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PSYCHOLOGICAL FACTORS IN NURSING VIOLATIONS
BY STUDENTS OF A NURSING SCHOOL AND RISK MANAGERS
IN A HOSPITAL

YUKO ADACHI*, ETSUKO NAKAGAMI-YAMAGUCHI**,
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Abstract

We examined the manner in which four factors that contribute to violations in nursing affect intention to violate rules, risk perception, and benefit perception. The four factors were risks derived from violations, violation benefits (i.e., saving time and effort), time pressure, and social pressure from other medical staff. We submitted this questionnaire to nursing school students and risk managers (RMs) in a hospital. We found that student nurses' intention to violate rules was affected by violation risks, while RM nurse's intention was affected by violation risks and benefits. Both nursing students and RM nurses estimated risks solely on the basis of risks derived from violations. In contrast, nursing students estimated benefits based on risks derived from violations, and RM nurses estimated benefits based on risk of violation, benefits of violation, and time pressure. Risks were only estimated on the basis of risks derived from violations; however, the greater the subjects' field experience, the greater the number of factors that affected their perceptions of benefits. Benefit perceptions therefore led to differences in intention to violate rules between subject groups. In the interests of medical safety, both risks and benefits of violation should be reduced.

Key words: violation, nursing, risk perception, benefit perception

1. Introduction

1.1. Medical Accidents and Violations

Unsafe human behavior has often been found to underlie medical accidents (e.g., Reason, 1993). Various professions are involved in medicine; however, nursing is the most populous profession among them, constituting approximately 30% of all healthcare workers (National Institute of Population and Social Security Research, 2013); in addition, the behavior of nurses is considered to play an important role in medical safety due to nurses' numerous opportunities to establish and maintain direct contact with patients.

Violations are one aspect of unsafe behavior, and even in nursing services, there are reports of violations such as touching patients and contaminated objects without wearing gloves, placing unsanitary objects in sanitary locations, and failure to wash hands properly (Adachi, Usui, Shinohara, Matsumoto, Aoki, 2007). Although it is commonly thought that "there should be no violations" and "even when there are, they are only committed by some people," violations are by no means rare. The Center for Disease Control and Prevention in the U.S. has reported an overall average hand hygiene compliance rate of 40% (Boyce & Pittet, 2002). In a study conducted in a Japanese hospital, the average hand hygiene compliance rate was reported to be approximately 40–60% (Osuka, 2005). These types of minor violation can be performed by anyone, and whether or not they will lead to an accident is a matter of probability, as noted in Heinrich's Law and the Swiss cheese model (Reason, 1993). Therefore, in order to prevent violations and accidents, it is important to elucidate the mechanisms by which violations occur rather than assume that there are no violations.

1.2. Factors Contributing to Violations

A violation has been defined as "deliberating departures from rules" (Lawton, 1998) and overlaps with risk-taking behavior, which is described as "daring to perform an act knowing that it is dangerous" (Haga, Akatsuka, Kusukami, Kon-no, 1994). Although various factors contribute to violations, studies examining risk-taking behavior have suggested some factors that contribute to violation.

Matsuo (2006) showed that, in memory decision tasks in which a hint related to the task was available for viewing before participants made decisions, risk-taking behavior involved in making a decision without looking at the hint increased when there was no fine paid for making the wrong decision (low objective risk), relative to that observed when a fine was paid (large objective risk); however, this was conditional and only occurred when participants had low confidence in memory. With a similar memory task, Matsuo (2003) conducted a study that manipulated the delay in display time between clicking a help button to receive a hint and display of the hint. The Results showed that, when the delay in display time was long (large objective benefit), risk-taking behavior involved in making a decision without looking at the hint increased

relative to that observed when the delay in display was short (small objective benefit). In a study involving computer tasks requiring confirmation for each trial, Wada, Usui, Shinohara, Kanda, Nakamura, and Tachikake (2007) showed that, when there was a long delay in display time (large objective benefit) until the confirmation screen was shown, violations involving failure to display confirmation increased. These studies showed that, when the objective risk that occurs with daring to act was low and the objective benefit gained from daring to act was large, risk-taking behavior and violations occurred more easily. Based on these findings, we can assume that it is also easy for violations to occur in nursing when the objective risk is low in situations such as those in which there is little danger of infection or few adverse effects on patients and when the objective benefit is large in situations such as those involving saving a great deal of effort.[1]

It has also been noted that there is generally time pressure due to a sense of temporal urgency and excessive workloads in nursing, as well as verbal and nonverbal social pressure from organizations and other people (e.g., Yamauchi & Yamauchi, 2000). Observational surveys have shown that rates of hand hygiene implementation drop due to time pressure (Osuka, 2005). Furthermore, based on the fact that reasons such as "I was pressured by work," "saving time was appealing," "I was told to do so by the doctor," and "I was instructed to do so by a senior nurse" are given for violation in nursing (Adachi et al., 2007), we can assume that time pressure and social pressure are factors that contribute to violation.

1.3. Risk Perception and Benefit Perception

Previous studies on violations and risk-taking behavior suggest that subjective evaluations of the risks and benefits associated with the behavior (hereinafter referred to as risk perception and benefit perception) are both important factors that influence the decision to perform the behavior (e.g., Parsons, Siegel, & Cousins, 1997). In a questionnaire survey specifically addressing unsafe behavior in everyday, driving and walking, estimated risk and intention to violate rules were negatively correlated (Akatsuka, Haga, Kusukami, Inoue, 1998). In a questionnaire survey addressing unsafe behavior in train operation settings, benefit perception and intention were positively correlated (Misawa, Inadomi, Yamaguchi, 2006). Low risk and high benefit perception are contributing to increased intention to violate rules in nursing.

However, while risk and benefit perceptions have both been said to be influenced by surrounding conditions (Tsuchida, 2009), individual variability with regard to risk perception according to age, gender, and race (e.g., Finn & Bragg, 1986; Flynn, Slovic & Mertz, 1994; Harris & Jenkins, 2006) has often been observed; however, little research has been conducted to examine benefit perception (Tsuchida, Itoh, 2003). In other words, there are hardly any studies

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[1] Benefits in medicine include promoted healing, reduced physical burden to patients, and lowered medical expenses; however, in this study, we limited the meaning of objective benefits to local/small/narrow benefits such as nurses' ability to reduce efforts and shorten working time.

investigating the influence of such conditions on risk and benefit perceptions. In order to clarify why violations occur, investigation into the influence of certain conditions on risk and benefit perceptions will be useful.

1.4. Previous Research Involving Nurses

Against this background, Adachi, Usui, and Matsumoto (2010) conducted a questionnaire survey examining violations and targeted nurses. Adachi et al. (2010) addressed the risks associated with violations (objective risk), such as risk of infection; the benefits, such as saving time and effort, gained from a violation (objective benefits); time pressure, including requirements to cope with large numbers of hospitalized patients and nurse calls; and social pressure such as that involved in senior nurses' verbal instructions that promote violation, as factors thought to contribute to violation occurrence and inquired about intention to violate, which describes one's level of intent to commit a violation and perform risk and benefit perceptions. Their findings showed that low objective risk, high objective benefit, and high time pressure were implicated in greater intention to violate. In addition, they showed that high objective risk was involved in heightened risk perception, while low objective risk, large objective benefit, high time pressure, and low levels of social pressure contributed to heightened benefit perception.

Although the influence of factors contributing to violations on intention to violate rules and risk and benefit perceptions has been studied in nurses by Adachi et al. (2010), would the same factors, such as low objective risk, have a similar influence in nursing students and nurses working as risk managers in hospitals (hereinafter referred to as RM nurses)? RM nurses are in positions in which they are responsible for risk management and expected to take a strict stance against violations. Factors that contribute to violations, even among RM nurses, require priority measures. In addition, from the standpoint of leading improvement in nursing[2], understanding these characteristics will be useful in continuing the process of effective violation prevention with the cooperation of practicing nurses. If we can compare different groups involved in nursing, we can better understand the occurrence of violations in nursing, which will be helpful in establishing countermeasures.

1.5. Aims and Hypotheses of This Study

In reference to Adachi et al. (2010), this study investigates the following aims, targeting nursing students in Survey 1 and RM nurses in Survey 2.[3]

Aim 1: To clarify the influence of objective risk, objective benefit, time pressure, and social pressure on intention to violate rules in nursing.

Aim 2: To clarify the influence of objective risk, objective benefit, time pressure, and social

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[2] RM nurses are often responsible for managerial positions and serve as lead or chief nurses.

[3] Surveys 1 and 2 of this study were conducted with the approval of the research ethics review board of the graduate school to which the first author belongs.

pressure on risk and benefit perceptions for violations in nursing.

Although little research has been conducted to investigate the impact of conditions on risk and benefit perceptions, it has been suggested that while specialists make decisions based on probability and logical proof, lay people make decisions based on images, metaphors, and experiences (Siegrist, Keller, & Cousin, 2006). It has been noted that while risk associated with risk-taking behavior can be recalled in great detail, benefits associated with risk-taking behavior only tend to be recalled in a comparatively abstract way. (Moore & Gullone, 1996). Based on this understanding of risk, we can assume that, when one is able to understand the risks associated with a target behavior, it is difficult for risk perception to be influenced by factors other than objective risk. In this study, we worked with violation-associated risks that are widely associated with nursing and could be understood with a basic nursing knowledge, such as strength of infections and invasiveness of procedures. Therefore, we believed that, relative to RM and practicing nurses, risk perception in nursing students, whose level of expertise is low, would only be influenced by objective risk (hypothesis 1).

In contrast, benefit perception is not connected to nurses' expertise, as benefits associated with violations (such as saving time or effort as a result of the violation) are part of subjective perception. Therefore, it is possible that benefit perception is influenced by factors other than objective benefit. It is also possible that, as the level of involvement in nursing increases with accumulated experience and routine engagement in the nursing field, one becomes sensitive to the benefits of reducing working time and effort and is influenced by factors other than objective benefit. Therefore, nursing students' benefit perception will not necessarily be influenced by all of the factors related to violation (hypothesis 2). In contrast, RM nurses' benefit perception is likely influenced by all factors (hypothesis 3).

It is likely that there is a negative correlation between risk perception and intention to violate rules and a positive correlation between benefit perception and intention to violate rules, as previous research on risk-taking behavior and violation has suggested (e.g., Parsons, et al., 1997; hypothesis 4).

2. Survey 1

2.1. Aim

To investigate aims 1 and 2 in nursing students.

2.2. Methods

2.2.1. Participants.　Two hundred nineteen students attending a nursing school in the Kansai region of Japan

2.2.2. Survey Period and Procedures.   From June to July 2009; we used the leaving method. The questionnaires were distributed by class teachers, completed anonymously and voluntarily, placed in a specified box, and collected.

2.2.3. Factorial Design of the Questionnaire.   We included four factors: objective risk, objective benefit, time pressure, and social pressure. The objective risk was "risk of infection," and objective benefits were "potentially shortened working hours or reduced effort resulting from the violation." Time pressure was defined according to "number of hospitalized patients and the existence or absence of nurse calls," and social pressure was defined according to "the existence or absence of senior nurses' verbal instructions that promote the violation." Two levels, large and small for objective benefit and high and low for objective risk, time pressure, and social pressure were configured for each of the four factors.

2.2.4. Questionnaire Form Composition.   After presenting the inside cover that showed time pressure and social pressure configuration (see appendix, inside cover examples 1 and 2), we presented the photograph of the violation being enacted and text describing the circumstances leading to the violation. By changing parts of the story description, we manipulated the factors' high and low or large and small settings (see appendix, example texts 1 and 2, underlined sections a to d). We distributed sketches of a hospital with the questionnaire form and asked participants to look at them as they responded. We asked them to answer the questions concerning intention to violate rules and risk and benefit perceptions based on the photographs and story. The questions were as follows: "Do you think you would perform the action described above," "assuming that you performed the action above, how risky do you think it would be," and "assuming that you performed the action above, how much merit (saved time or reduced effort) do you think there would be to it?" We requested answers on 9-point scales rated as follows: from 0 ("I absolutely do not think so") to 8 ("I absolutely think so"), from 0 ("no risk at all) to 8 ("extremely risky"), or 0 ("not beneficial at all") to 8 ("extremely beneficial").

2.2.5. Violations Used on the Questionnaire.   We prepared six types of violation such as "treating a patient with bare hands, without gloves." The questionnaire used was the same as that used by Adachi et al. (2010). For the convenience of implementation, objective risk was used as a factor within participants, and objective benefit, time pressure, and social pressure were used as factors between participants. Participants responded to 12 scenes (objective risk (2) × violation (6)).

2.3. Results

2.3.1. Valid Responses.   We received valid responses from 73 people (10 men, 63 women, average age 29.61 (*SD* = 8.14, *range*: 19–51)).

2.3.2. Considerations in Analysis.   Although we used six types of violation, as certain violations could not be performed easily in certain situations, we used the mean value of the six types in the analysis.

2.3.3. Influence of Violation-Related Factors on Intention to Violate Rules. In order to investigate aim 1, we performed a four-way analysis of variance with objective risk, objective benefit, time pressure, and social pressure as independent variables and the mean score for intention to violate rules as the dependent variable (Figure 1, Tables 1 and 2). A significant main effect was found for objective risk, with significantly high values in the low objective risk
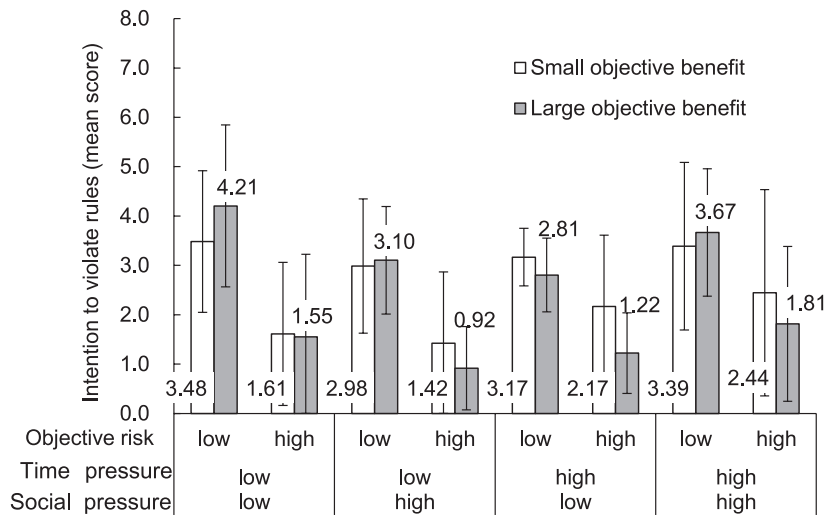

FIGURE 1.
Nursing students' mean scores for intention to violate rules

TABLE 1
Main effect of intention to violate rules in nursing students

	low/small configuration	high/large configuration	p value
A. Objective risk	3.42 (1.41)	1.65 (1.57)	.0000 ***
B. Cbjective benefit	2.56 (1.68)	2.51 (1.79)	.5006 n.s.
C. Time pressure	2.46 (1.82)	2.64 (1.61)	.4959 n.s.
D. Social pressure	2.60 (1.73)	2.47 (1.73)	.8204 n.s.
	(SD)		***p < .001

TABLE 2
Interactions for intention to violate rules in nursing students

	p value		p value		p value
AB	.1586 n.s.	BD	.9617 n.s.	ACD	.6296 n.s.
AC	.1598 n.s.	CD	.0344 *	BCD	.3287 n.s.
AD	.7835 n.s.	ABC	.9687 n.s.	ABCD	.8146 n.s.
BC	.3465 n.s.	ABD	.9349 n.s.		
					*p < .05

configuration (F (1, 130) = 44.53, p < .001). A significant first-order interaction between time pressure and social pressure was found (p < .05), and for a simple main effect in the high social pressure configuration, values were higher with the high time pressure setting relative to the low time pressure setting (p < .05).

2.3.4. Influence of Violation-Related Factors on Risk Perception.　In order to investigate aim 2, a four-way analysis of variance was performed with objective risk, objective benefit, time pressure, and social pressure as independent variables and mean risk perception as the dependent variable (Figure 2, Tables 3 and 4). A significant main effect was found for objective risk, with significantly high values in the high objective risk configuration (F(1, 130) = 58.81, p < .001). No interactions were found.

2.3.5. Influence of Violation-Related Factors on Benefit Perception.　In order to investigate aim 2, we performed four-way analysis of variance with objective risk, objective benefit, time pressure, and social pressure as independent variables, and the mean benefit perception score as the dependent variable (Figure 3, Tables 5 and 6). A significant main effect was found for
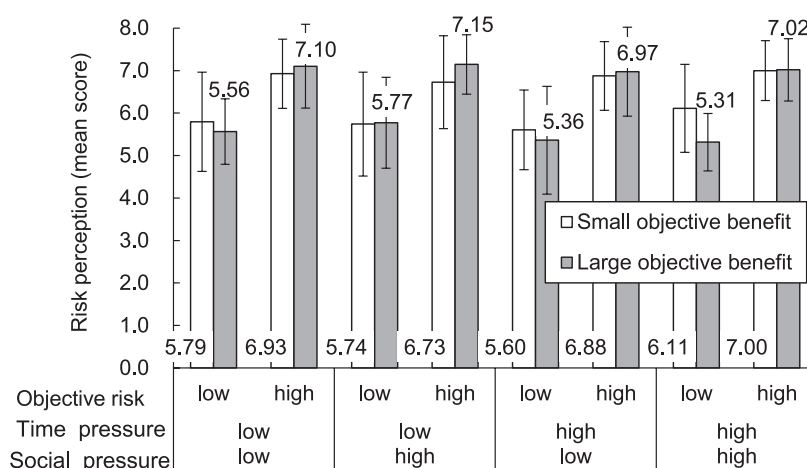

FIGURE 2.
Nursing students' mean score for risk perception

TABLE 3
Main effect of risk perception in nursing students

	low/small configuration	high/large configuration	p value
A. Objective risk	5.67 (1.05)	6.97 (0.89)	.0000 ***
B. Cbjective benefit	6.34 (1.14)	6.29 (1.20)	.7003 *n.s.*
C. Time pressure	6.34 (1.19)	6.29 (1.15)	.7078 *n.s.*
D. Social pressure	6.29 (1.20)	6.34 (1.15)	.6448 *n.s.*
	(*SD*)		****p* < .001

TABLE 4
Interactions for risk perception in nursing students

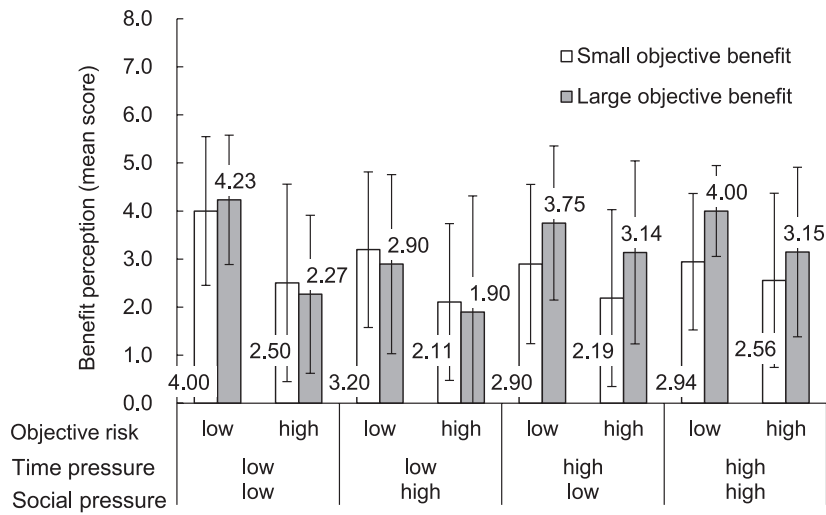|	*p* value		*p* value		*p* value
AB	.1569 *n.s.*	BD	.9227 *n.s.*	ACD	.9869 *n.s.*
AC	.7470 *n.s.*	CD	.6460 *n.s.*	BCD	.4107 *n.s.*
AD	.6615 *n.s.*	ABC	.7932 *n.s.*	ABCD	.7214 *n.s.*
BC	.3375 *n.s.*	ABD	.7378 *n.s.*		

FIGURE 3.
Nursing students' mean score for benefit perception

TABLE 5
Main effect of benefit perception in nursing students

	low/small configuration	high/large configuration	*p* value
A. Objective risk	3.53 (1.60)	2.44 (1.91)	.0011 **
B. Cbjective benefit	2.80 (1.80)	3.17 (1.88)	.2302 *n.s.*
C. Time pressure	2.92 (1.94)	3.06 (1.72)	.5335 *n.s.*
D. Social pressure	3.13 (1.86)	2.84 (1.82)	.3613 *n.s.*
		(*SD*)	**$p < .01$

TABLE 6
Interactions for benefit perception in nursing students

	p value		*p* value		*p* value
AB	.7619 *n.s.*	BD	.7854 *n.s.*	ACD	.5981 *n.s.*
AC	.2224 *n.s.*	CD	.1438 *n.s.*	BCD	.8860 *n.s.*
AD	.5542 *n.s.*	ABC	.9972 *n.s.*	ABCD	.6477 *n.s.*
BC	.1059 *n.s.*	ABD	.9987 *n.s.*		

objective risk, with significantly high values in the low objective configuration ($F(1, 130) =$ 11.07, $p < .01$). No interactions were found.

2.3.6. Correlations Between Variables.   We calculated correlation coefficients for associations between intention to violate rules, risk perception, and benefit perception. A significant negative correlation was found between risk perception and intention to violate rules ($r = -.64$, $p < .001$), and a significant positive correlation was found between benefit perception and intention to violate rules ($r = .57$, $p < .001$). A significant negative correlation was found between risk perception and benefit perception ($r = -.55$, $p < .001$).

2.4. Discussion

2.4.1. Influence of Violation-Related Factors on Intention to Violate Rules.   Results showed that when objective risk was low, the intention to violate rules was high. In the high social pressure configuration, intention to violate rules was high with high time pressure. This indicates that intention to violate rules increased during busy periods when a senior nurse encouraged violation.

2.4.2. Influence of Violation-Related Factors on Risk Perception.   Risk perception was only influenced by objective risk. When objective risk was high, risk perception was also high, which supported hypothesis 1.

2.4.3. Influence of Violation-Related Factors on Benefit Perception.   Benefit perception was only influenced by objective risk. When objective risk was low, benefit perception was high. This supported hypothesis 2, which supposed that nursing students' benefit perceptions are not necessarily influenced by all of the factors that contribute to violations. A negative correlation between risk and benefit perception and a positive correlation between risk perception and intention to violate rules were observed, which supported hypothesis 4.

The result indicating that benefit perception was not influenced by objective benefit can be attributed to the lack of substantial difference between the values of various extents of objective benefit in nursing students. The result demonstrating that benefit perception was influenced by objective risk that was not involved in the original benefit perception was due to an indirect impact. A significant negative correlation was observed between risk and benefit perceptions, and benefit perception was dependent upon relative comparison to risk perception.

3. Survey 2

3.1. Aim

To investigate aims 1 and 2 targeting RM nurses. In Survey 2, one of the factors contributing to violation, social pressure, was changed to the presence or absence of surrounding staff. This was done in anticipation of many cases in which no senior staff member would be with RM nurses, as the nurses held managerial positions. In previous research, in order to facilitate

violations, experimenters were absent and took measures to enable participants to work alone (e.g., Nakasato, Aoyama, 1969; Mullen & Nadler, 2008), and during the experiments, there were more rule violations when attention was not directed toward participants relative to situation in which attention was directed toward them (Burton, 1996). Therefore, we included the presence or absence of surrounding staff, because we believed that having no one around would encourage violation. We predicted that intention to violate rules would be high when there were no other staff members present.

3.2. Methods

3.2.1. Participants.   The participants were 38 RM nurses from a university hospital in the Kansai region in Japan.[4]

3.2.2. Survey Period and Procedures.   The survey was conducted in June 2010 using the leaving method. The questionnaire was distributed during training sessions in the hospital, with anonymous and voluntary responses submitted to a predetermined location and collected.

3.2.3. Factorial Design of the Questionnaire.   In Survey 2, we changed one factor, and the survey was configured with 4 factors: objective risk, objective benefit, time pressure, and the presence of surrounding staff. Objective risk was defined according to "the magnitude of danger extending to the patient's body due to erroneous administration." We changed the content of objective risk because it was difficult to manage "risk of infection" due to the change in violations used in Survey 2 (the reason for this is explained below). We manipulated high and low configuration of objective risk using levels of risk such as those of invasiveness or ease of causing an allergic reaction. There were substantial differences between risk configurations for medical personnel. Determination of these configurations involved staff members from the patient safety management department at the hospital. Objective benefit was the same as it was in Survey 1 and defined according to "possible time savings or reduced effort as a result of the violation." Time pressure was defined according to "dates, staff absences, and number of patients to care for." We changed time pressure in order to create a situation common to all departments, as the hospital in which we conducted survey 2 is a general hospital and has many treatment and diagnosis departments. We changed social pressure to the existence of surrounding staff, defined according to "presence or absence of staff in the immediate surroundings." We created two levels, high and low for objective risk, time pressure, and existence of surrounding staff and large and small for objective benefit, for each of the four factors.

3.2.4. Questionnaire Form Composition.   As in Survey 1, we initially displayed the text for time pressure and surrounding staff configuration, on the inside cover (see appendix, inside cover examples 3 and 4). Subsequent pages contained photographs of the violation and text describing the story leading up to the violation. We manipulated the high and low and large and

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[4]   In the hospital, the chief nurse of each ward was an RM nurse.

small configurations of objective risk and objective benefit, respectively, by changing parts of the story text (see appendix, text examples 3 and 4 and underlined sections a and d). We distributed sketches of a hospital with the questionnaire form and asked participants to look at these as they responded. In addition to the configurations of high time pressure and presence or absence of surrounding staff on the inside cover, we provided content from the story, "Today is busy, and many patients are waiting for care," and "There are numerous other staff members around, caring for patients" or "There are no other staff members around; you are the only person taking care of the patient" (see appendix, text examples 3 and 4, underlined sections b and c). We sought responses to questions concerning intention to violate rules and risk and benefit perceptions using a 9-point scale.

3.2.5. Changes in Violations.   The violations used in the questionnaire were changed. At first, we planned to use the same violations as those used in Survey 1 and Adachi et al.'s (2010) study; however, the rule used therein, "do not use a blood glucose meter twice," has become widespread throughout the country in recent years, changing the implications of the violation. Therefore, based on a survey conducted by the hospital, involving rule compliance rates in 2009, this rule involved an action with a moderate compliance rate, and we selected new violations of rules that have been adapted nationwide. These five types of violation were "looking at a printout or memo and performing a procedure without confirming it with the original (e.g., instructions, prescription, or exam content) on the computer," "placing multiple patients' needles on the same tray," "giving instructions on prescription, dosage, and drug administration without confirming the patient's information via the barcode," "injecting without verifying the barcode," and "providing a prescription without confirming the medication bag with the patient."[5] These five violations were chosen by a group of seven people: three researchers (of which one was a doctor) and four nurses/pharmacists from the hospital's patient safety management department.

   The four factors were used as within-participant factors. Participants responded to 80 scenes, objective risk (2) × objective benefit (2) × time pressure (2) × social pressure (2) × violation (5). To avoid order effect, we prepared eight versions of the questionnaire, which displayed the text and 20 scenes in varying order on the inside cover, and survey participants responded to any one of these.

3.3. Results

3.3.1. Valid Responses.   We received valid responses from 37 people (37 women, average age 50 years (*SD* = 4.74), the average number of years' experience including that gained at other hospitals was 25.62 (*SD* = 7.22), the average number of years of service at the hospital was 27.63

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[5]   Confirmation via computer and barcode verification do not apply to hospitals that have not introduced a hospital information system; however, verification using the originals and confirmation of patient information were nation-wide rules. The act of confirming a medication bag with patients was the hospital's own rule; however, confirming a medication with a patient while they are fully conscious was a nationwide rule.

(SD = 5.30), and the average number of years' experience as an RM was 5.15 (SD = 3.64)). Everyone worked on a hospital ward; however, they did not perform nursing procedures for patients as part of their regular duties.

3.3.2. Considerations in Analysis. As specific violations cannot be measured easily under specific conditions, we used the mean values for the five types of violation in the analysis.

3.3.3. Influence of Violation-Related Factors on Intention to Violate Rules. In order to investigate aim 1, we performed a four-way analysis of variance with objective risk, objective benefit, time pressure, and surrounding staff as independent variables and the mean score for intention to violate rules as the dependent variable (Figure 4, Tables 7 and 8). This showed significant main effects of objective risk and benefit, and values in the low objective risk and large objective benefit configurations were significantly high (F(1, 36) = 26.78, p < .001 ; F(1,36) = 2.90, p < .10, respectively). A significant first-order interaction was observed between objective risk and surrounding staff and objective benefit and surrounding staff (p < .05 and
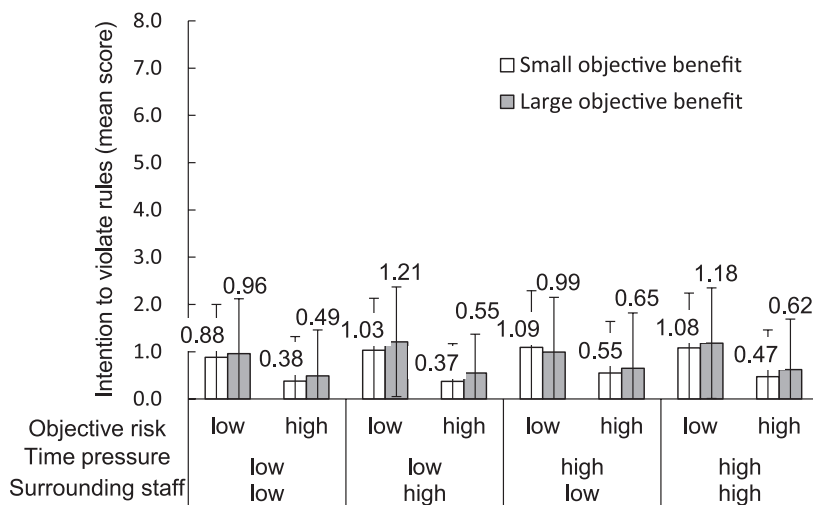

FIGURE 4.
Nurses' mean scores for intention to violate rules

TABLE 7
Main effect of intention to violate rules in RM nurses

	low/small/absent configuration	high/large/present configuration	p value
A. Objective risk	1.05 (1.16)	0.51 (0.99)	.0000 ***
B. Cbjective benefit	0.73 (1.10)	0.83 (1.12)	.0974 †
C. Time pressure	0.73 (1.06)	0.83 (1.16)	.2042 *n.s.*
D. Surrounding staff	0.75 (1.13)	0.81 (1.09)	.2542 *n.s.*
	(SD)	†p < .10, ***p < .001	

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TABLE 8
Interactions for intention to violate rules in RM nurses

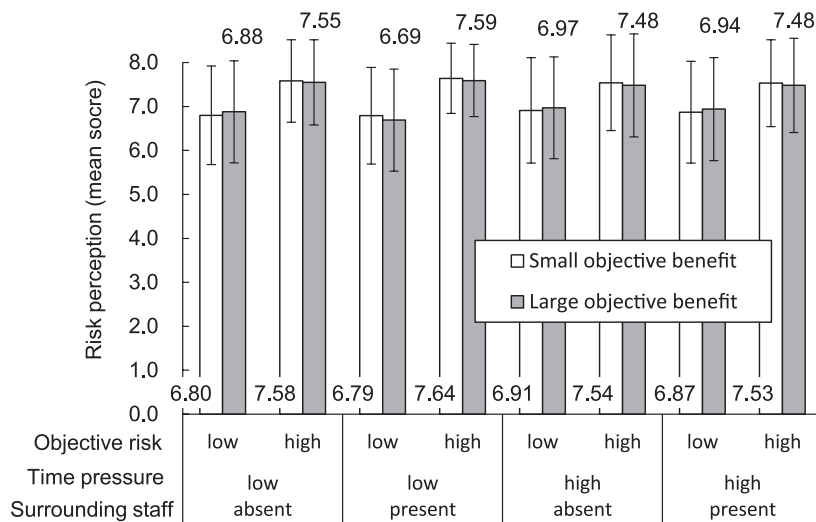|	*p* value		*p* value		*p* value
AB	.3082 *n.s.*	BD	.0683 †	ACD	.8749 *n.s.*
AC	.3170 *n.s.*	CD	.3516 *n.s.*	BCD	.6979 *n.s.*
AD	.0234 *	ABC	.3023 *n.s.*	ABCD	.4377 *n.s.*
BC	.2341 *n.s.*	ABD	.2402 *n.s.*		

†*p* < .10, **p* < .05

FIGURE 5.
RM nurses' mean score for risk perception

p < .10, respectively). Besides results showing similar trends toward main effect content, which included higher values with low, relative to high, objective risk and higher values with large, relative to small, objective benefit, for significant simple main effects in the low objective risk and large objective benefit configurations, there were higher values for presence of surrounding staff than there were for absence of surrounding staff (*p* < .05 and *p* < .10, respectively).

3.3.4. Influence of Violation-Related Factors on Risk Perception. To investigate aim 2, we performed a four-way analysis of variance with objective risk, objective benefit, time pressure, and surrounding staff as independent variables, and mean risk perception score as the dependent variable (Figure 5, Tables 9 and 10). The analysis revealed a significant main effect for objective risk, and values in the high objective risk configuration were significantly high ($F(1, 36) = 28.81$, $p < .001$). Significant first-order interactions were revealed between objective risk and time pressure, and objective risk and surrounding staff ($p < .001$, $p < .05$, respectively), as well as significant second-order interactions between objective risk, time pressure, and surrounding staff

TABLE 9
Main effect of risk perception in RM nurses

	low/small/absent configuration	high/large/present configuration	p value
A. Objective risk	6.86 (1.20)	7.55 (0.88)	.0000 ***
B. Cbjective benefit	7.21 (1.10)	7.20 (1.12)	.6687 n.s.
C. Time pressure	7.19 (1.09)	7.21 (1.13)	.6474 n.s.
D. Surrounding staff	7.21 (1.10)	7.19 (1.12)	.5410 n.s.
		(SD)	***p < .001

TABLE 10
Interactions for risk perception in RM nurses

	p value		p value		p value
AB	.1149 n.s.	BD	.1815 n.s.	ACD	.0916 †
AC	.0001 ***	CD	.9679 n.s.	BCD	.1889 n.s.
AD	.0423 *	ABC	.4248 n.s.	ABCD	.4320 n.s.
BC	.5314 n.s.	ABD	.1837 n.s.		

†p < .10, *p < .05, ***p < .001

($p < .10$). Besides results showing similar trends toward main effect content (higher values in the high, relative to low, objective risk configuration) with respect to significant simple main effects, in the low objective risk configuration, high time pressure simple main effects were observed in the low objective risk and presence of surrounding staff configurations, and high time pressure showed higher values relative to low time pressure ($p < .05$); in low objective risk and time pressure configurations, absence of surrounding staff exhibited higher values relative to presence of surrounding staff ($p < .10$).

3.3.5. Influence of Violation-Related Factors on Benefit Perception. In order to investigate aim 2, we performed a four-way analysis of variance with objective risk, objective benefit, time pressure, and surrounding staff as independent variables and mean benefit evaluation score as the dependent variable (Figure 6, Tables 11 and 12). Results showed a significant main effect for objective risk, objective benefit, and time pressure, and values were significantly higher in low objective risk, large objective benefit, and high time pressure configurations ($F(1, 36) = 11.88$, $p < .01$; $F(1, 36) = 10.85$, $p < .01$; $F(1, 36) = 7.52$, $p < .01$). While analysis showed significant first-order interactions between objective risk and benefit and objective risk and time pressure, values were higher with low, relative to high, subjective risk, and values were higher with large, relative to small, objective benefit, which was the same trend as that observed for the main effect content.

3.3.6. Correlations Between Variables. We calculated correlation coefficients between intention to violate rules and risk and benefit perceptions. We calculated the correlation for each
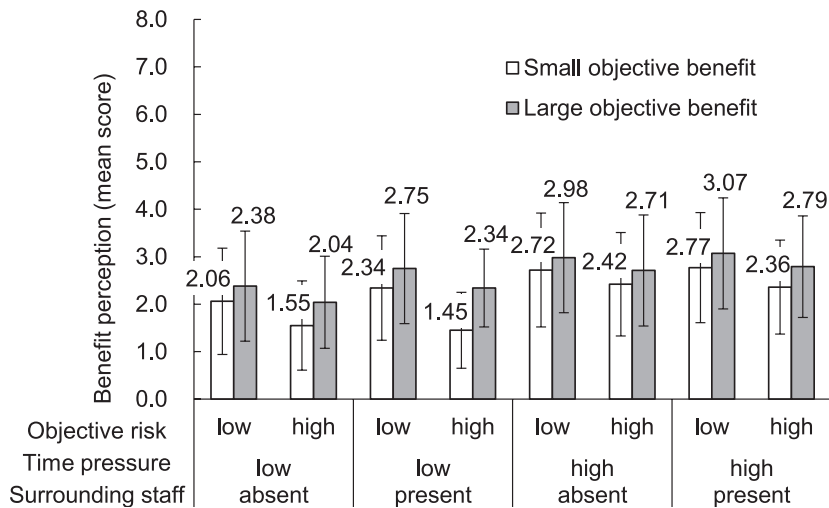
FIGURE 6.
RM nurses' mean score for benefit perception

TABLE 11
Main effect of benefit perception in RM nurses

	low/small/absent configuration	high/large/present configuration	p value
A. Objective risk	2.64 (2.20)	2.21 (2.38)	.0015 ***
B. Cbjective benefit	2.21 (2.11)	2.63 (2.46)	.0022 ***
C. Time pressure	2.11 (2.12)	2.73 (2.43)	.0095 **
D. Surrounding staff	2.36 (2.30)	2.49 (2.30)	.1070 n.s.

(SD) \qquad $**p < .01, ***p < .001$

TABLE 12
Interactions for benefit perception in RM nurses

	p value		p value		p value
AB	.0246 *	BD	.1342 n.s.	ACD	.4242 n.s.
AC	.0766 †	CD	.2872 n.s.	BCD	.3867 n.s.
AD	.1059 n.s.	ABC	.1892 n.s.	ABCD	.4812 n.s.
BC	.1230 n.s.	ABD	.1627 n.s.		

$†p < .10, *p < .05$

of the 16 combinations of configurations involving objective risk (2) × objective benefit (2) × time pressure (2) × surrounding staff (2). In all 16, a significant negative correlation was observed between risk perception and intention to violate rules ($r = -.70$ to $-.92$, $p < .001$ for all). A positive correlation was observed between benefit perception and intention to violate rules, reaching significance in 10 of the combinations ($r = .28$ to $.45$, $p < .10$ to $.01$). A negative

correlation was observed between risk and benefit perceptions, which reached significance in 11 combinations ($r = -.28$ to $-.46$, $p < .10$ to .01).

3.4. Discussion

3.4.1. Effect of Violation-Related Factors on Intention to Violate Rules. The analysis revealed that when objective risk was low or objective benefit was large, intention to violate rules was high. While in Survey 1, scores for intention to violate rules were 0.92–4.21, they dropped to 0.37–1.21 in Survey 2. As we used a different questionnaire form, we could not make a simple comparison; however, it is possible that RM nurses showed low levels of intention to violate rules due to the fact that they were in positions of responsibility with respect to risk management.

Intention to violate rules was high in the low objective risk and large objective benefit configurations with the presence of surrounding staff. This indicates that in situations in which it was easy for a violation to occur, such as those involving low objective risk or large objective benefit, intention to violate rules was high when there were surrounding staff members.

3.4.2. Influence of Violation-Related Factors on Risk Perception. Risk perception was only influenced by objective risk. When objective risk was high, risk perception was high, which supported hypothesis 1.

Risk perception was also high with low objective risk and high time pressure configurations. This means that when participants were busy and the objective risk was low, they estimated the risk as high, indicating that risk perception erred toward the side of caution. Risk perception was high when there was high time pressure in the low objective risk and presence of surrounding staff settings; this shows that risk perception erred toward the side of caution when it was high during busy times, similar to that stated above.

In the low objective risk and low time pressure configurations, risk perception was found to be low with the presence of surrounding staff. This indicates that risk perception was relatively low when there were surrounding staff. Even when there was surrounding staff, the risk associated with the violation did not change. However, it is possible that in emergency situations in which care is provided by multiple people, a sense of trust and security in the surrounding staff lowers risk perception. This is thought to be one factor contributing to high intention to violate rules in the presence of surrounding staff, which was the opposite of what we predicted.

3.4.3. Influence of Violation-Related Factors on Benefit Perception. Benefit perception was influenced by objective risk, objective benefit, and time pressure. When objective risk was low, objective benefit was large, and time pressure was high, the benefit perception was shown to be high. The presence or absence of surrounding staff was not involved in benefit perception, which partially supported hypothesis 3. A negative correlation between risk perception and intention and a positive correlation between benefit perception and intention were observed, which supported hypothesis 4.

4. General Discussion

4.1. Summary of Results

This study targeted nursing students in Survey 1 and RM nurses in Survey 2 and aimed to clarify the influence of four factors (objective risk, objective benefit, time pressure, and social pressure or presence or absence of surrounding staff) on intention to violate rules and risk and benefit perception in nursing.

Results showed that the effects of these four factors influenced intention to violate rules, risk perception, and benefit perception differently for each target group. With regard to intention to violate rules, nursing students were influenced by objective risk, and RM nurses were influenced by objective risk and benefit. This is thought to stem from the fact that factors involved in nursing students and RM nurses' benefit perception differed.

With respect to risk perception, hypothesis 1 "risk perception is only influenced by objective risk" was supported in both nursing students and RM nurses. With regard to benefit perception, nursing students were influenced by objective risk, and RM nurses were influenced by objective risk, objective benefit, and time pressure. This supported hypothesis 2 "nursing students' benefit perception is not necessarily influenced by all of the factors that contribute to violation." Hypothesis 3 "RM nurses' benefit perception is influenced by all of the factors that contribute to violation" was supported with the exception of the involvement of surrounding staff members.

Regarding the relationships between risk perception and benefit perception and intention to violate rules, hypothesis 4 "risk perception has a negative a correlation with intention to violate rules, and benefit perception is positively associated with intention to violate rules" was supported.

4.2. Characteristics of Each Target Group Related to Intention to Violate Rules and Risk Perception.

4.2.1. In Nursing Students. Characteristics for each target group were observed with regard to intention to violate rules and risk perception. For intention to violate rules in nursing students, a first-order interaction was observed between time pressure and social pressure, and in the high social pressure configuration with high time pressure, intention to violate rules was high, indicating that during busy times, intention to violate rules increased when participants were encouraged to do so by a senior staff member. However, in both risk and benefit perception, no significant first-order interaction was observed between time pressure and social pressure. This indicates that, although intention to violate rules increased during busy times, when nurses were encouraged to do so by a senior nurse, intention to violate rules changed without changes in risk or benefit perceptions such as "as my senior nurse said to, the violation is not as dangerous as I thought it was" and "as my senior nurse said to, even if I perform the violation, there will be the value of saved effort."

As there was no decrease in risk perception or increase in benefit perception, which are normally assumed to lead to increased intention to violate rules, senior nurses' prompts to violate are thought to have a temporary effect on increased intention to violate rules. However, as there was no change in either risk or benefit perception, it is highly probable that the nursing students experienced conflict, and being on the receiving side of violation prompts, they were in an undesirable situation in terms of mental health. Inhibiting prompts to violate from senior staff is important from a nursing student's perspective of violation prevention; we should also consider this from the perspective of preserving nursing students' mental health. While we could interpret violation prompts from senior staff as leading to a temporary increase in intention to violate rules, it is necessary to investigate the influence of prolonged prompts to violate rules separately.

4.2.2. In RM Nurses. RM nurses' risk perception was high in the low objective risk configuration with high time pressure and high in the low objective risk with the presence of surrounding staff configuration with high time pressure. Each of the five types of violation used in Survey 2 was used for confirmation, and as there were numerous patients, and it was a busy period in the high time pressure configuration, there were conditions in which it would be easy for issues such as patient misidentification and drug administration error to occur. This can be interpreted as an indication that, under conditions that increase the risk of patient misidentification, such as those involved in the high time pressure configuration, risks were estimated to be higher during safe periods, such as those in which objective risk was low or there were other staff members present, and RM nurses' tendency toward erring on the side of caution, with attitudes such as "be more careful during safe periods," appeared in risk perception.

4.3. The Importance of Reducing Benefit Perception.

With regard to benefit perception, parts of hypotheses 2 and 3 were supported. Among RM nurses, low objective risks, large objective benefit, and high time pressure were involved in increased benefit perception. This was observed in nurses (Adachi et al., 2010). Reducing benefit perception is of utmost importance, particularly among practicing healthcare workers, such as RM nurses and nurses, who feel the magnitude of the benefits of saving time and effort at work.

Reducing objective benefits and time pressure would be effective measures for reducing benefit perceptions. Following the medical law reform in Japan in 2001, the hospital bed area per patient was increased. From the perspective of improving patient comfort, hospitals also allow ample space for patient use, using areas such as the hallway or space around the bed. As a result, healthcare workers are required to work across a large space, and there are cases in which the objective benefit used in this study, "saving time and effort as a result of the violation," has increased. Moreover, as hospitals endeavor to reduce objective risks to improve medical safety, objective benefits have become relatively larger. Hospitals conventionally devise room layout and goods placement to allow staff to work smoothly and efficiently. This has become synonymous with reducing objective benefits, which contributes to a reduction in the number of

violations healthcare workers may intend to commit. Therefore, the hospitals' efforts, as described above, are also important from the perspective of violation prevention.

4.4. Future Issues

This study targeted nursing students and RM nurses and investigated the influence of violation-related factors on intention to violate rules and risk and benefit perception. This study revealed commonality and difference in intention to violate rules and risk and benefit perceptions among nurses, nursing students, and RM nurses. However, there were a number of limitations to this study.

First, as Survey 1, which targeted nursing students, examined factors between participants, it was difficult to show statistically significant differences in factors within participants. As the results of Surveys 1 and 2 were from one school and one hospital, the results cannot be generalized to all nursing students and RM nurses. The study should be repeated with other participants.

Second, in Survey 2, which targeted RM nurses, we believe that benefit perception was influenced by more factors, because RM nurses had become more sensitive to objective benefits throughout the years of field experience they had gained as nurses. However, there was another possibility. As the RM nurses were in managerial positions, benefit perceptions may not only have been based on patient care but performed from a hospital management perspective. As this study could not clarify whether this occurred, it is necessary to delve further into this via interviews and other means.

Third, violations used in this study, such as "treating a patient with bare hands," were behaviors that occur counter to the basics of nursing. Therefore, it was assumed that each violation observed in Surveys 1 and 2 was understood as behavior that deviated from the rules; however, we do not have strict confirmation that they were understood as such by all of the participants. There are many additions and changes to rules in the fields of nursing and medicine. Therefore, grasping the actual degree of rule awareness and understanding is also important for violation prevention.

This study was a questionnaire survey and did not capture actual behavior, for which establishment of a methodology, such as investigation performed through secondary use of log data for each action amassed in the hospital information system, would be required.

Appendix

Inside Cover example 1 (high time pressure, high social pressure). Please imagine a busy day. There are numerous patients being admitted to, or discharged from, the hospital. In addition, there are two patients who have made a sudden turn for the worse, and two emergency-care patients have dropped in. There are insufficient staff members, and it is hectic. You are working with a senior nurse.

Text example 1 (low objective risk, small objective benefit, high time pressure, high social pressure configuration, "treating a patient with bare hands, without gloves"). Just as you went to treat a patient's wound, you realized that you forgot your gloves. You are in <u>Room A</u>,[a] and the gloves are in the treatment room. <u>You know from a test that the patient does not have an infectious disease</u>.[b] The treatment involves dressing a slight scrape on the patient's knee. <u>Just then, the nurse call rings and you have to go to another room</u>.[c] <u>A senior nurse says, "It's fine to do it without gloves."</u> [d] You treat the patient with bare hands, without gloves.

[a, b, c,] and [d] are sections controlling for objective benefit, objective risk, time pressure, and social pressure, respectively. These four sections were made easily visible on the questionnaire form, each printed in a different color.

Inside cover example 2 (low time pressure, low social pressure). Please imagine a calm day. There are no patients being admitted or discharged. There are plenty of staff members on duty, and it is relaxed. You are working alone.

Sentence example 2 (high objective risk, small objective benefit configuration, low time pressure, low social pressure configuration, "washing hands with your watch on"). You have come to a place for washing your hands. <u>The watch you are wearing can be removed with one touch</u>.[a] Immediately before this, you performed <u>sputum suctioning</u>.[b] You wash your hands without taking off your watch.

[a,] and [b] are sections controlling for objective benefit and risk. In this case of configuration, time pressure and social pressure were not described in the text.

Inside cover example 3 (high time pressure, no surrounding staff). Please imagine a busy day. Today is the start of a long holiday (long holiday season "*Golden Week,*" New Year's holidays) and there are two staff absences. It seems you are in charge of more patients than usual. You are working alone.

Text example 3 (low objective risk, small objective benefit, high time pressure, surrounding staff are present configuration: "Reading a printout or memo and then performing a procedure without confirming it with the original (instructions, prescription, exam contents, etc.) on the computer. You are about to perform a <u>minimally invasive medical procedure</u>[a] (such as urinalysis) and clerical work. <u>There are no other staff members around, and you are the only person taking care of the patient</u>.[b] <u>Today is busy, and many patients are waiting for care</u>.[c] There is no computer in Room A, where you are; the computer is in <u>Room B</u>[d]. You read a printout or memo and perform the procedure without confirming it with the original (instructions, prescription, and exam contents) on the computer.

[a, b, c,] and [d] are sections controlling for objective risk, surrounding staff, time pressure, and objective benefit, respectively. The four sections were made easy to see on the questionnaire form, each printed in a different color.

Inside cover example 4 (low time pressure, presence of surrounding staff). Please imagine a calm day. Today is a weekday and there are no staff absences. You are performing routine

work. A number of staff members surround you as you work.

Text example 4 (high objective risk, small objective benefit configuration, low time pressure, presence of surrounding staff configuration, "performing an injection without verifying the barcode"). It is time to administer an injection of a <u>high-risk drug</u>[a] (e.g., an anticancer drug or narcotic). <u>There are numerous other staff members around, caring for patients.</u>[b] There is no barcode reader or personal digital assistance (PDA) in Room A, where you are, and these instruments are in <u>Room B</u>.[d] You inject without verifying the barcode.

[a, b,] and [d] are sections controlling for objective risk, surrounding staff, and objective benefit. In this case of configuration, time pressure was not described in the text.

Acknowledgements

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