



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



## Estimation of the impact of providing outpatients with information about SARS infection control on their intention of outpatient visit

Tatsuro Ishizaki<sup>a</sup>, Yuichi Imanaka<sup>a,\*</sup>, Masahiro Hirose<sup>a</sup>, Kenshi Hayashida<sup>a</sup>,  
Minoru Kizu<sup>b</sup>, Akihiro Inoue<sup>b</sup>, Susumu Sugie<sup>b</sup>

<sup>a</sup> Department of Healthcare Economics and Quality Management, School of Public Health, Kyoto University  
Graduate School of Medicine, Yoshida Konoe-cho, Sakyo-ku, Kyoto 606-8501, Japan

<sup>b</sup> Otsu Municipal Hospital, Otsu, Shiga, Japan

Received 16 December 2003

### Abstract

To examine the effect of provision of information about the infection control in the specific infection disease treatment unit in a city hospital on the outpatient's intention of outpatient service use, respondents who underwent outpatient medical care at the hospital ( $N = 821$ ) were asked whether or not they intended to continue the outpatient visit at the hospital if a severe acute respiratory syndrome (SARS) patient was admitted to the unit. Although 56% of respondents replied that they could continue to visit the department if a SARS patient was admitted to the unit in the hospital before they read the information, the proportion of those who intended to continue outpatient care significantly increased by 15% after they read it. The logistic regression analyses revealed that respondents who had frequently visited the outpatient department ( $P < 0.001$ ), those who felt relieved by reading the information about the unit ( $P < 0.001$ ), and those who did not worry about nosocomial SARS infection inside the hospital ( $P < 0.001$ ) were significantly more likely to reply that they would continue outpatient visits. We estimated that admission of a SARS patient to the unit would result in a 20% decrease in the cumulative total number of outpatients in the hospital during a 180-day interval after admission of a SARS patient to the unit, and the cumulative total number of outpatients increased by 7% after they read the information. This study suggests that providing outpatients with appropriate information about SARS infection control in the hospital had a statistically significant and substantial impact on the outpatients' intention to continue outpatient visits at the hospital.

© 2004 Elsevier Ireland Ltd. All rights reserved.

**Keywords:** Severe acute respiratory syndrome; Epidemic of fear; Infection control; Health belief model; Outpatient visits; Japan

### 1. Introduction

On 5th July 2003, World Health Organization stated that the global outbreak of severe acute respiratory syndrome (SARS) had been contained [1]. By July 31, 2003, a cumulative total of 8098 probable cases

\* Corresponding author. Tel.: +81 75 753 4454;  
fax: +81 75 753 4455.  
E-mail address: [imanaka@pbh.med.kyoto-u.jp](mailto:imanaka@pbh.med.kyoto-u.jp) (Y. Imanaka).

and 774 deaths had been reported from 26 countries [2]. Although a novel coronavirus was identified as the etiological agent of SARS [3–5], strategies for diagnosis and treatment of SARS have not been determined to date [6]. According to the experiences of SARS outbreaks in Hong Kong and Toronto [7,8], in order to prevent nosocomial SARS infection, along with an increased emphasis on hand-washing, all health care workers should use personal protective equipment appropriate for standard, contact, and airborne precautions, such as hand-washing, gown, gloves, N95 or equivalent masks, and eye protection, along with an increased emphasis on hand-washing, and SARS patients should be admitted to a negative pressure ventilated room [6,9].

Despite methods for nosocomial SARS infection control being reported, an epidemic of fear of SARS transmission among lay persons has been in evidence [10–12]. Although no confirmed SARS case had been publicly reported in Japan as of 5th July 2003, an epidemic of fear was observed in Japan because a Taiwanese physician who was probably infected with SARS had visited Japan for 6 days in May 2003. To examine secondary infection by the patient during his stay in Japan, the Japanese government released the time schedule of his trip [13,14] and recommended that visitors during that period should undergo health check-ups for SARS infection. Although no secondary SARS infection was identified, many people avoided visiting the places where the patient stopped by. Consequently, the restaurants, shops, and hotels where the patient stopped by and related markets were economically disrupted. Patients who are afraid of nosocomial SARS infection may avoid outpatient visits to hospitals that provide SARS treatment. Lay persons may be scared of SARS infection because the exact mechanism of SARS transmission, strategies for diagnosis, and treatment of SARS are not determined [15,16].

Hospital visits for such patients may be explained by a psychosocial theory, the health belief model, which assumes that the likelihood of an action is affected by one's perception of his or her own susceptibility to the disease and the perceived severity of the disease, which together form the individual's perception of the threat of the disease [17,18]. In addition to severity and susceptibility, value of threat reduction and benefits of actions are also modeled

to influence behavior [19]. Based on this model, we hypothesized that, if non-SARS outpatients consider that they are less likely to catch SARS infection in a hospital where a SARS patient stays because of completeness of SARS infection control in the hospital, patients are likely to continue to visit the hospital. We also hypothesized that, even if non-SARS outpatients want to suspend outpatient visits after the admission of a SARS patient to the hospital, they may change their intention into continuing their visit to the hospital when they are given appropriate information about both SARS transmission and the completeness of SARS infection control in the hospital. We further hypothesized that it is important for a SARS treatment hospital to examine factors associated with non-SARS patients' perception about continuation of ambulatory care. However, to the best of our knowledge, there has to date been no study that examined a non-SARS patient's intention of ambulatory care use. This study examined the effect of providing outpatients with information about SARS infection control in the infectious disease treatment unit in a community hospital on their intention to continue outpatient visits, and estimated the cumulative total number of outpatients as well as the cumulative total expenditures for outpatient care at the hospital during a 180-day period after the admission of a SARS patient to the hospital.

## 2. Subjects and methods

### 2.1. Study setting and participants

This study was approved by the Institutional Review Board of Faculty of Medicine, Kyoto University Graduate School of Medicine, Japan. The data used in our analysis were obtained from patients who underwent outpatient service at a city hospital in Japan. The city is the capital of Shiga Prefecture, located in the middle of the main island of Japan. The population of the city in 2003 is about 300,000. The hospital has a total of 562 beds including eight beds in the specific infectious disease treatment unit accredited by the government. Two out of eight beds are individual negative pressure rooms ventilated with HEPA filters. The entrance, elevator, and each bed in the unit are completely separated from other units in the hospital. Staff working in the unit use full personal protective

equipment appropriate for standard contact and airborne precautions.

This study had a cross-sectional design. When the patient came to reception to request outpatient care, the hospital staff asked each patient to participate in this survey. When a patient agreed to participate, a self-administered questionnaire was passed and the patient was asked to return it to a collection box located in the outpatient department, after filling out the questionnaire. Respondents were assured about the anonymity and confidentiality of the survey. The survey was conducted for 3 days in the summer of 2003.

## 2.2. Questions

We used key concepts of the health belief model to design our questionnaire. The questionnaire included the following items.

### 2.2.1. Perceived knowledge about SARS transmission routes

There were two questions asking about perceived knowledge about the likelihood of SARS infection by direct infection or indirect infection: “Do you suppose that SARS is likely to be transmitted by exposure of respiratory secretions from SARS patients?” and “Do you suppose that SARS is likely to be transmitted by surface contamination by touching a handrail?” Answer options for these questions were “Yes,” “No,” and “No idea.”

### 2.2.2. Perceived severity of SARS

There was one question asking respondents’ fear of death from SARS infection as the perceived severity: “Do you fear death from SARS?” Answer options for this question were “Yes” and “No.”

### 2.2.3. Perceived susceptibility of SARS infection

The respondent was asked about their perceived susceptibility to nosocomial SARS infection in this hospital: “Do you think whether you are likely to be infected with SARS in this hospital?” Answer options for this question were “Yes” and “No.”

### 2.2.4. Perceived efficacy of the control measures against nosocomial SARS infection

There was a question asking whether the information about SARS infection management in the unit

assuaged the respondent’s fear of SARS infection control in the hospital: “Was this information about the unit useful to alleviate your fears about SARS infection control in this hospital after you read it?”

### 2.2.5. Demographics

The questionnaire involved other questions about demographic characteristics, such as age, gender, history of hospital use, and use of outpatient departments in the hospital.

### 2.2.6. Intention of outpatient visit

There was one question asking intention of outpatient visits when a SARS patient was admitted to the hospital: “When a SARS patient is admitted to this hospital, do you intend to continue outpatient visits to this hospital?” Response options were “Yes” and “No, I would like to suspend my visit.” When a respondent replied that he or she would suspend an outpatient visit, he or she was asked to reply how long the respondent intended to suspend the visit. There were six choices for this question: until the SARS patient’s discharge, until 10 days after the SARS patient’s discharge, until one month after the SARS patient’s discharge, until a few months after the SARS patient’s discharge, never, and no idea.

### 2.2.7. Providing information about SARS infection control

To provide respondents with information about infection control at the infectious disease treatment unit, the following description was included in the questionnaire: This hospital has a specific infectious disease treatment unit for extremely hazardous infectious diseases. The unit is designed to strictly control nosocomial infection. Therefore, the unit is completely separated from other units and department in this hospital, and has a specific entrance, specific elevator, and specific corridor. All health care workers in this unit use special clothing to prevent nosocomial infection during care. In addition, this unit has a special ventilation system to prevent microorganisms from being disseminated into the environment.

The questions about perceived susceptibility to SARS infection and perceived efficacy of SARS prevention were shown after the information about SARS infection control. The question about the intention of outpatient visit was asked before and after providing

the information about SARS infection control, to examine the impact of providing outpatients with information on their intention of outpatient visits.

### 2.3. Statistical analyses

A change in the respondent's intention of outpatient service use at the hospital before and after he or she read the information about the infectious disease treatment unit in the hospital was tested by McNemar test. Both  $\chi^2$ -test and a multivariate logistic regression analysis were performed to examine factors associated with the intention to continue outpatient visits. Dependent variables were the intention to continue ambulatory care at the hospital if a SARS patient was admitted to the hospital and the intention to continue ambulatory care at the hospital among subjects who initially intended to suspend outpatient visits. Independent variables included age, gender, frequency of outpatient visits, knowledge about transmission by direct infection or indirect infection, fear of death from SARS infection, knowledge of existence of the infectious disease treatment unit in the hospital, perception about satisfaction with the nosocomial infection control in the hospital after reading the information, and fear of nosocomial transmission in the hospital. All analytical procedures were performed using the SPSS statistical package Version 11.0. All reported *P* values were two-tailed, and the level of significance was *P* < 0.05.

### 2.4. Modeling the magnitude of suspending outpatient visit

We used a probability tree to estimate the cumulative total number of outpatients who intend to use the outpatient care service during a 180-day period after a SARS patient was admitted to the hospital. We assumed that the total number of outpatients of the hospital was 1200 patients per day, and the mean total expenditure for outpatient care was about ¥ 8000 (about US\$ 67: US\$ 1 = JPN¥ 120) per patient per day. We used seven kinds of respondents' intention regarding whether or not the respondent wished to continue to visit the outpatient care in the hospital after a SARS patient was admitted to the hospital. Available answers and assumed periods of respondents who intend to suspend outpatient visit were: (1) continue to

visit (suspended period = 0 day), (2) suspended until SARS patient's discharge (20 days), (3) suspended for 10 days after SARS patient's discharge (30 days), (4) suspended for 1 month after SARS patient's discharge (60 days), (5) suspended for two or three months after SARS patient's discharge (120 days), (6) would not use the outpatient department any more (180 days), and (7) no idea. For respondents who replied "no idea," we assumed that all of them would suspend for the first 20 days, 10% of them would resume visits 30 days after admission of a SARS patient, 20% of them would resume visits after 60 days, 30% after 120 days, and 40% of them would not visit during a 180-day period. Because the hospital provides ambulatory care services 5 days a week, the net days during each suspended period were assumed to be (1) 0 days for patients who continue to use the outpatient department in the hospital, (2) 15 days for patients who suspend visits until a SARS patient is discharged, (3) 21 days for patients who suspended visits for 10 days after a SARS patient is discharged, (4) 41 days for a patient who suspend visits for 1 month after a SARS patient is discharged, (5) 82 days for patients who suspend visits for a few months after a SARS patient is discharged, and (6) 123 days for patients who would not use the outpatient department any more. We calculated the cumulative total number of patients who were assumed to visit the outpatient department by summing the number of patients during each suspended period. Next, we obtained the cumulative total expenditures for outpatient care at the hospital during the 180-day interval by multiplying the cumulative total number of outpatients by the mean total expenditure for outpatients per patient per day. Then we compared the estimated cumulative total number of outpatients between before and after respondents read the information about the infectious disease treatment unit in the hospital. We performed a one-way sensitivity analysis using a 95% confidence interval of the proportion of respondents who replied that they intended to continue to visit before and after they read the information about the SARS treatment unit. In the sensitivity analysis, because we did not ask how long the patient intended to suspend outpatient visits when they replied that they would suspend even after reading the information, we assumed that the suspension period of the respondent was the same as that in the response before the respondent read the information.

### 3. Results

The total number of patients who visited the outpatient department at the city hospital during the 3-day survey period was 2985, and a total of 959 questionnaires were completed (response rate = 30.5%). Tables 1 and 2 show basic characteristics of the study participants and their intention to continue outpatient visits before they read the information about the infectious disease treatment unit in the hospital. Before they read the information about the unit, when we asked respondents their intention of outpatient visits if a SARS patient was admitted to the unit in the hospital, 44% of them replied that they would suspend visits to the outpatient department. Table 3 shows the change in the respondents' intention of outpatient visits at the hospital if a SARS patient was admitted to the

Table 1  
Basic characteristics of respondents who visit outpatient department at a community hospital in Japan ( $n = 821$ )

		%
Gender	Men	47.0
	Women	53.0
Respondents	Patients	89.0
	Family	10.6
	Others	0.4
Age	<40	23.3
	40–59	29.2
	60–69	25.1
	70+	22.4
Use of outpatient department	Gastroenterology	22.8
	General internal medicine	18.3
	Ophthalmology	17.5
	Orthopedics	15.6
	Cardiology	12.9
	Obstetrics and gynecology	12.1
	Dermatology	11.4
	Urology	9.7
	Otolaryngology	9.1
	Dentistry	9.1
	Neurosurgery	8.3
	Surgery	6.7
	Neurology	6.3
	Psychosomatic medicine	4.6
	Thoracic surgery	4.1
Respiratory	3.3	
Pediatrics	2.3	
Respiratory surgery	0.5	
Others	3.9	

Table 2

Respondents' intention of outpatient visits before reading information about the infection control in the infectious disease treatment unit

Intention to visit outpatient department if a SARS patient stays in the hospital ( $n = 821$ )	Continue visits	55.7
	Suspend visits	44.3
Reply about suspension period for outpatient visits among respondents who replied that they would suspend visits ( $n = 356$ )	Upon discharge of a SARS patient	12.4
	10 days after upon discharge	14.6
	1 month after upon discharge	27.0
	2 or 3 months after upon discharge	13.2
	Never visit again	0.6
	No idea	32.3

hospital before and after the respondents read the information about SARS infection control at the infectious disease treatment unit in the hospital. The proportion of patients who intended to continue outpatient visits at the hospital significantly increased after they read the information ( $P < 0.001$ ): 38% of the respondents who initially intended to suspend ambulatory care visits replied that they intended to continue outpatient visits to the hospital. Tables 4 and 5 show results from the bivariate and multiple logistic regression analyses to examine factors associated with respondents' intention to continue outpatient visits to the hospital. The logistic regression analysis revealed that, after the respondents read the information about the unit, those who had visited outpatient department frequently ( $P < 0.05$ ), those who were relieved after reading the information about the unit ( $P < 0.001$ ), and those who did not worry about SARS infection in the hospital ( $P < 0.001$ ), were significantly more likely to continue outpatient visits at the hospital, even if a SARS patient were admitted to the hospital. The other logistic regression analysis showed that, among respondents who initially intended to suspend ambulatory visits to the hospital, those who had frequently visited the outpatient department ( $P < 0.001$ ), those who were relieved after reading the information about the unit ( $P < 0.001$ ), and those who did not worry about nosocomial SARS infection in the hospital ( $P < 0.001$ ), were significantly more likely to change their intention to continue outpatient visits at

Table 3

Change of respondents' intention of outpatient visits before and after they read information about the SARS infection control in the infectious disease treatment unit at the community hospital

			Intention of outpatient service use after the provision of information			
			Continue visits		Suspend visits	
			<i>n</i> = 581	70.8%	<i>n</i> = 240	29.2%
Intention of outpatient service use before the provision of information	Continue visits	<i>n</i> = 457	443	96.9%	14	3.1%
	Suspend visits	<i>n</i> = 364	138	37.9%	226	62.1%

McNemar test:  $P < 0.001$ .

the hospital. Table 6 shows a result of simulations to estimate the cumulative total number of outpatients at the hospital during the 180-day period following a SARS patient's admission to the unit, and to examine the impact of the provision of information about the infection control in the unit. Before the respondents read the information, the cumulative number of outpatients and the cumulative total expenditures for outpatient care during a 180-day period were estimated to decrease by 20% after admission of a SARS patient. We also estimated that the hospital would lose total expenditures for outpatient care of US \$2.0 million during the 180-day period. The presentation of information about the infection control in the unit was estimated to change these numbers by 7%.

#### 4. Discussion

To examine the effect of provision of information about infection control in the specific infection disease treatment unit in a city hospital on the outpatient's intention of outpatient service use, respondents who underwent outpatient medical care at the hospital were asked whether or not they intended to continue outpatient visits at the hospital if a SARS patient were admitted to the unit, before and after they read the information. Although 56% of respondents replied that they would continue to visit the department if a SARS patient was admitted to the unit in the hospital before they read the information, the proportion of those who intended to continue outpatient care significantly increased by 15% after they read it. The logistic regression analyses revealed that respondents

who had frequently visited the outpatient department, those who felt relieved by reading the information about the unit, and those who did not worry about the nosocomial SARS infection inside the hospital were significantly more likely to reply that they would continue outpatient visits. We estimated that admission of a SARS patient to the unit would result in a 20% decrease in the cumulative total number of outpatients in the hospital during a 180-day interval after admission of a SARS patient to the unit. The cumulative total number of outpatients was estimated to increase by 7% when respondents read the information. This study suggests that providing outpatients with appropriate information about SARS infection control in the infectious treatment unit in the hospital had a statistically significant and substantial impact on the outpatients' intention to continue outpatient visits at the hospital.

This study revealed that respondents who felt relieved after they read the information about the unit and those who did not worry about nosocomial SARS infection inside the hospital were significantly more likely to continue outpatient visits to the hospital. Because these variables were key components of the health belief model explaining patients' behavior: i.e. perceived susceptibility to SARS infection as threat of the disease and perceived efficacy of SARS infection control as benefits of actions, these results indicate that the intention of outpatient visits at a hospital that has a infectious disease treatment unit may be explained by threat of the disease and benefits of actions in the health belief model [19]. This is consistent with another report which revealed that threat of disease and tendency to visit a physician were associated with use of physicians in a cross-national study conducted in

Table 4

Proportion of respondents who intended to continue outpatient visit after they read information about the SARS infection control in the unit by variables ( $\chi^2$  test)

		Proportion of respondents who intended to continue outpatient visit among analyzable subjects after they read the information ( $n = 821$ )			Proportion of respondents who changed their perception to continue to visit after reading the information about the unit among those who initially intended to suspend visit ( $n = 364$ )		
		$n$	%	$P$ value	$n$	%	$P$ value
Gender	Men	386	75.9	0.002	149	40.9	0.322
	Women	435	66.2		215	35.8	
Age	<40	191	59.7	<0.001	113	37.2	0.875
	40–59	240	70.0		111	36.0	
	60–69	206	75.2		76	38.2	
	70+	184	78.3		64	42.2	
History of respondents' outpatient service use at the hospital	Have used before	757	72.3	0.001	322	38.8	0.323
	Visit first time	64	53.1		42	31.0	
Perceived knowledge about the likelihood of indirect SARS transmission	Probable	335	67.2	0.064	169	36.7	0.902
	Not probable	313	75.4		116	38.8	
	Do not know	173	69.4		79	39.2	
Perceived knowledge about the likelihood of direct SARS transmission	Probable	701	69.3	0.086	327	37.9	0.999
	Not probable	52	80.8		16	37.5	
	Do not know	68	77.9		21	38.1	
Perceived severity: perceived fear of death due to SARS infection	Scared	753	69.7	0.028	346	37.9	0.930
	Not scared	68	82.4		18	38.9	
Respondents' knowledge about the presence of the infection unit	Have known	375	67.2	0.039	200	41.5	0.119
	Have not known	446	73.8		164	33.5	
Perceived efficacy: impact of the information on relief, against fear of SARS infection	No change	165	50.9	<0.001	90	12.2	<0.001
	Scared	8	25.0		7	14.3	
	Relieved	648	76.4		267	47.2	
Perceived susceptibility: perceived fear of SARS infection in the hospital	Scared	540	60.0	<0.001	295	30.5	<0.001
	Not scared	281	91.5		69	69.6	

the United States, England, and Yugoslavia [20]. This is consistent with our study: respondents who had frequently visited the outpatient department were significantly more likely to continue their visits. Although the current study was conducted with a cross-sectional design, it is reasonable for us to speculate that the fear of nosocomial SARS transmission in the hospital among non-SARS outpatients as the threat of the disease may affect their intention to suspend outpatient visits if a SARS patient were admitted to the hospital.

This study also revealed that the provision of simple information about infection control in the unit to non-SARS outpatients as the benefits of actions had a statistically significant and substantial impact on the outpatients' behavior for hospital use. We estimated that the cumulative total number of outpatients who using the outpatient department during 180 days after the admission of a SARS patient to the hospital would decrease by 20%, compared with before the SARS patient's admission to the hospital. In addition,



Table 5

Factors associated with respondents' intention of outpatient visit after they read information about the SARS infection control in the unit (multiple logistic regression analyses)

		An analysis for all respondents ( $n = 821$ ) 1 = continue to visit, 0 = suspended to visit				An analysis for respondents who initially replied to suspend outpatient visit ( $n = 364$ ) 1 = changed from suspending to continuing, 0 = remained suspending			
		OR	95% CI		$P$ value	OR	95% CI		$P$ value
Gender	Women	1.000				1.000			
	Men	1.650	1.158	2.349	0.006	1.320	0.805	2.163	0.271
Age	<40	1.000				1.000			
	40–59	1.020	0.639	1.629	0.934	0.667	0.355	1.253	0.208
	60–69	1.173	0.705	1.950	0.539	0.728	0.363	1.461	0.371
	70+	1.314	0.759	2.277	0.330	0.916	0.435	1.927	0.816
Frequency of respondents' outpatient service use at the hospital	First visit	1.000				1.000			
	Irregular visit	1.868	0.968	3.605	0.063	1.779	0.769	4.114	0.178
	Visit every day—a few times a month	4.112	2.141	7.895	<0.001	2.327	0.997	5.431	0.051
Perceived knowledge about the likelihood of indirect SARS transmission	Probable	1.000				1.000			
	Not known	0.983	0.604	1.598	0.944	1.130	0.573	2.229	0.725
	Not probable	1.065	0.645	1.759	0.805	0.947	0.467	1.924	0.881
Perceived knowledge about the likelihood of direct SARS transmission	Probable	1.000				1.000			
	Not known	0.525	0.248	1.113	0.093	0.540	0.178	1.633	0.275
	Not probable	0.996	0.347	2.857	0.994	0.429	0.084	2.191	0.309
Perceived severity: perceived fear of death due to SARS infection	Scared	1.000				1.000			
	Not scared	1.059	0.494	2.268	0.883	0.630	0.191	2.077	0.448
Respondents' knowledge about the presence of the infection unit	Have not known	1.000				1.000			
	Have known	1.271	0.888	1.819	0.190	0.860	0.519	1.424	0.557
Perceived efficacy: impact of the information on relief against fear of SARS infection	Scared	1.000				1.000			
	No change	0.412	0.076	2.239	0.304	1.089	0.115	10.271	0.941
	Relieved	3.012	1.996	4.546	< 0.001	5.670	2.773	11.596	< 0.001
Perceived susceptibility: perceived fear of SARS infection in the hospital	Scared	1.000				1.000			
	Not scared	6.753	4.163	10.955	<0.001	5.139	2.748	9.612	<0.001
Hosmer–Lemeshow $\chi^2$		4.15				3.96			
		( $P = 0.843$ )				( $P = 0.861$ )			

OR: odds ratio, CI: confidence interval.

we estimated that the cumulative total expenditures for medical care provided during the 180-day period would decrease by US \$2.0 million, compared with before the SARS patient's admission to the hospital. The Japan's universal health insurance system guarantees that patients can access any medical facility all over Japan: "the free access policy" [21]. Thus, if

patients are not willing to visit the hospital any more, even for non-medical reasons, they can use another hospital for their outpatient care. Thus the free access policy may result in a decrease in non-SARS outpatients in a SARS treatment hospital if a SARS patient is admitted to the hospital and outpatients that they will catch SARS in the hospital. This decrease of outpa-

Table 6

Estimates of a cumulative total number of outpatients and cumulative total fees for outpatient care during a 180-day period after an admission of a SARS patient at the community hospital

	Cumulative total number of outpatients (1000)		Proportion of the estimates in the cumulative total number before the admission of a SARS patient (%)		Cumulative total fees for outpatient care (US\$ 1 million)		Reduction of total fees compared with no SARS patient admission (US\$ 1 million)	
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI
Before providing respondents with information about the unit	117.6	(115.3, 119.9)	79.6	(78.1, 81.2)	7.8	(7.7, 8.0)	2.0	(1.9, 2.2)
After providing respondents with information about the unit	127.8	(125.7, 129.9)	86.6	(85.2, 88.0)	8.5	(8.4, 8.7)	1.3	(1.2, 1.5)

CI = confidence interval.

tient visits would result in a decrease of the number of admissions to the hospital, because patients generally visit an outpatient department prior to admission. Since almost all Japanese medical facilities are managed by Japan's universal health insurance system based on a fee-for-service payment with universal point-fee tables, any such decrease in the number of outpatients may trigger an economic crisis in hospital management not only for outpatients departments but also for inpatient care. Appropriate information about SARS, such as the efficacy of infection control, must be provided to patients so that the hospital can minimize the decrease in number of outpatient visits. Meanwhile, health authorities should implement a system which compensates for deficits in medical care expenditure associated with SARS care at a hospital.

When we interpret the results of our study, some limitations must be considered. First, non-response bias is a potential limitation of the study. As the response rate of this survey was 31%, the results are likely biased, but the direction of that bias is not clear. Also, because the ratio of gender and the distribution of age between the respondents and all patients who underwent outpatient care during the survey period were similar, we might assume that the intention of outpatient visits when a SARS patient is admitted to the hospital is similar between the respondents and non-respondents. Second, the hospital selected in this study is not representative of all hospitals for SARS care in Japan. There were only 13 hospitals with specific infectious treatment units having separate nega-

tive pressure rooms in August 2003 in Japan. We need to conduct further investigation at other SARS treatment hospitals in Japan to examine the generalizability of the results in this study. Third, our simulations to estimate the cumulative total number of outpatients and to estimate the cumulative total expenditures for outpatient care in the hospital were based on many assumptions. Especially, because we did not ask how long the patient intended to suspend outpatient visits when they replied that they would suspend even after reading the information, we assumed that the suspension period of the respondent was the same as that before reading the information. Fourth, though information about SARS control was provided to the respondents in the questionnaire, it is only assumed that respondents would not read the entire questionnaire before answering the questions. On the other hand, if a respondent read the whole questionnaire first, including the information on SARS control, the questions that assessed before and after changes might not be valid. Finally, we were not able to examine all possible factors that are considered to associate with outpatients' behavior, such as educational status, perceived benefit, vulnerability to illness in general, satisfaction with providers, and severity of illness [22]. For example, among subjects who initially replied that they would suspend ambulatory visits, 53% answered that although the provision of information about the infection management in the unit relieved them of their fear about SARS transmission in the hospital they still wanted to suspend outpatient care underwent at the hospital. This indicates

that some unmeasured factor may be associated with their behavior [19].

Despite these limitations, this study showed that providing outpatients with information about the efficacy of control measures to prevent nosocomial SARS infection might have a statistically significant and substantial impact on the outpatients' intention to continue outpatient visits at the hospital. We believe that every health authority has a responsibility to implement a comprehensive and effective communication strategy to share information about SARS with the public [23]. Based on a comprehensive insight into the needs and perceptions of the public for SARS, health authorities have to provide appropriate information about SARS care to both health care providers and the public. This study showed that respondents who were scared about nosocomial SARS infection were five times less likely to continue outpatient visits than those who were not scared by it, even after they read the information about the efficacy of the SARS infection control in the hospital. Health authorities should thus properly provide both general information about SARS and information about the efficacy of control measures for nosocomial SARS infection prevention to the public so that they can easily understand the value and meaning of the information.

To establish effective communication between health authorities and the public, health authorities must take into account both the channels through which they can convey information most effectively and the timing when the information provided will have the most advantageous effect [23]. General information about SARS and control measures for SARS transmission has been reported in newspapers and TV news. Nevertheless, this study revealed that one-third of respondents changed their mind after they read information about efficacy of SARS control in the hospital. Therefore, in terms of channels, mass media, such as newspaper and television, play the major role in communicating with the public. However, the mass media is a two-edged sword; sometimes the public are relieved that they have less chance to catch SARS in hospital due to a news story, and sometimes they are scared about susceptibility to SARS infection. Thus, health authorities should establish an effective communication system which avoids an epidemic of fear due to poor communication between health authorities and the mass media and the public.

For example, health authorities might proactively share correct information about SARS with the mass media. In addition, health authorities should continuously monitor perception of SARS among the public, including perceived severity, perceived susceptibility, and perceived efficacy of SARS control measures. When health authorities identify that the public are scared of SARS too much, they should quickly provide additional information about SARS to both the public and the mass media.

## References

- [1] World Health Organization. Update 96. Taiwan, China: SARS transmission interrupted in last outbreak area. Available from: URL: [http://www.who.int/csr/don/2003\\_07\\_05/en/](http://www.who.int/csr/don/2003_07_05/en/).
- [2] World Health Organization. Summary of probable SARS cases with onset of illness from 1 November to 31 July 2003 (revised 26 September). Available from: URL: [http://www.who.int/csr/sars/country/table2003\\_9\\_23/en/](http://www.who.int/csr/sars/country/table2003_9_23/en/).
- [3] Dorosten C, Gunter S, Preiser W, van der Werf S, Brodt HR, Becker S, et al. Identification of a novel coronavirus in patient with severe acute respiratory syndrome. *New England Journal of Medicine* 2003;348:1967–76.
- [4] Ksiazek TG, Erdman D, Goldsmith CS, Zaki SR, Peret T, Emery S, et al. A novel coronavirus associated with severe acute respiratory syndrome. *New England Journal of Medicine* 2003;348:1953–66.
- [5] World Health Organization. A multicentre collaboration to investigate the cause of severe acute respiratory syndrome. *Lancet* 2003;361:1730–3.
- [6] Sampathkumar P, Temesgen Z, Smith TF, Thompson RL. SARS: epidemiology, clinical presentation, management, and infection control measures. *Mayo Clinical Proceedings* 2003;78:882–90.
- [7] Seto WH, Tsang D, Yung RWH, Ching TY, Ng TK, Ho M, et al. Effectiveness of precautions against droplets and contact in prevention of nosocomial transmission of severe acute respiratory syndrome (SARS). *Lancet* 2003;361:1519–20.
- [8] Varia M, Wilson S, Sarwal S, McGeer A, Gourmis E, Galanis E, et al. Investigation of a nosocomial outbreak of severe acute respiratory syndrome (SARS) in Toronto, Canada. *Canadian Medical Association Journal* 2003;169:285–92.
- [9] Centers for Disease Control and Prevention. Guideline for isolation precautions in hospital. *American Journal of Infection Control* 1996;24:24–52.
- [10] LaPorte RE, Ronan A, Sauer F, Saad R, Shubnikov E. Bioterrorism and the epidemiology of fear. *Lancet Infectious Disease* 2002;2:326.
- [11] Eysenbach G. SARS and population health technology. *Journal of Medical Internet Research* 2003;5:e14. Available from: URL: <http://www.jmir.org/2003/2/e14/>.

- [12] Razum O, Becher H, Kapaum A, Junghans T. SARS, lay epidemiology, and fear. *Lancet* 2003;361:1739–40.
- [13] Ministry of Health, Labour and Welfare. Hotels and other facilities where a SARS patient stopped by during his stay in Japan. Available from: URL: <http://www.mhlw.go.jp/topics/2003/03/dl/tp0318-1b51.pdf> (in Japanese).
- [14] Ministry of Health, Labour and Welfare. Itinerary for a Taiwanese physician during his stay in Japan. Available from: URL: <http://www.mhlw.go.jp/topics/2003/03/dl/tp0318-1j2.pdf> (in Japanese).
- [15] Fraser DW, Tsai TR, Orenstein W, Parkin WE, Beecham HJ, Sharrar RG, et al. Legionnaire's disease. *New England Journal of Medicine* 1977;297:1189–97.
- [16] Falsey AR, Walsh EE. Novel coronavirus and severe acute respiratory syndrome. *Lancet* 2003;361:1312–3.
- [17] Rosenstock IM, Strecher VJ, Becker MH. Social learning theory and health belief model. *Health Education Quarterly* 1988;15:175–83.
- [18] Thompson B, Kinne S. Social change theory application to community health. In: Bracht N, editor. *Health promotion at the community level*, second ed. Thousand Oaks, CA: Sage; 1999. p. 29–46.
- [19] Kirscht JP. The health belief model and illness behavior. In: Becker MH, editor. *The health belief model and personal health behavior*. Thorofare, NJ: 1974. p. 60–81.
- [20] Bice T, White K. Factors related to the use of health services: an international comparative study. *Medical Care* 1969;7:124–33.
- [21] Hirose M, Imanaka Y, Ishizaki T, Evans E. How can we improve the quality of health care in Japan? Learning from JCQHC Hospital Accreditation. *Health Policy* 2003;66:29–49.
- [22] Hershey JC, Morton BG, Braithwaite J, Reichgott MJ. Patient compliance with antihypertensive medication. *American Journal Public Health* 1980;70:1081–9.
- [23] Churchill RE. Using surveillance information in communications, marketing, and advocacy. In: Teutsch SM, Churchill RE, editors. *Principles and practice of public health surveillance*, second ed. New York, NY: Oxford University Press; 2000. p. 364–89.