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Knowledge, attitude, and practices related to standard precautions of surgeons and physicians in university-affiliated hospitals of Shiraz, Iran

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KEYWORDS
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Summary
Objective: To measure levels of knowledge, attitudes, and practice toward standard precautions (SP) in medical practitioners of Shiraz University of Medical Sciences affiliated hospitals in Iran.
Method: In this cross-sectional study, knowledge, attitude, and practice related to SP among four medical staff groups — surgeons, surgical residents, physicians and medical residents — were assessed using a questionnaire.
Results: Across the four medical staffing groups the median levels of knowledge ranged from 6 to 7 (maximum score 9), median attitude scores were high ranging from 35 to 36 (maximum score 45), while median practice scores were low, ranging from 2 to 3 (maximum score 9). A moderate relationship between knowledge and attitudes was found in surgical residents and medical residents ($r = 0.397$, $p = 0.030$ and $r = 0.554$, $p = 0.006$, respectively). No significant correlation was found between knowledge and practice between the groups. A significant but poor ($r = 0.399$, $p = 0.029$) relationship between attitude and practice was found in surgical residents.
Conclusion: Specific training programs may have to target newly graduated medical practitioners to establish acceptance of appropriate practices that will enable them to adopt and adhere to SP while their older counterparts may require more intense continuous assistance.

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Introduction

A heightened understanding of transmission of blood-borne diseases in the mid-1980s[1–6] to healthcare workers (HCWs), including surgeons, physicians, and residents in training, and the importance of adherence to standard precautions (SP) is well accepted. Adherence to SP is even more important with the emergence of infectious diseases, such as avian influenza, severe acute respiratory syndrome, and the threat of bioterrorism.[7] The problems of containing drug-resistant organisms such as methicillin-resistant staphylococcus[8–10] and vancomycin-resistant enterococci from colonizing patients give a continuous reminder to HCWs that adherence to SP is also pivotal to patient safety in terms of healthcare-associated infections. In 1996, the Centers for Disease Control proposed Guidelines for Isolation Precautions in Hospitals, as new, two-tiered best practice of infection control precautions that are standard for all patients who are to be regarded as potential carriers of pathogenic microorganisms.[1,10] Strict adherence to SP guidelines is necessary to prevent exposure to potentially life-threatening infections,[3,11–15] yet a high level of compliance with SP has been reported to be problematic worldwide.[3,4,16–20]

Medical practitioners, especially surgeons, are among high-risk healthcare workers for exposure to blood-borne or other infections during direct patient contact.[2–4] The purpose of our study was to measure the level of knowledge, attitude, and practice in surgeons and physicians in Shiraz University of Medical Sciences affiliated hospitals.

Methods

A cross-sectional survey was conducted in Shiraz University of Medical Sciences, Shiraz, Iran between May and November 2003 of four groups of medical staff; the questionnaire was to be answered by physicians, surgeons, surgical residents, and medical residents. The questionnaire was prepared by an infection control expert, a pediatrician certified in infectious diseases, and a psychiatrist, and reviewed by experts from the Iranian National Expert Group of Infection Control Specialists. It consisted of questions on knowledge, attitude, and practice of the guidelines with respect to standard isolation precautions as described by the CDC. The questionnaire was pre-tested on a random sample of participants to ensure practicability, validity, and interpretation of responses. The validity of the questionnaire was assessed using the Kuder–Richardson test for reliability and Cronbach's alpha internal consistency coefficient.

Items in the questionnaire included demographic data, specialty and status of medical practitioner (surgeon, physician, surgical, or medical resident), previous SP education, willingness to be trained, and nine questions pertaining to hand-washing, personal protective equipment,

Table 1 Standard precaution items and frequency of participants with correct responses

Items	Correct knowledge score of 1 (*n*/total)	Correct practice score of 1 (*n*/total)	Correct attitude score of 5 (*n*/total)
Q1. Do you wash your hands before and after patient care?	141/150	28/149	86/151
Q2. Do you wash your hands before and after using gloves?	100/149	29/138	48/141
Q3. Do you wash your hands when unwanted touching of blood, body fluids, excretions, and contaminated items occurs?	147/153	137/153	143/153
Q4. Do you wear gloves before touching mucous membranes and non-intact skin?	141/153	94/152	124/151
Q5. Do you wear goggles to protect mucous membranes of the eyes (including persons who wear eyeglasses) when procedures and activities are likely to generate splashes or sprays of blood and body fluids?	143/151	27/151	101/146
Q6. Do you wash your hands with betadine after caring for patients when procedures and activities are likely to generate splashes or sprays of blood and body fluids?	22/148	9/127	4/126
Q7. Do you wear a surgical mask to protect the nose and mouth when procedures and activities are likely to generate splashes or sprays of blood and body fluids?	138/150	46/147	96/144
Q8. Do you bend needles before disposal?	55/150	37/128	17/126
Q9. Do you wear a gown to protect mucous membranes when procedures and activities are likely to generate splashes or sprays of blood and body fluids?	135/148	29/144	77/143

use of antiseptic solution, and disposal method for used syringes. Responses to items for knowledge were ''yes'', ''no'', or ''don't know''. The questions used to assess attitude were in the format of the Likert scale with responses that included ''very strong'', ''strong'', ''considerable'', ''weak'', or ''null'' and the five-point Likert scale response for practice questions (always, often, sometimes, seldom, never). All responses in accordance with CDC guidelines[1,10] were given a score value of 1 for correct answers to the knowledge questions and when answers for practice questions were ''always'', while a score zero was assigned to all other answers. The total scores ranged from zero to 9. For attitude questions, a score of 5 was equivalent to the answer ''very strong'' and a score of 1 to ''nil'', therefore, the total score ranged from 9 to 45 (Table 1). The questionnaire was pre-tested on 21 randomly-selected members from the target population with high test–retest reliability (alpha = 0.73).

Descriptive and inferential statistics including significance tests, Wilcoxon rank-sum test, Kruskall–Wallis test, and Spearman correlation coefficient were performed using SPSS version 10.0. Alpha was set at the 5% level.

Results

Of the 250 questionnaires distributed, 155 (62%) were returned completed. Participants included 78 senior medical staff (42 surgeons and 36 physicians) and 77 residents (41 surgical residents and 36 medical residents) (Table 2). There were more male, 73.8% ($p = 0.002$) than female surgeons, while there was no significant ($p = 0.061$) gender difference within the physicians, 54.8% males. Neither were there significant differences in the proportion of male surgical residents (56.1%, $p = 0.435$) and male medical residents (58.3%, $p = 0.317$). The median age of all senior medical staff was 34 years (range 26–70 years) and 31 years (range 24–39 years) for all residents (Table 2). Regardless of the status of medical practitioners, the majority (85.9% senior practitioners and 87.0% residents) reported no previous formal SP education and most (87.2% senior practitioners and 88.3% residents) were willing to receive SP training (Table 2).

The median scores for SP knowledge for all medical practitioners ranged from 6 to 7, while the range of median scores for attitudes was from 35 to 36 and that for practices from 2 to 3 (Table 3). The median scores for knowledge and attitude were not significantly different ($p = 0.077$ and $p = 0.653$, respectively) between surgeons (knowledge median 7.0 and attitudes median score 36) and physicians (knowledge median score 6.0 and attitudes median score 35); median scores for practices were less than half the possible total score of nine, although the median scores for surgeons, 3.0, and physicians, 3.0, were equal but differed significantly ($p = 0.036$) (Table 3).

Although median scores for knowledge and attitudes were moderate to high, surgeons were the only group where a

Table 2 Demographics of the study group

Practitioner (*n*)	Gender		Age (years)	Previous formal SP training		Willingness to attend SP training		
	Male % (*n*)	Female % (*n*)	Median (range)	Yes % (*n*)	No % (*n*)	Yes % (*n*)	No % (*n*)	Do not know % (*n*)
Senior								
Surgeon (42)	73.8 (31)	26.2 (11)	37 (26–58)	11.9 (5)	88.1 (37)	90.5 (38)	2.4 (1)	7.1 (3)
Physician (36)	52.8 (19)	47.2 (17)	36.5 (26–70)	16.7 (6)	83.3 (30)	83.3 (30)	2.8 (1)	13.9 (5)
Total (78)	64.1 (50)	35.9 (28)	34 (26–70)	14.1 (11)	85.9 (67)	87.2 (68)	2.6 (2)	10.2 (8)
Residents								
Surgical (41)	56.1 (23)	43.9 (18)	31 (24–39)	17.1 (7)	82.9 (34)	95.1 (39)	0 (0)	4.9 (2)
Medical (36)	58.3 (21)	41.7 (15)	30 (24–37)	8.3 (3)	91.7 (33)	80.6 (29)	2.8 (1)	16.6 (6)
Total (77)	57.1 (44)	42.9 (33)	31 (24–39)	13.0 (10)	87.0 (67)	88.3 (68)	1.3 (1)	10.4 (8)

SP, standard precautions.

Table 3 Median scores for knowledge, attitude, and practices associated with standard precautions for practitioners

Type and level of medical practitioner	Knowledge median[a] (range)	*p*	Attitudes median[b] (range)	*p*	Practices median[a] (range)	*p*
Surgeon	7.0 (0.0–8.0)		36.0 (16.0–40.0)		3.0 (0.0–6.0)	
Physician	6.0 (0.0–9.0)	0.077	35.0 (32.0–40.0)	0.653	3.0 (0.0–7.0)	0.036
Surgical resident	7.0 (0.0–9.0)		36.0 (24.0–40.0)		3.0 (0.0–7.0)	
Medical resident	7.0 (4.0–9.0)	0.237	35.0 (31.0–40.0)	0.542	2.0 (0.0–7.0)	0.007
Total[c]		0.072		0.861		0.000

[a] Maximum correct score = 9.
[b] Maximum correct score = 45.
[c] Difference between groups (Kruskal–Wallis test).

Table 4 Correlations[a] between knowledge, attitude, and practices for medical practitioner

Type and level of medical practitioner	Knowledge and attitude r (p)	Knowledge and practice r (p)	Attitudes and practice r (p)
Surgeon	0.748 (<0.0001)	0.150 (0.342)	0.158 (0.397)
Physician	0.459 (0.042)	0.170 (0.322)	−0.240 (0.308)
Surgical resident	0.397 (0.030)	0.304 (0.053)	0.399 (0.029)
Medical resident	0.554 (0.006)	0.139 (0.420)	−0.005 (0.981)

[a] Spearman correlation coefficient.

moderate to strong ($r = 0.748$) relationship between knowledge and attitudes was significant ($p < 0.0001$) while for other medical groups this relationship was poor (Table 4). The relationship between knowledge and practices for all practitioners was not significant, as was the case for attitudes and practices, where correlations were not significant for all practitioners except surgical residents, where the relationship was significant but not strong, $r = 0.399$ ($p = 0.029$) (Table 4).

All medical practitioners' levels of knowledge were high for the same six items that were answered correctly by at least three quarters of practitioners within each group (Table 5). Few medical practitioners answered correctly that needles should not be bent before disposal with correct knowledge ranging from 27.8% (physicians) to 55.6% (medical residents). As few as 9.5% of surgeons and 9.8% of surgical residents correctly believed that betadine was not used as a hand washing antiseptic solution. Less than three quarters of practitioners correctly knew that they had to wash hands before glove use with proportions of practitioners answering correctly ranging from 52.8% (physicians) to 70.7% (surgical residents). Only two of nine attitudinal items were answered as ''very much'' by more than 75% of practitioners (Table 6). These two items indicating good attitudes related to SP activities do not require effort or much persuasion; the proportion of practitioners washing hands after touching blood, body fluids, excretions and contaminated items ranged from 91.7% to 95.2%, and glove use for touching mucous membranes, proportions ranged from 69.4% to 95.2%. Only one SP practice item, hand washing after touching contaminated items, was always practiced by 75.6% to 100% of practitioners (Table 5).

A medical resident's knowledge towards SP was related to willingness to be trained ($p = 0.013$) and a surgeon's practice of SP was related only to female gender ($p = 0.006$). No other significant predictive relationships were found.

Table 5 Scores for correct knowledge and practice items

Items[a]	Correct answers by type and level of medical practitioner					
	Surgeon n (%)	Physician n (%)	p	Surgical resident n (%)	Medical resident n (%)	p
Knowledge items						
Q1	37 (88.1)	33 (91.7)	0.607	37 (90.2)	34 (94.4)	0.492
Q2	29 (69.0)	19 (52.8)	0.143	29 (70.7)	23 (63.9)	0.525
Q3	41 (97.6)	33 (91.7)	0.238	38 (92.7)	35 (97.2)	0.374
Q4	41 (97.6)	28 (77.8)	0.007	36 (87.8)	36 (100)	0.031
Q5	41 (97.6)	32 (88.9)	0.119	36 (87.8)	34 (94.4)	0.315
Q6	4 (9.5)	6 (16.7)	0.350	4 (9.8)	8 (22.2)	0.135
Q7	41 (97.6)	29 (80.6)	0.014	35 (85.4)	33 (91.7)	0.394
Q8	12 (28.6)	10 (27.8)	0.939	13 (31.7)	20 (55.6)	0.036
Q9	40 (95.2)	27 (75.0)	0.011	37 (90.2)	31 (86.1)	0.576
Standard precaution practice items						
Q1	11 (26.2)	9 (25.0)	0.905	6 (14.6)	2 (5.6)	0.196
Q2	16 (38.1)	6 (16.7)	0.037	7 (17.1)	0 (0.0)	0.010
Q3	42 (100)	33 (91.7)	0.058	31 (75.6)	31 (86.1)	0.249
Q4	34 (81.0)	20 (55.6)	0.016	23 (56.1)	17 (47.2)	0.440
Q5	6 (14.3)	6 (16.7)	0.773	13 (31.7)	2 (5.6)	0.004
Q6	1 (2.4)	2 (5.6)	0.905	0 (0.0)	6 (16.7)	0.129
Q7	17 (40.5)	8 (22.2)	0.087	16 (39.0)	5 (13.9)	0.014
Q8	11 (26.2)	4 (11.1)	0.367	5 (12.2)	17 (47.2)	0.703
Q9	9 (21.4)	6 (16.7)	0.597	11 (26.8)	3 (8.3)	0.037

[a] Listed in Table 1.

Table 6 Agreement scores for the importance of attitude items

		Very much *n* (%)	Much *n* (%)	Intermediate *n* (%)	Low *n* (%)	No importance *n* (%)
Q1	Surgeon	22 (55.0)	13 (32.5)	5 (12.5)	—	—
	Physician	22 (61.1)	10 (27.8)	3 (8.3)	—	1 (2.8)
	Surgical resident	26 (65.0)	12 (30.0)	2 (5.0)	—	—
	Medical resident	16 (45.7)	15 (42.9)	4 (11.1)	—	—
Q2	Surgeon	18 (45.0)	7 (17.5)	7 (17.5)	5 (12.5)	3 (7.5)
	Physician	10 (31.3)	9 (28.1)	7 (21.9)	5 (15.6)	1 (2.8)
	Surgical resident	16 (41.0)	11 (28.2)	9 (23.1)	2 (5.1)	1 (2.6)
	Medical resident	33 (91.7)	3 (8.3)	—	—	—
Q3	Surgeon	40 (95.2)	1 (2.4)	—	—	1 (2.4)
	Physician	33 (94.3)	1 (2.9)	—	—	1 (2.9)
	Surgical resident	37 (92.5)	2 (5.0)	1 (2.5)	—	—
	Medical resident	33 (91.7)	3 (8.3)	—	—	—
Q4	Surgeon	40 (95.2)	1 (2.4)	—	—	1 (2.4)
	Physician	25 (69.4)	6 (16.7)	1 (2.8)	1 (2.8)	1 (2.8)
	Surgical resident	32 (78.0)	6 (14.6)	1 (2.4)	—	—
	Medical resident	27 (75.0)	9 (25.0)	—	—	—
Q5	Surgeon	30 (71.4)	10 (23.8)	1 (2.4)	1 (2.4)	—
	Physician	19 (59.4)	8 (25.0)	4 (12.5)	1 (3.1)	—
	Surgical resident	31 (81.6)	5 (13.2)	2 (5.3)	—	—
	Medical resident	21 (61.8)	12 (53.3)	1 (2.9)	—	—
Q6	Surgeon	24 (68.6)	5 (14.3)	4 (11.4)	2 (5.7)	—
	Physician	9 (33.3)	12 (44.4)	2 (7.4)	2 (7.4)	2 (7.4)
	Surgical resident	23 (65.7)	8 (22.9)	2 (5.7)	2 (5.7)	—
	Medical resident	10 (34.5)	8 (27.6)	4 (13.8)	5 (17.2)	2 (6.9)
Q7	Surgeon	30 (73.2)	8 (19.5)	2 (4.9)	1 (2.4)	
	Physician	19 (63.3)	7 (23.3)	2 (6.7)	—	—
	Surgical resident	29 (74.4)	9 (23.1)	1 (2.6)	—	—
	Medical resident	18 (52.9)	13 (38.2)	1 (2.9)	2 (5.9)	—
Q8	Surgeon	26 (70.3)	5 (13.5)	2 (5.4)	1 (2.7)	3 (8.1)
	Physician	13 (48.1)	7 (25.9)	3 (11.1)	2 (7.4)	2 (7.4)
	Surgical resident	20 (58.8)	9 (26.5)	—	—	5 (14.7)
	Medical resident	10 (35.7)	8 (28.6)	2 (7.1)	1 (3.6)	7 (19.4)
Q9	Surgeon	24 (60.0)	13 (32.5)	2 (5.0)	—	1 (2.5)
	Physician	14 (48.3)	11 (37.9)	3 (10.3)	1 (3.4)	—
	Surgical resident	28 (71.8)	8 (20.5)	3 (7.7)	—	—
	Medical resident	11 (31.4)	16 (45.7)	6 (17.1)	1 (2.9)	1 (2.9)

Conclusion

Adherence to standard precaution guidelines has been problematic for HCWs universally.[2–4] This study was limited by its reliance on self-reporting rather than by observing compliance with SP by practitioners. However, self-reported attitudes towards SP and compliance were low. Our poor compliance with many SP practices is not unique to our teaching hospitals, with similar results published in other centers.[3,4,17–21] While principles of SP should be strictly observed by surgeons and physicians for their own safety as well as setting leadership roles for their residents, success in the implementation of SP guidelines depends on many factors such as optimal awareness and a positive attitude in all HCWs, and these goals are not reached without qualified personnel receiving continuing regular education, as has been repeatedly demonstrated in the literature.[4,22–32] Our study revealed that more than 80% of all medical practitioners had not received previous SP education, and that more than 80% were willing to be trained. These findings illustrate that SP practices are not behaviors readily adopted, even by those aware of the SP issue and moderate to low levels of attitudes.

A revision of current medical curricula offered in Iran may be required that mandates all medical students and hospital trainees attend infection control courses specific to their clinical terms. Although all our medical practitioners reported a willingness to be trained, compliance behavior is complex.[33] Some barriers to adherence observed internationally include inadequacy of equipment and facilities and difficulties of access to equipment, stressful working conditions, and the belief that practice of SP may interfere with patient care.[2,23,34–41] Influencing the Iranian senior practitioner may require elements of other successful programs

and innovative approaches, such as improved hospital infrastructure that offers an infection control awareness week with infection control auditors to inform about correct practices at the time incorrect practices are observed, freely available personal protective equipment, such as gowns, gloves and masks, with reinforcing posters but also staff seminars launched on a platform of the importance of consistent SP practice for personal protection in times of emerging diseases.

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