', pay sites accounted for 9.4% (458 of 4861) of use, and free sites accounted for 43.3% (2103 of 4861).

Table 2. Web Communities and Websites Used to Get Information about Medicine (n=4861)

	n (%)
Drug information search engine	2790 (57.4)
Isha Kara Moratta Kusuri Ga Wakaru	1178 (24.2)
Okusuri Wo Sagasu (Yahoo! healthcare)	1038 (21.4)
Okusuri 110Ban	897 (18.5)
Kusuri Kensaku (Goo Healthcare)	645 (13.3)
Drug Dictionary Kokokarada	393 (8.1)
Okusuri Kensaku	140 (2.9)
Drug Search e-Pharma	128 (2.6)
Qlife Drug Search	105 (2.2)
Kusuri no Shiori	93 (1.9)
Pharmaceuticals and Medical Devices informational website	77 (1.6)
Social media	2478 (51.0)
Community for knowledge sharing	2288 (47.1)
Pay site	458 (9.4)
AskDoctors	231 (4.8)
Karada Soudan (Yahoo! Healthcare)	267 (5.5)
Free site	2103 (43.3)
Yahoo! Chiebukuro	1844 (37.9)
Oshiete! Goo	957 (19.7)
OKWave	348 (7.2)
Social networking site	276 (5.7)
Mixi	232 (4.8)
Mobagetown	63 (1.3)
Gree	60 (1.2)
Bulletin board system	
2channel	433 (8.9)
Microblogging service	
Twitter	65 (1.3)
Other websites	
Pharmaceutical company website	1131 (23.3)
Healthcare provider or government website	805 (16.6)
Personal website and blog	636 (13.1)
Other	159 (3.3)
Site user category	
User of anonymous sites	2296 (47.2)
User of only anonymous sites	772 (15.9)

In the site user category, 47.2% (2296 of 4861) used Web communities and websites where the information giver was anonymous, while 15.9% (772 of 4861) used such resources exclusively.

Types of Medicine and Drug Information A total of 68.4% (3325 of 4861) of users had researched

prescription drugs online, 37.9% (1842 of 4861) researched over-the-counter drugs, and 4.7% (229 of 4861) researched drugs not approved for use in Japan.

Table 3 shows the summary of researched drug information. Almost half (49.2% (2390 of 4861)) of users surveyed reported having searched for information on drug side effects. The mechanism of action was the second-most sought after information (44.9% (2183 of 4861)). The average number of selected the types of drug information sought was 2.9 (S.D.=2.1) and the median was 2.

Multivariable Logistic Regression Analysis Table 4 shows the data on the users for the multivariable logistic regression analysis. Of the 4861 users, comparisons were made between those who had used anonymous sites (n=2296) *versus* those who had not

Table 3. Topics on Drugs Researched Online (n=4861)

Question items	n (%)
Drug side effects	2390 (49.2)
Action mechanism	2183 (44.9)
Effect of drug on body	1563 (32.2)
Whether drug being taken is suitable for symptoms	1438 (29.6)
Choosing which drug is appropriate for symptoms	1138 (23.4)
Whether drug is truly effective	998 (20.5)
Generic drugs	790 (16.3)
Drug interactions (with other drugs, or with food and drinks)	778 (16.0)
Dosage and administration and how to use drug	740 (15.2)
Cost of medicine	733 (15.1)
Time to onset of action and durability of response	500 (10.3)
How to obtain the drug	342 (7.0)
Effect of drug on pregnancy	233 (4.8)
Services of pharmacies	174 (3.6)
Restrictions on use of drug while traveling (in transit and in other countries)	77 (1.6)
Other	39 (0.8)

Table 4. Characteristics of the Independent Variable of the Multiple Classification Analysis

Variable	Total n=4861 n (%)	Use of anonymous sites (n=2296) n (%)	p value[a]	Use of only anonymous sites (n=772) n (%)	p value[a]
Sex					
Male	2353 (48.4)	1074 (46.8)	.032	394 (51.0)	.111
Female	2508 (51.6)	1222 (53.2)		378 (49.0)	
Age					
16–29	1109 (22.8)	683 (29.7)		260 (33.7)	
30–39	1120 (23.0)	580 (25.3)		218 (28.2)	
40–49	990 (20.4)	428 (18.6)	<.001	130 (16.8)	<.001
50–59	970 (20.0)	362 (15.8)		103 (13.3)	
≥60	672 (13.8)	243 (10.6)		61 (7.9)	
Education					
High school or less	1418 (29.2)	676 (29.4)	.549	226 (29.3)	.945
College or postgraduate	3434 (70.6)	1615 (70.3)		546 (70.7)	
Refused	9 (0.2)	5 (0.2)	—	0 (0.0)	—
Internet use pattern					
Using the Internet daily	4520 (93.0)	2144 (93.4)	.308	685 (88.7)	<.001
Using the Internet for more than three hours per day	2929 (60.3)	1426 (62.1)	.013	421 (54.5)	<.001
Use of Internet device other than PC	2229 (45.9)	1131 (49.3)	<.001	344 (44.6)	.431
Referring to the reputation and the narrative of other Internet users on shopping	2628 (54.1)	1435 (62.5)	<.001	414 (53.6)	.791
Health-related behavior					
Taking prescription drug	1795 (36.9)	761 (33.1)	<.001	176 (22.8)	<.001
Eating health food[b]	1302 (26.8)	642 (28.0)	.080	166 (21.5)	<.001
Experience a side-effect	1245 (25.6)	593 (25.8)	.745	111 (14.4)	<.001
Having family pharmacy	1712 (35.2)	810 (35.3)	.934	206 (26.7)	<.001
Frequent consulting non-experts about medical care and health	1131 (23.3)	662 (28.8)	<.001	184 (23.8)	.684
Purchasing prescription-only drugs online	278 (5.7)	156 (6.8)	.002	42 (5.4)	.716
Purchasing over-the-counter drugs online	879 (18.1)	464 (20.2)	<.001	108 (14.0)	.001
Purchasing contact lenses online	568 (11.7)	307 (13.4)	.001	90 (11.7)	.980

[a] Represents statistical significance based on χ^2 test for proportional distribution. [b] Vitamin and mineral were not regarded as eating health food here.

used anonymous sites ($n=2565$), and between those who had used only anonymous sites ($n=772$) and users who used anonymous sites some or none of the time ($n=4089$). Factors except education revealed a number of significant differences. We tried several groups of educational status as independent variable. As a result, the group of ''high school or less'' and ''college or postgraduate'' showed the most sensitive response. The ϕ coefficients between the independent variables showed no strong relationships.

Results of the logistic regression analysis are shown in Table 5. Significant predictors were reported in the final model with a $p<0.01$.

In Model 1, the dependent variable was the use of anonymous websites. This was measured against age (OR, 0.778; 95% CI, 0.742–0.816), referring to the reputation and the narrative of other Internet users on shopping (OR, 1.640; 95% CI, 1.450–1.855), taking a prescription drug (OR, 0.806; 95% CI, 0.705–0.922), and frequent consulting with non-professionals about medical care and health (OR, 1.613; 95% CI, 1.396–1.865). Results of Model 1 indicated that all the above factors were significantly associated with the use of the anonymous websites to research drug information.

In Model 2, the dependent variable was the use of only anonymous websites. This was measured against age (OR, 0.753; 95% CI, 0.705–0.805), using the Internet daily (OR, 0.611; 95% CI, 0.426–0.808), taking a prescription drug (OR, 0.614; 95% CI, 0.505–0.747), and experiencing a side effect (OR, 0.526; 95% CI, 0.421–0.658). Results of Model 2 indicated that all the above factors were significantly associated with using only anonymous websites to research drug information.

DISCUSSION

Our survey targeted Internet users of 16 years of age and older. About 50% of the respondents, and about 60% of the respondents who were continuous users of prescription drugs had experience collecting information about pharmaceutical products on the Internet. We learned that they use a wide variety of websites and Web services.

About 70% of the pharmaceutical products about which they collected information were prescription drugs, and approximately 40% were over-the-counter drugs. More information was collected about prescription drugs that could be obtained through a medical professional than was collected about over-the-counter drugs that they could select and use on their own. We also found that users collected information

Table 5. Results of the Multivariable Logistic Regression Analysis ($n=4861$)

Variable[a]	Model 1		Model 2	
	OR (95%CI)	p value	OR (95%CI)	p value
Sex (female)	0.018 (0.902–1.149)	.771	0.868 (0.737–1.022)	.089
Age[b]	0.778 (0.742–0.816)	<.001	0.753 (0.705–0.805)	<.001
Internet use pattern				
Using the Internet daily	0.912 (0.719–1.157)	.449	0.611 (0.462–0.808)	.001
Using the Internet for more than three hours per day	1.065 (0.942–1.204)	.315	0.834 (0.707–0.984)	.032
Use of Internet device other than PC	1.041 (0.917–1.181)	.535	1.237 (1.043–1.468)	.015
Referring to the reputation and the narrative of other Internet users on shopping	1.640 (1.450–1.855)	<.001	1.046 (0.884–1.238)	.599
Health-related behavior				
Taking prescription drug	0.806 (0.705–0.922)	.002	0.614 (0.505–0.747)	<.001
Eating health food[c]	1.105 (0.961–1.270)	.160	0.944 (0.773–1.151)	.566
Experience a side-effect	0.964 (0.838–1.109)	.610	0.526 (0.421–0.658)	<.001
Having family pharmacy	1.056 (0.926–1.205)	.418	0.833 (0.691–1.004)	.055
Frequent consulting non-experts about medical care and health	1.613 (1.396–1.865)	<.001	1.267 (1.042–1.540)	.017
Purchasing prescription-only drugs online	1.135 (0.865–1.488)	.362	1.303 (0.895–1.897)	.167
Purchasing over-the-counter drugs online	1.125 (0.956–1.325)	.157	0.763 (0.600–0.970)	.027
Purchasing contact lenses online	0.972 (0.805–1.172)	.764	0.897 (0.695–1.157)	.402

Model 1: Dependent variable was whether anonymous websites were used. Model 2: Dependent variable was whether the only anonymous websites were used. Abbreviations: OR, odds ratio; 95%CI, 95% confidence interval. [a] All variables except for age were dichotomized. [b] Odds ratio for age corresponded to change in five categories (16–29 years, 30 s, 40 s, 50 s, and 60 and above). [c] Vitamin and mineral were not regarded in eating health food here.

about drugs that were not approved in Japan.

As we expected before conducting the analysis, the content of the information that was collected on the Internet was mostly information that would have a direct impact on the user's body, such as medical side effects. However, about 40% of the respondents with experience searching for information were seeking information about the drugs' mechanisms of action, and many respondents sought further understanding of drug products, as well as to acquire specialized knowledge.

In regard to the websites and Web communities used, 40% of the users used the free social media knowledge community known as Yahoo! Chiebukuro (the Japanese version of Yahoo! Answers), which was the largest group. Some respondents used social media services such as social networking sites, bulletin board systems, and Twitter as drug information sources.

Most social media services obscure the true identity of the participants, and structure the communication such that the anonymity of the participants is maintained. Approximately half of the participants who had experience searching for drug information online used such services as a source of drug information. Moreover, about 20% of the participants used only anonymous sites to obtain their drug information.

We used multiple logistic regression analysis to create Model 1, in which the dependent variable is whether or not anonymous websites were used, and Model 2, in which the dependent variable is whether or not anonymous sites were the only type of site used. The significant independent variables common to both Model 1 and Model 2 were age and use of a prescription drug regularly. In Model 1, Internet users who referenced the reputation and comments of other Internet users on shopping were 1.640 times more likely to use anonymous sites to research drug information than those who do not. Furthermore, Internet users who frequently consulted non-experts about medical care and health were 1.613 times more likely to use anonymous sites than those who do not. In Model 2, Internet users who use the Internet daily were almost 1.6 (1/OR=1/0.611) times less likely to use only anonymous site to research drug information than those who do not. In addition, Internet users who experienced a side effect were almost 1.9 times (1/OR=1/0.526) less likely to use only anonymous sites as those who do not.

Medical consumers collected a wide variety of information. We also found that the spread of the Internet continues to lessen the asymmetric nature of the ability of medical consumers and medical professionals to access information.

The information that is available to medical consumers has undergone considerable changes. In Japan, beginning in the 1990s, the trend for prescription drugs to be dispensed from facilities separate from medical practices accelerated, and the name of prescription drugs were disclosed to patients. From April 2000, health insurance pharmacies were given an allowance to cover the dispensing fee to provide documentation containing information on the appropriate use of prescribed medicine. Then, in April 2010 it became mandatory for health insurance pharmacies to provide dispensing fee details to patients. Furthermore, we believe that with the development of the information environment, the information demanded by medical consumers is becoming more sophisticated.

Yahoo! JAPAN is the most used search engine in Japan.[26] Yahoo! JAPAN search results include discussions from Yahoo! Chiebukuro that are returned in the main search results; moreover, the system displays search results from Yahoo! Chiebukuro at the bottom of the main screen. We believe that this is the reason why we observed such high use of Yahoo! Chiebukuro. In the case of most free-of-charge knowledge sharing communities, the discussions are displayed in the main search results, regardless of whether Yahoo! Japan, Google, or some other search engine is used. This allows the users to see the content of the discussion without accessing the free-of-charge knowledge sharing community.

Free-of-charge knowledge sharing communities have the following characteristics:

1. The answers are evaluated by the questioner, who selects the answer that he perceives to be the best.
2. It is difficult to edit or update information in the case that new knowledge becomes available regarding a past question.
3. Answers can be given without clearly providing one's identity or qualifications.

Characteristic 1 is particular to free-of-charge knowledge sharing communities, but with the exception of Wikipedia and similar sites, the other points are common among many other examples of social media, which are types of consumer generated media.

Because information regarding drugs will continue to change as new knowledge is discovered about the drugs the longer they are used in society, there is always a need to add information or edit existing information. Appropriate information must be available to ensure the proper use of drugs.

When the identity and qualifications of the information provider are unknown, the sense of responsibility for the information that is provided is diluted, and in many cases the completeness of the information may be lacking. In addition, the source of the information is not always cited clearly. Consequently, the authenticity and reliability of the information cannot be determined in many cases.

Another characteristic of medical consumer generated media is that information is often given based on an individual's personal experience. In regard to information about drugs, however, unlike other information on other products, allergies, ability to metabolize a drug, concurrent drug use, current medical history, and previous medical history will all have a large effect on drug selection and use. This means that information provided by anonymous Internet users cannot be used simply as it is. In addition, drug information regarding the effectiveness of drugs on individuals includes some ambiguity, and drawing definitive conclusions is difficult. Therefore, skill is necessary to interpret the drug information.

Existing social media research has reported on the situation regarding the exchange of information related to the non-medical use of drugs on social networking sites,[27] and the spread of mistaken medical and drug information *via* Twitter.[28] Information reduces uncertainty. We can expect much benefit by appropriately providing individuals with information that has a sufficient guarantee of volume, quality, and credibility.

In order for medical consumers to appropriately choose the relevant information from the drug information that has the previously mentioned characteristics, and then apply that information, an information environment and ability are required. An information environment, such as a website that provides information that is updateable and has credibility, is needed. This requires the individual to have the ability to scrutinize the information, to consider how the information applies to their personal case and to make a selection. In other words, they must have a certain level of drug information literacy. The skills of the individual are especially important when using information from anonymous websites.

From a variable analysis, we found the following. Comparison of the two multiple logistic regression models revealed that Internet users who are older or who take a prescription drug may have a tendency not to use anonymous sites as their source of drug-related information. In addition, it was gathered that those exhibiting behavior such as active soliciting of information might have a tendency to use websites including anonymous sites to research drug information. Meanwhile, it was assumed that individuals who use the Internet every day or who are familiar with gathering information online, and experience a side-effect or know how medicine affects the body, might have a tendency not to use only anonymous sites to obtain drug information. In other words, those who do not have much experience with online research or do not have a good understanding of how medicine works might have a tendency to gather drug information from only anonymous sites.

The advanced information society continues to make rapid progress, and the Internet is becoming increasingly integrated into daily life. In this environment, in order for medical consumers to use information appropriately, they need not only general information literacy, but an understanding of the status of drugs in healthcare. Then they must supplement that understanding with drug information literacy. Going forward, it will be necessary to begin cultivating these skills in the classroom, and to obtain support from pharmacists.

Limitations In this survey, sampling bias and the bias arising from individual answers may have influenced the results. Specifically, sample bias might have arisen because this survey targeted a population registered for a particular Internet rewards program. Another bias might have arisen because some people were not interested in the content of this survey and did not complete all of it. However, we set the quota on the number of responses and set the questions other than that related to educational level to be displayed in random order to avoid a bias. Moreover, it was a cross-sectional survey and thus did not provide time information that would enable us to determine cause-and-effect relationships. For these reasons, going forward, we must test the hypotheses that we inferred from this survey.

Lastly, we were unable to judge the quality, vol-

ume, and reliability of the information that the medical consumers accessed in the survey.

In addition to the above matters, we need to conduct a more detailed survey examining the following: medical consumers' ability to scrutinize drug information, how they evaluate the reliability of information on websites, and their behavior after collecting information from the Internet.

CONCLUSIONS

Internet devices are becoming more diversified, and the Internet is becoming a tool that is increasingly integrated into daily life. We believe that the number of Internet users and frequency of Internet use will continue to increase. We also believe that the information demanded by medical consumers is changing with the advances in technology. Pharmacists should be involved in providing drug information according to these changes, and they should support drug information literacy.

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