Original Article

Title: Worker resignation due to patient nuisance in hospitals: determinants and prevention

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Running title: Resignation of workers due to patient-derived nuisance

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Abstract

This study aimed to investigate determinants and protective strategies for the resignation of healthcare workers resulting from patient-derived nuisance in medical institutions. We conducted a cross-sectional survey in the 57 hospitals in Mie Prefecture, Japan. A random sampling of 775 employees (physicians, nurses, administrators and other healthcare workers) was provided self-administered questionnaires. Among 480 participants who experienced patient-derived nuisance, 132 participants considered resignation as a result, giving an estimated prevalence of 17.1% [95%CI: 14.4 to 19.8%] of all respondents. Non-physical nuisances such as "demand for an unwarranted apology" (OR: 2.57 [95% CI: 1.61 to 4.12]) had higher ORs for considering resignation than other kinds of nuisance. In contrast, OR for the provision of human support by medical institutions was 0.49 [95% CI: 0.28 to 0.86]. Human support was associated with alleviation of the intention to resign.

Keywords: healthcare workers, non-physical violence, nuisance, occupational safety, resignation

Introduction

To fulfil their role in providing patients with safe and high-quality healthcare, healthcare workers must be supported by suitable occupational safety and health management practices. Recently, however, the frequency of patient-derived nuisance in medical institutions, such as violence (e.g. physical attacks, verbal or written threats) or undue complaints, has increased and this has threatened the safety of staff.[1-3] Indeed, most healthcare workers have been exposed to some degree of workplace violence from patients,[2-4] and a recent survey showed that as many as 83.4% of employees had experienced work-related violence.[5]

Several studies have identified risk factors for violence or aggression against workers in healthcare settings. Among results, younger or female workers were at higher risk of targeting for violence in healthcare settings;[4,6] years of experience and working in a region with the lowest income were risk factors for work-related violence and aggression toward doctors in medical hospitals;[7] and nurses or females were more exposed to sexual harassment by patients than doctors or males.[8] These kinds of violence and aggression towards healthcare workers result in physical injury, anxiety, depression and stress.[4,9]

Moreover, violence and aggressive behaviors by patients can adversely impact medical institutions in other ways, such as by inducing on-the-job errors, low productivity and increases in healthcare

costs.[10,11] Combined with the current shortages of physicians and nurses in medical institutions in Japan,[12,13] these results indicate that patient-derived nuisance in healthcare settings places a substantial burden on both healthcare workers and their institutions.

Some studies have suggested that violence or aggression by patients influences the intention of nurses to resign.[3,14-16] One study revealed the prevalence of the intention to resign among emergency nurses due to exposure to patient violence.[16] However, to our knowledge, few studies have evaluated what kinds of patient-derived nuisance influence the intention to resign.[14,15] Furthermore, it is unclear whether support within healthcare settings could prevent the resignation of healthcare workers. This lack of information hinders managers and administrators in the establishment of effective strategies to prevent clinical staff resignation in healthcare settings.

Here, we conducted a cross-sectional study to investigate determinants of and protective strategies against resignation by healthcare workers as a result of patient-derived nuisance in medical institutions in Mie Prefecture, Japan.

Methods

Study design and participants

We conducted a cross-sectional survey from August 2010 to October 2012 in Mie Prefecture, Japan. This prefecture has 103 hospitals with 22,924 employees (Figure 1). Of these 103 hospitals, 17 were not registered as members of the Mie Hospital Association. Since the association is a public utility, we aimed to consider the internal validity of the study by excluding these 17 hospitals from the study. As a result, 86 association member hospitals with 19,802 full-time employees were included (86.4%). Among these, 57 member hospitals with 15,515 employees consented to participate (67.7%). A simple random sampling was performed of all employees who worked in the 57 hospitals based on our sample size estimation. The employees included physicians, nurses, administrators, pharmacists, radiologists, laboratory technicians, physical therapists, and other healthcare workers. Finally, 775 sample employees were provided with questionnaires via the participating hospitals. Those who agreed to participate in the study completed the questionnaires anonymously and returned them by post. Additional data were collected from the participating hospitals. Exclusion criteria were hospital or employee refusal to cooperate; and failure by a participant to answer almost all questions including sex and age.

Ethical considerations

This study was approved by the Ethics Committee of the Medical Department of Mie University

(approval number: 1145). Written informed consent was obtained from all institutions. Employees who returned the anonymous questionnaires were regarded as having provided consent to the study. The study was conducted in accordance with the Helsinki Declaration.

Definition of nuisance

In accordance with the Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health,[17,18] we defined workplace violence as "violent acts (including physical assaults and threats of assaults) directed toward persons at work or on duty" and considered it to be a nuisance by patients. In addition, we included disruptive behavior, undue complaints and delayed or non-payment of charges as nuisance behaviors towards healthcare workers (Appendix 1), on the basis that aggression such as property damage or complaints had a psychological impact on healthcare workers.[7] A comprehensive definition of nuisance behaviors contains the following concepts: "violation of hospital rules", "demands for an unwarranted apology", "property destruction", etc. In the questionnaire we asked "Have you experienced any nuisance such as disruptive behavior, undue complaints, violent acts and delayed or non-payment of charges from patients in the past three years?"

Questionnaire

A self-administered questionnaire was distributed to assess participant characteristics and

determinants of intention to resign, namely sex, age (20-29, 30-39, 40-49, 50-59), occupation (physician, nurse, administrator, pharmacist, radiologist, laboratory technician, physical therapist, other healthcare worker), years of experience (less than 5 years, 5-9 years, 10-14 years, 15-19 years, over 20 years), education (high school, technical colleges, college, university or higher), history of receiving any nuisance from patients in the past three years, detailed description of the nuisance if any, and the presence of an intention to resign as a result of the nuisance. From the participating hospitals, we additionally obtained information on the presence of human support or a support function within the medical institution aimed at helping affected staff cope with nuisance. In the questionnaire we asked "Do you have a human support (lawyer or dedicated staff) or a support function within the medical institution aimed at helping affected staff cope with nuisance?"

Sample size estimation

Arimatsu et al. reported that 24.1% of physicians had experienced verbal violence from patients or clients at least once in the last 6 months.[6] Another study showed that 39% of family physicians had experienced at least 1 incident of severe abuse.[19] A study from the U.S found that one-third of emergency nurses had considered leaving their emergency department or emergency nursing because of violence.[16] Assuming that 40% of the study population had experienced exposure to any nuisance by patients and that 25% of those workers intended to resign as a result, then 10% of the population might intend to resign from their jobs. Since logistic regression analysis requires ten events per

variable[20] and we considered adjusting for five confounders in the logistic regression models, analysis required at least 50 outcomes or 500 subjects. Assuming that the participation rate was two-thirds of the population, a total of 750 participants was required for the study, which was equivalent to approximately 4% of the target population. In summary, with reference to the anticipated participation rates and results of previous studies, which reported violence/nuisance in 25% to 40%, we finally proposed 775 participants as the required sample size.

Statistical analysis

We first described participant characteristics, including sex, age, occupation, years of experience, education and nuisances, using appropriate summary statistics. Second, we then investigated the distribution of characteristics by each nuisance behavior. Third, to examine the association between nuisance behaviors and intention to resign among exposed staff, we performed logistic regression analysis with intention to resign as the dependent variable, and estimated odds ratio (OR) for intention to resign and 95% confidence interval (CI) using three models: Model 1, crude; Model 2, adjusted for sex and age (20-29, 30-39, 40-49, 50-59); and Model 3, adjusted for Model 2 and occupation (physician, nurse, administrator, others), years of experience (less than 10 years, 10-19 years, over 20 years) and education (university or higher, or others). In Model 3, we combined categories of variables for “occupation”, “years of experience” and “education” to decrease degrees of freedom. In all models, each of the following behaviors was used as an independent variable:

"violation of a hospital rule", "unnecessarily prolonged correspondence", "disturbance of medical examination", "disruptive behavior toward other patients", "undue complaint related to a medical procedure", "demand for an unwarranted apology", "demand for money", "property destruction", "physical violence", "sexual harassment", "mental abuse", and "delayed or non-payment of charges". Finally, to examine the association between intention to resign and institutional support, logistic regression analysis (fixed effects model) with intention to resign as the dependent variable was performed as with the previous models. Furthermore, we conducted a multilevel logistic regression analysis (random effects model) on the hospital staff nested within 57 hospitals in consideration of the cluster characteristics. To investigate the variation between clusters by comparing two persons from two randomly chosen, different clusters, median odds ratio (MOR) was estimated.[21] The measure of MOR is always equal to or greater than 1. If the MOR is 1, there is no variation between clusters (no second-level variation).[21] For missing data, available-case analysis was conducted. All *P* values were two-sided at a significance level of 5%. All statistical analyses were performed using SPSS v.21 (SPSS Inc, Chicago, Ill., USA).

Results

Participant characteristics

Among the 86 member hospitals of the Mie Hospital Association (including 19,802 employees), 57 hospitals (15,515 employees) consented to participate in the study (Figure 1), giving a participation rate of 55.3% for the target hospitals and 67.7% for the target population. The survey was conducted in 775 employees randomly selected from these 15,515 employees, of whom 772 (99.7%) responded to the questionnaire. Of the respondents, 250 (32.4%) were male and 552 were female (67.6%) (Table 1), and the largest percentage was aged 40-49 years (31.7%). By occupation, 55.1% were nurses, 13.1% were physicians, and 10.9% were administrators. Most participants (44.9%) had more than 20 years' work experience. For education, 417 participants (54.0%) had graduated from technical colleges and 230 from university or higher (29.8%).

Proportion and details of nuisances

The distribution of participant characteristics by nuisance type is shown in Table 2. A total of 480 participants (62.2%) answered that they encountered some nuisance by patients. Although various types of nuisances were reported, most cases were categorized as "mental abuse" (81.5%), "violation of a hospital rule" (75.4%), "undue complaint related to a medical procedure" (74.8%) and "unnecessarily prolonged correspondence" (66.7%). In contrast, fewer participants reported experiencing violent acts such as "physical violence" (50.0%) and "property destruction" (33.5%).

The proportion exposed to sexual harassment was estimated as 46.3%. Females, those aged 40-49 years and nurses had greater exposure to nuisances, albeit that there was no large difference in distribution of characteristics by individual nuisance behaviors.

Prevalence of intention to resign and determinants of intention to resign

Among those who experienced patient-derived nuisance, 132 participants (27.5%) considered resignation as a result, giving an estimated prevalence of 17.1% [95%CI: 14.4 to 19.8%] of all respondents. Crude analysis showed that participant characteristics including female sex, age 30-39 years (vs. ≥50 years), nurses (vs. physician) and those with 15-19 years of work experience (vs. less than 5 years of work experience) had higher odds ratio of considering resignation than the reference groups, with odds ratios of 2.84 [95%CI: 1.67 to 4.81], 2.30 [95%CI: 1.28 to 4.15], 2.40 [95%CI: 1.16 to 4.95] and 3.03 [95%CI: 1.16 to 7.89], respectively (Appendix 2). In contrast, education was not associated with intention to resign.

We found significant associations between almost all kinds of non-physical nuisance and intention to resign (Table 3). Moreover, these associations remained after adjustment for sex, age and other confounding factors. In particular, "demand for an unwarranted apology" (OR: 2.57 [95% CI: 1.61 to 4.12]), "violation of a hospital rule" (OR: 2.25 [95% CI: 1.23 to 4.13]) and "unnecessarily prolonged correspondence" (OR: 2.03 [95% CI: 1.22 to 3.37]) had higher odds ratios of considering resignation

than other kinds of nuisance. In contrast, violent acts were not associated with intention to resign except for "property destruction".

Protective strategies for resignation

The questionnaire for medical institutions showed that 13 (22.8%) of 57 participating hospitals had a manual to cope with patient nuisance, while 20 (35.0%) had staff members or a division within the institution who could be consulted in case of nuisance.

We conducted further analysis of the association between support by the institution and intention to resign to identify protective strategies for resignation (Table 4). The crude OR of human support was estimated as 0.46 [95% CI: 0.29 to 0.72]. After adjustment for confounding factors, the associations remained and the adjusted OR was 0.49 [95% CI: 0.30 to 0.79]. Similarly, multilevel analysis was performed but the result was not different from those of the other fixed-effects models; the adjusted OR was 0.49 [95% CI: 0.28 to 0.86]. The MORs were nearly equal to 1 even for the null model (MOR = 1.38, 1.09, respectively).

Discussion

We conducted a cross-sectional study to investigate determinants of the resignation of healthcare workers resulting from patient-derived nuisance in medical institutions in Mie Prefecture, Japan. Associations were observed between almost all kinds of patient-derived psychological nuisance and the intention of healthcare workers to resign, even after adjustment for confounding factors. Furthermore, we found that medical institutions with human support or divisions had a significantly lower odds ratio of intention to resign. This study provides meaningful information on occupational safety and health in healthcare settings.

Several studies have identified risks and risk factors associated with exposure to patient-derived physical or mental violence, complaints or sexual harassment in healthcare settings. The prevalence or incidence of exposure to patient-derived nuisance was estimated to range from 2.1% (physical violence) to 45.8% (verbal violence) or 0.20×10^{-3} per practice hour (work-related aggression and violence) in Japan.[6-8,22,23] Sato et al. estimated that the proportion of nurses exposed to physical or mental aggressive behaviors was approximately 22% to 34%.[22] Fujita et al reported that 36.4% of healthcare staff experienced workplace violence by patients.[8] Wada et al. reported that 45.8% of medical staff experienced verbal violence by patients.[23] Moreover, a US study reported that 25% of emergency nurses had been subjected to physical violence from patients at work more than 20 times in the past three years.[16] In China, 71.9% of nurse respondents experienced non-physical violence.[2]

Similarly, worker characteristics such as female sex, young age or nurse had higher risk of exposure to nuisance.[2,4,6-8,24] These previous results are consistent with our findings, and indicate that healthcare workers are at increasing risk for mental health problems such as anxiety, depression and stress, or intention to resign.[3,4,7-9,14-16,23]

The intention of medical workers to resign was significantly associated with patient-derived nuisance, particularly "demand for an unwarranted apology", "unnecessarily prolonged correspondence" and "violation of a hospital rule". On the other hand, no association was seen for physical violence or sexual harassment, which are commonly considered to be major acts of infringement, although a study reported that violence or harassment from patients was associated with a 1.32 [95%CI: 1.17 to 1.50] or 1.51 [95%CI: 1.33 to 1.71] times higher risk of intention to leave.[15] A possible explanation for these findings is that the significant factors in our study are considered to confer greater psychological stress on healthcare workers than other kinds of nuisance, and that these factors might therefore be strongly associated with the intention of medical workers to resign. Another explanation is that medical workers who had in fact experienced physical violence might not be reflected in the results - these workers likely left their jobs immediately due to the strong physical and mental stress. In any case, these results suggest that we need to deal with both non-physical as well as physical violence to prevent healthcare works from considering resigning.

We found that the presence of human or institutional support by medical institutions was associated with a significantly lower odds ratio of intention to resign. Schat et al and Gillespie et al reported that support from co-workers and managers reduced negative physical and psychological attitudes towards work.[4,25] The present and previous results indicate that human support or an established section or division to deal with nuisance within the medical institution could relieve healthcare workers of their psychological burden and dissuade them from an intention to resign. Furthermore, a case study showed that legal support in medical institutions decreased complaints from patients and alleviated their economic burden.[26] A resident lawyer in a medical institution or alternative dispute resolution mechanism might be a useful aide in promoting occupational health and management in healthcare settings.

Several limitations of this study warrant mention. First, it was conducted under a cross-sectional design, and a follow-up survey is accordingly required to draw causal conclusions. Second, we excluded hospitals which were not registered members of the Mie Hospital Association, which might limit generalization. Third, the response rate was not particularly high (at most 67.7%) and may have introduced selection bias into the results as the employees who considered resignation may have been less likely to participate in the survey. Moreover, we might have underestimated the prevalence of intention to resign because some healthcare workers would likely leave their jobs immediately after a nuisance event due to strong stress. Fourth, we performed available-case analysis as missing

data were found in the questionnaire, possibly due to reporting bias; this might have resulted in the under- or overestimation of the results even if the number of missing values was small. Finally, we did not include other preventive strategies or possible risk factors such as self-defence, hours worked, marital status or workplace in this study,[4] which might have led to the presence of residual confounding.

Conclusions

We found that the estimated prevalence of intention to resign as a result of patient-derived nuisance was 17.1% [95%CI: 14.4 to 19.8%] in total respondents. In particular, non-physical nuisance was significantly associated with the intention of healthcare workers to resign. Moreover, human support by the medical institution was associated with a significantly lower odds ratio of an intention to resign, even after adjustment for confounding factors. These present and previous results indicate that human support, an established section or division to deal with nuisance within the medical institution, and legal support can relieve healthcare workers of the psychological burden of nuisance and dissuade them from the intention to resign. This study provides important information for managers and administrators involved in occupational safety and health in healthcare settings.

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Statement of authorship

YK and SS conceived and designed the study; MH and KU helped to collect the data; TY1 and TY2 checked the data; TY1 and TY2 analysed the data; YK wrote the manuscript; TY1 contributed to the initial revision of the manuscript; KT and SS contributed to the critical revision of the manuscript; YK had primary responsibility for final content. All authors read and approved the final manuscript.

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Figure legend

Figure 1. A flowchart of participants in the study.

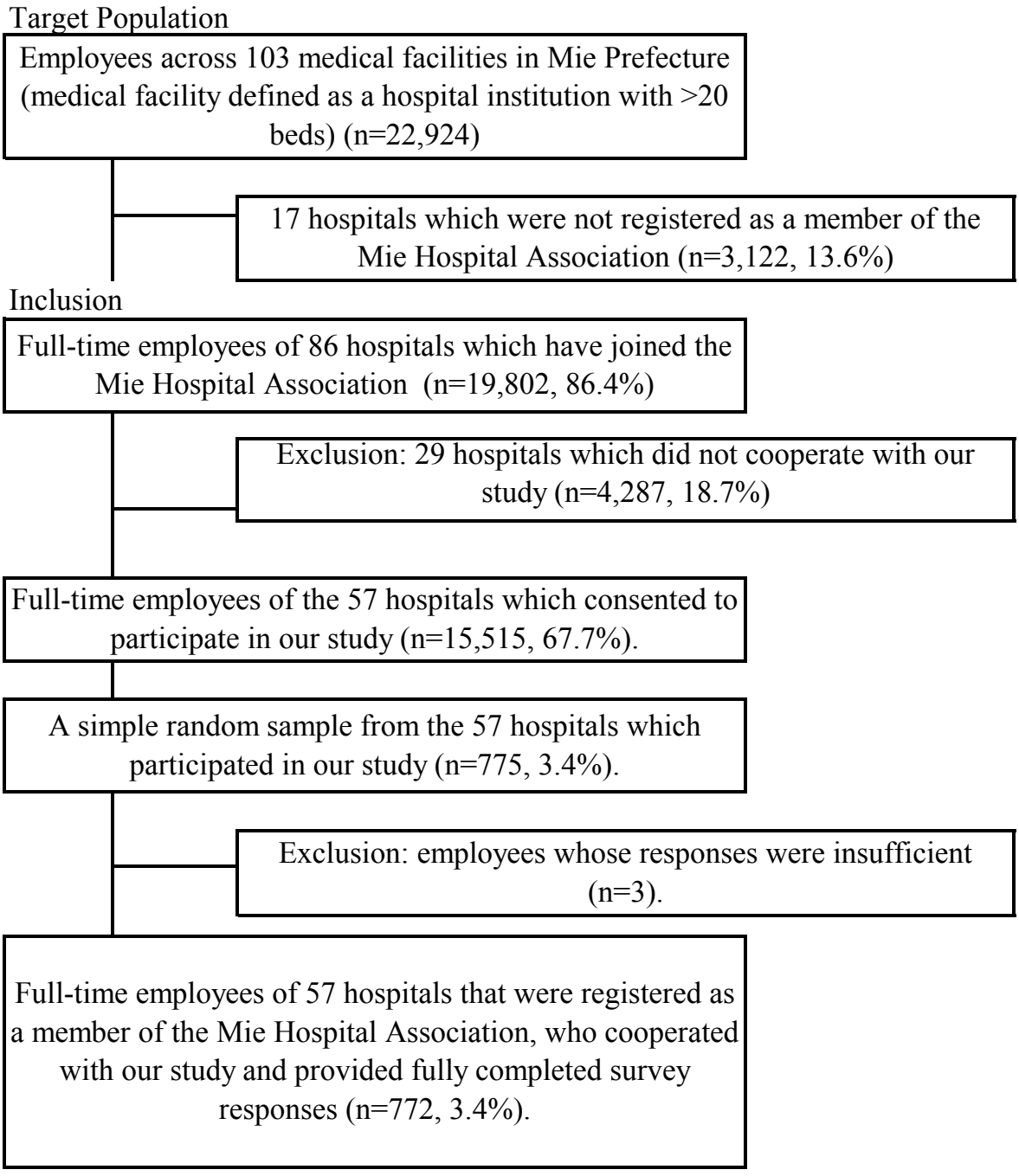
Target Population
Employees across 103 medical facilities in Mie Prefecture (medical facility defined as a hospital institution with >20 beds) (n=22,924)
17 hospitals which were not registered as a member of the Mie Hospital Association (n=3,122, 13.6%)
Inclusion
Full-time employees of 86 hospitals which have joined the Mie Hospital Association (n=19,802, 86.4%)
Exclusion: 29 hospitals which did not cooperate with our study (n=4,287, 18.7%)
Full-time employees of the 57 hospitals which consented to participate in our study (n=15,515, 67.7%).
A simple random sample from the 57 hospitals which participated in our study (n=775, 3.4%).
Exclusion: employees whose responses were insufficient (n=3).
Full-time employees of 57 hospitals that were registered as a member of the Mie Hospital Association, who cooperated with our study and provided fully completed survey responses (n=772, 3.4%).

Table 1. Participant characteristics

Characteristic		Number (Total=772)	%
Sex			
	Male	250	32.4
	Female	522	67.6
Age			
	<30	77	10.0
	30-39	225	29.1
	40-49	245	31.7
	≥50	225	29.1
Occupation			
	Physician	101	13.1
	Nurse	425	55.1
	Administrator	84	10.9
	Pharmacist	24	3.1
	Radiologist	27	3.5
	Laboratory technician	21	2.7
	Physical therapist	23	3.0
	Other healthcare worker	67	8.7
Years of experience			
	Less than 5 years	87	11.3
	5-9 years	103	13.3
	10-14 years	126	16.3
	15-19 years	107	13.9
	Over 20 years	347	44.9
	Missing value	2	0.3
Education			
	High school	50	6.5
	Technical college	417	54.0
	College	74	9.6
	University or higher	230	29.8
	Missing value	1	0.1

Table 2. Distribution of participant characteristics by nuisance behavior

			Occupation					Sex			Age				
			Physician	Nurse	Clerk	Others	Missing	Male	Female	Missing	<30	30-39	40-49	50≦	Missing
		n=480	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Disruptive behavior	Violation of a hospital rule	362	42 (11.6)	239 (66.0)	46 (12.7)	33 (9.1)	2 (0.6)	99 (27.3)	262 (72.4)	1 (0.3)	29 (8.0)	107 (29.6)	140 (38.7)	85 (23.5)	1 (0.3)
	Unnecessary prolonged correspondence	320	41 (12.8)	195 (60.9)	50 (15.6)	32 (10.0)	2 (0.6)	94 (29.4)	226 (70.6)	0 (0.0)	23 (7.2)	80 (25.0)	120 (37.5)	97 (30.3)	0
	Disturbance of medical examination	282	40 (14.2)	185 (65.6)	28 (9.9)	27 (9.6)	2 (0.7)	81 (28.7)	201 (71.3)	0 (0.0)	24 (8.5)	88 (31.2)	103 (36.5)	66 (23.4)	1 (0.4)
	Disruptive behavior toward other patients	234	22 (9.4)	172 (73.5)	22 (9.4)	16 (6.8)	2 (0.9)	59 (25.2)	174 (74.4)	1 (0.4)	16 (6.8)	72 (30.8)	88 (37.6)	57 (24.4)	1 (0.4)
Undue complaint	Undue claim related to a medical procedure	359	50 (13.9)	230 (64.1)	44 (12.3)	33 (9.2)	2 (0.6)	101 (28.1)	256 (71.3)	2 (0.6)	30 (8.4)	100 (27.9)	132 (36.8)	96 (26.7)	1 (0.4)
	Demand for an unwarranted apology	238	34 (14.3)	140 (58.8)	39 (16.4)	24 (10.1)	1 (0.4)	82 (34.5)	156 (65.5)	0	14 (5.9)	54 (22.7)	92 (38.7)	78 (32.8)	0
	Demand for money	190	23 (12.1)	111 (58.4)	38 (20.0)	15 (7.9)	3 (1.6)	60 (31.6)	128 (67.4)	2 (1.1)	14 (7.4)	44 (23.2)	69 (36.3)	62 (32.6)	1 (0.5)
Violent acts	Property destruction	161	18 (11.2)	111 (68.9)	17 (10.6)	14 (8.7)	1 (0.6)	46 (28.6)	115 (71.4)	0	10 (6.2)	45 (28.0)	62 (38.5)	44 (27.3)	0
	Physical violence	240	23 (9.6)	171 (71.3)	23 (9.6)	22 (9.2)	1 (0.4)	64 (26.7)	176 (73.3)	0	24 (10.0)	77 (32.1)	87 (36.9)	52 (21.7)	0
	Sexual harassment	222	16 (7.2)	159 (71.6)	22 (9.9)	23 (10.4)	2 (0.9)	47 (21.2)	174 (78.4)	1 (0.5)	21 (9.5)	70 (31.5)	82 (36.9)	48 (21.6)	1 (0.5)
	Mental abuse	391	51 (13.0)	247 (63.2)	49 (12.5)	42 (10.7)	2 (0.9)	110 (28.1)	280 (71.6)	1 (0.3)	31 (7.9)	106 (27.1)	145 (37.1)	109 (27.9)	0
Delayed or non-payment etc	protest over charges, delayed payment or incomplete or non-recovery	217	28 (12.9)	130 (59.9)	44 (20.3)	15 (6.9)	0	65 (30.0)	151 (69.6)	1 (0.5)	16 (7.4)	61 (28.1)	83 (38.2)	57 (26.3)	0

Table 3. Association between intention to resign and nuisance behavior among hospital staff who experienced patient-derived nuisance

	Determinant		Intention to resign, n (%)		Crude		Sex-, age-adjusted		Multivariable-adjusted*	
			Yes	No	OR	95%CI	OR	95%CI	OR	95%CI
Disruptive behavior	Violation of a hospital rule	Yes	108(31.2)	238(68.8)	2.43	1.38-4.28	2.27	1.28-4.01	2.25	1.23-4.13
		No	17(15.7)	91(84.3)	1.00	ref	1.00	ref	1.00	ref
	Unnecessarily prolonged correspondence	Yes	96(31.4)	210(68.6)	1.89	1.18-3.03	2.19	1.34-3.58	2.03	1.22-3.37
		No	29(19.5)	120(80.5)	1.00	ref	1.00	ref	1.00	ref
	Disturbance of medical examination	Yes	83(30.9)	186(69.1)	1.55	1.00-2.38	1.46	0.93-2.29	1.38	0.87-2.20
		No	41(22.4)	142(77.6)	1.00	ref	1.00	ref	1.00	ref
	Disruptive behavior toward other patients	Yes	77(34.5)	146(65.5)	2.05	1.36-3.14	1.94	1.25-2.99	1.92	1.22-3.03
		No	47(20.4)	183(79.6)	1.00	ref	1.00	ref	1.00	ref
Undue complaint	Undue complaint related to a medical procedure	Yes	104(30.0)	243(70.0)	1.79	1.06-3.04	1.82	1.06-3.13	1.87	1.06-3.29
		No	21(19.3)	88(80.7)	1.00	ref	1.00	ref	1.00	ref
	Demand for an unwarranted apology	Yes	77(33.6)	152(66.4)	1.88	1.23-2.86	2.37	1.52-3.71	2.57	1.61-4.12
		No	48(21.2)	178(78.8)	1.00	ref	1.00	ref	1.00	ref
	Demand for money	Yes	62(34.1)	120(65.9)	1.72	1.14-2.61	2.04	1.32-3.17	2.05	1.29-3.26
		No	63(23.1)	210(76.9)	1.00	ref	1.00	ref	1.00	ref
Violent act	Property destruction	Yes	55(35.7)	99(64.3)	1.84	1.20-2.81	1.92	1.23-2.98	1.91	1.21-3.01
		No	69(23.2)	228(76.8)	1.00	ref	1.00	ref	1.00	ref
	Physical violence	Yes	74(32.0)	157(68.0)	1.59	1.05-2.42	1.45	0.94-2.23	1.35	0.86-2.13

		No	50(22.8)	169(77.2)	1.00	ref	1.00	ref	1.00	ref
	Sexual harassment	Yes	73(33.6)	144(66.4)	1.78	1.18-2.71	1.50	0.97-2.31	1.49	0.95-2.33
		No	52(22.1)	183(77.9)	1.00	ref	1.00	ref	1.00	ref
	Mental abuse	Yes	109(28.9)	268(71.1)	1.68	0.92-3.08	1.75	0.94-3.26	1.59	0.84-3.01
		No	15(19.5)	62(80.5)	1.00	ref	1.00	ref	1.00	ref
Delayed or non-payment etc	protest over charges, delayed payment or incomplete or non-recovery	Yes	66(31.7)	142(68.3)	1.48	0.97-2.25	1.54	0.99-2.37	1.56	0.98-2.48
		No	56(23.9)	178(76.1)	1.00	ref	1.00	ref	1.00	ref

OR = Odds Ratio; CI = Confidence Interval; ref = reference.

* Adjusted for sex, age, occupation, years of experience and education.

Table 4. Association between intention to resign and availability of support in healthcare settings among hospital staff who experienced patient-derived nuisance

	Intention to resign, n (%)		Null		Crude		Sex-, Age-adjusted		Multivariable-adjusted*		Multivariable-adjusted†	
Protective factor	Yes	No	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Fixed effects												
Human support (Yes)	39(18.7)	170(81.3)	NA		0.46	0.29-0.72	0.51	0.32-0.82	0.49	0.30-0.79	0.49	0.28-0.86
(No)	69(33.3)	138(66.7)	NA		1.00 (ref)		1.00 (ref)		1.00 (ref)		1.00 (ref)	
Random effects												
Variance			0.116		NA		NA		NA		0.0085	
Standard error			0.099		NA		NA		NA		0.078	
MOR			1.38								1.09	

CI = Confidence Interval; MOR = Median Odds Ratio; NA = Not applicable; OR = Odds Ratio; ref = reference.

* Adjusted for sex, age, occupation, years of experience and education.

† Multilevel analysis was performed on the hospital staff nested within 57 hospitals.

Appendix 1. Definition of nuisance

Workplace violence ranges from offensive or threatening language to homicide. The National Institute for Occupational Safety and Health (NIOSH) defines workplace violence as violent acts (including physical assault and threats of assault) directed towards persons at work or on duty.[1]

Examples of violence include the following:
Threats: Expressions of intent to cause harm, including verbal threats, threatening body language, and written threats.
Physical assaults: Attacks ranging from slapping and beating to rape, homicide, and the use of weapons such as firearms, bombs, or knives.
Muggings: Aggravated assaults, usually conducted by surprise and with intent to rob.

Referring to a previous study,[2] we defined the following behaviors by patients as nuisances in this study:
Disruptive behavior: "violation of hospital rules", "unnecessarily prolonged correspondence", "disturbance of medical examinations" and "disruptive behavior toward other patients".
Undue complaint: "undue complaints related to a medical procedure", "demands for an unwarranted apology" and "demand for money".
Violent acts: "property destruction", "physical violence", "sexual harassment" and "mental abuse".
Delayed or non-payment of charges: "protest over charges, delayed payment or incomplete or non-recovery".

Appendix 2. Crude analysis of the association between participants' characteristics and intention to resign among those who experienced some nuisances

Characteristics		Intention to resign			
		Yes, n	No, n	Odds Ratio	95%CI
Sex					
	Female	106	215	2.84	1.67-4.81
	Male	20	115	1.00 (ref)	
Age					
	<30	12	26	2.10	0.92-4.79
	30-39	43	85	2.30	1.28-4.15
	40-49	49	120	1.86	1.05-3.28
	50≦	22	100	1.00 (ref)	
Occupation					
	Physician	95	190	1.00(ref)	
	Nurse	10	48	2.40	1.16-4.95
	Administrator	8	53	1.44	0.56-3.68
	Other	12	40	0.73	0.26-1.99
Years of experience					
	Less than 5 years	7	34	1.00(ref)	
	5-9 years	18	37	2.36	0.88-6.36
	10-14 years	21	55	1.56	0.71-4.83
	15-19 years	25	40	3.03	1.16-7.89
	Over 20 years	54	163	1.61	0.67-3.84
Education					
	High school	8	22	1.00(ref)	
	Technical colleges	85	177	1.32	0.57-3.09
	College	13	31	1.15	0.41-3.25
	University or higher	20	101	0.54	0.21-1.40

CI = Confidence Interval; ref = reference.

Reference

1. (NIOSH) TNIfOSaH. Violence Occupational Hazards in Hospitals. 2002; http://www.cdc.gov/niosh/docs/2002-101/default.html. Accessed 07/21, 2015.
2. Saeki K, Okamoto N, Tomioka K, et al. Work-related aggression and violence committed by patients and its psychological influence on doctors. *J Occup Health.* 2011;53(5):356-364.