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## Brief Report

# Factors associated with intensified infection prevention and vaccination practice among Thai health care personnel: A multicenter survey during COVID-19 pandemic



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## Key Words:

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Intensified infection prevention (IP) and health care personnel (HCP) vaccination programs could enhance HCP safety during COVID-19 pandemic. A multi-center survey regarding on intensified IP practices and vaccination uptake among HCP was performed. Working in the emergency medicine department was associated with wearing a double mask and face shield ( $P = .04$ ). Despite having more confidence in care of COVID-19 patients, there was no significant improvement of intensified IP practices, COVID-19 and influenza vaccination programs among “high-risk” HCP.

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There have been consistent reports of health care personnel (HCP) acquiring COVID-19 as a result of workplace exposure.<sup>1,2</sup> Following the tenets of basic infection prevention (IP) (eg, wearing masks, appropriate hand hygiene, physical distancing) greatly reduces but does not eliminate the risk of COVID-19 acquisition.<sup>2</sup> Recently, Centers for Disease Control and Prevention of the United States (CDC) demonstrated wearing a cloth mask over a medical procedure mask (ie, double masking technique), would improve mask filtration and more effectively prevent the spread/acquisition of COVID-19.<sup>3</sup> Wearing eye protection (eg, goggles, face shields) in addition to a medical mask for direct patient care is also recommended.<sup>4</sup> These intensified infection prevention (IP) measures (eg, double mask technique, face shield) and HCP vaccination programs (eg, COVID-19, influenza) could enhance HCP safety during the COVID-19 pandemic. A 13-hospital multi-center survey was conducted to understand the feasibility of implementing these intensified IP measures and vaccination programs during the COVID-19 pandemic.

## METHODS

This survey was developed by experienced hospital epidemiologist of Thammasat University Hospital (TUH). Prior to the survey, content validation was assessed by all investigators to ensure that the survey included relevant issues to achieve all study goals. The data collection was pilot tested in 20 HCP to ensure the reliability of the data collection. Based on the result of the pilot testing, the survey was revised to improve the understandability and reliability. This survey was performed among HCP employed by Thammasat University network, consisting of 13 hospitals from May 17, 2021 to June 4, 2021. HCP in all specialties were included. Google forms were created and distributed via a LINE application, version 11 (Tokyo, Japan). Data collected included demographics, underlying diseases, confidence in knowledge of COVID-19 transmission and/or self-protection and/or care of COVID-19 patients, awareness of being at-risk, feelings toward COVID-19 vaccination, IP practices, the acceptance/perception regarding intensified IP use and vaccination programs as a condition of employment.

Respondents rated the frequency of confidence in knowledge and awareness of being at-risk using a 5-point Likert scale (scale of 1 to 5), where 1 indicates “no risk and/or no confidence” and 5 indicates “very risky and/or very confident.” They rated IP practices on a scale of 1 to 5, where 1 indicated “never used” and 5 indicated “always

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used.” Feelings toward COVID-19 vaccination were assessed using a scale of 1 to 5, where 1 indicated “no worry and/or stress” and 5 indicated “very worried and/or stressed.” HCP were asked to rate (“yes” or “no”) whether they would be willing to practice intensified IP measures, to accept vaccination programs and whether requiring vaccination programs should be a condition of employment. The HCP risk groups were categorized as “high-risk” versus “low-risk”, where “high-risk” group was defined as HCP exposure to confirmed and/or suspected COVID-19 infections  $\geq 5$  patients/month and  $< 5$  patients/month in “low-risk” group. Institutional Review Board approved this study.

All analyses were performed using SPSS, version 26 (Armonk, NY). Chi-square tests were used to compare categorical variables. Independent t-tests were used for continuous data. All P values were 2-tailed, and  $P < .05$  was considered statistically significant. A multivariate analysis was conducted to evaluate factors associated with intensified IP practices and vaccination programs uptake. Adjusted odd ratios (aORs) and 95% confidence intervals (CIs) were calculated.

## RESULTS

Overall, 407 HCP from 13 hospitals (N = 30/hospital) consented to study participation. The survey response rate was 90.44% (407/450). The median age was 30 years (IQR, 25–44 years); 280 HCP (68.80%) were women. Most HCP were physicians (66.09%). Most participants were from the emergency medicine department (ED) (30.96%). The vaccination acceptance rate was 82.56% for COVID-19 and 95.58% for influenza. Majority of HCP expressed concern about efficacy/effectiveness (88.73%) of COVID-19 vaccines. Details on intensified IP practices and perception regarding on vaccination programs are summarized (Table 1).

Overall, 117 HCP were categorized as “high-risk” and 290 HCP as “low-risk”. Demographics and characteristics of participants in both groups were compared (Table 2). Compared to “low-risk” HCP, “high-risk” HCP were more likely to wear goggles ( $P < .001$ ) and have more confidence in their knowledge of disease transmission ( $P = .013$ ) and self-protection ( $P = .032$ ) (Table 2). However, there was no significant improvement of intensified IP practices among these HCP (Table 2). Factors associated with intensified IP compliance included those employed as nurses (aOR, 1.84; 95% CI, 1.08–3.13) and those assigned to the ED (aOR, 1.75; 95% CI, 1.02–3.00). Factors associated with acceptance of influenza vaccination include awareness of being at-risk (aOR, 5.18; 95% CI, 1.21–22.16).

## DISCUSSION

Our study had several implications. First, working in the ED was associated with intensified IP use given the higher risk of exposure to patients with unknown COVID-19 status, while “high-risk” HCP tended to wear goggles. Second, nurses had higher percentages of intensified IP practices which may reflect the fact that nurses spend more time in direct patient care. Third, the percentage of HCP who received COVID-19 vaccine (82.56%) was less than influenza vaccine (95.58%). Concerns about efficacy and safety were the main barrier for suboptimal COVID-19 vaccine uptake among HCP.

Several studies reported that using double masks can potentially increase the mask’s effectiveness by more than 80%<sup>3,5</sup> while face shields were shown to reduce immediate viral exposure by 96%.<sup>6</sup> While high percentages of HCP followed IP practices both in the hospital and in the community, there was no increase in intensified IP practices among “high-risk” HCP. These findings may be because intensified IP use was recommended by the United States CDC,<sup>3,4</sup> but not recommended by Thai CDC.<sup>7</sup> While vaccination programs for COVID-19 and influenza were recommended for all HCP<sup>8</sup> and should be a condition of employment in the United States,<sup>9,10</sup> COVID-19

**Table 1**  
Characteristics of study population

Variable	No. (%) (N = 407)
Age, median y (IQR)	30 (25–44)
Sex, female	280 (68.80)
Underlying diseases	
None	340 (83.54)
Diabetes mellitus	10 (2.46)
Hypertension	17 (4.18)
*Others	40 (9.83)
Occupations	
Physicians	269 (66.09)
Nurses	113 (27.76)
Pharmacists	25 (6.14)
Departments	
Emergency medicine	126 (30.96)
Internal medicine	96 (23.59)
*Others	185 (45.45)
Acceptance of vaccinations	
COVID-19	336 (82.56)
Nonacceptance (N = 71): efficacy concern	63 (88.73)
Nonacceptance (N = 71): safety concern	8 (11.27)
Influenza	389 (95.58)
Feelings toward COVID-19 vaccination	
Worry	43 (10.57)
Stress	25 (6.14)
Practice infection prevention in hospitals versus community	
Hand hygiene	379 (93.12) vs 360 (88.45)
Physical distancing	289 (71.01) vs 348 (85.50)
Mask	403 (99.02) vs 403 (99.02)
Goggles	155 (38.08) vs 0 (0.00)
Intensified infection prevention	
Double mask technique	291 (71.50)
Face shield	261 (64.13)
Perception regarding on vaccination program as a condition of employment	
COVID-19	255 (62.65)
Influenza	265 (65.11)
Level of hospital survey	
University hospital	233 (57.25)
Government hospital	150 (36.86)
Private hospital	24 (5.90)

IQR, interquartile range.

\*Dyslipidemia, Allergic rhinitis, thyroid disease, old cerebrovascular accident, coronary artery disease.

†Surgery, Pediatrics, Obstetrics and gynecology, Orthopedics, Otolaryngology, Ophthalmology, Psychiatry, Radiology, Anesthesiology, Physical medicine and rehabilitation.

vaccination uptake in Thailand remains suboptimal and indicates the need for additional strategies to enhance COVID-19 vaccination among HCP. Despite the knowledge and awareness of COVID-19 transmission and prevention among “high-risk” HCP, there was no clear translation of prevention methods into real practices. Although double masking is approaching the effectiveness of N95 respirators, we recommend N95 respirators for providing care of suspected or known COVID-19 patients.

There are some limitations in this study. First, the study was performed using self-reported survey. Second, the small sample size may limit our ability to identify other factors associated with intensified IP practices and vaccination programs. Third, because we only survey 13 hospitals, our results may not represent intensified IP practices and vaccination programs uptake for the whole country. Lastly, since this survey was performed in Thailand’s second wave of COVID-19 pandemic, it may not reflect future practices for Thai COVID-19 prevention.

In conclusion, intensified IP practices remain suboptimal and limited to HCP working in the ED and to those employed as nurses. While influenza vaccine uptake is high, COVID-19 vaccination uptake among HCP remains suboptimal. Practices to prevent COVID-19 featuring intensified IP use and vaccination programs uptake should be

**Table 2**  
Demographics and baseline characteristics of study populations compared “high-risk” versus “low-risk” health care personnel

Variable	Total (%)(N = 407)	*Low risk (%)(N = 290)	†High risk (%)(N = 117)	P Value
Age, median year (IQR)	30 (25–44)	29 (24–44)	34 (24–41)	0.031
Sex, female	280 (68.80)	200 (68.97)	80 (68.38)	0.908
Underlying diseases				
None	340 (83.54)	242 (83.45)	98 (83.76)	0.939
Diabetes mellitus	10 (2.46)	7 (2.41)	3 (2.56)	0.929
Hypertension	17 (4.18)	13 (4.48)	4 (3.42)	0.627
Others	40 (9.83)	28 (9.66)	12 (10.26)	0.778
Occupations				
Physicians	269 (66.09)	197 (67.93)	72 (61.53)	0.218
Nurses	113 (27.76)	70 (24.14)	43 (36.75)	0.010
Pharmacists	25 (6.14)	23 (7.93)	2 (1.71)	0.018
Departments				
Emergency medicine	126 (30.96)	66 (22.76)	60 (51.28)	<0.001
Internal medicine	96 (23.59)	57 (19.66)	39 (33.33)	0.003
Others	185 (45.45)	167 (57.59)	18 (15.38)	<0.001
Confidence				
Knowledge of disease transmission	315 (77.40)	215 (74.14)	100 (85.47)	0.013
Self-protection	320 (78.62)	220 (75.86)	100 (85.47)	0.032
COVID-19 patients care	214 (52.58)	125 (43.10)	89 (76.07)	<0.001
Awareness of being at-risk for infection	186 (45.70)	108 (37.24)	78 (66.67)	<0.001
Practices infection prevention in hospitals				
Hand hygiene	379 (93.12)	269 (92.76)	110 (94.02)	0.650
Social distance	289 (71.01)	207 (71.38)	82 (70.09)	0.795
Mask	403 (99.02)	286 (98.62)	117 (100)	0.202
Goggles	155 (38.08)	93 (32.07)	62 (52.99)	<0.001
Practices infection prevention in community				
Hand hygiene	360 (88.45)	256 (88.28)	104 (88.89)	0.861
Physical distancing	348 (85.50)	245 (84.48)	103 (88.03)	0.357
Mask	403 (99.02)	286 (98.62)	117 (100.00)	0.202
Intensified infection control				
Double mask technique	291 (71.50)	201 (69.31)	90 (76.92)	0.124
Face shield	261 (64.13)	185 (63.79)	76 (64.96)	0.825
Perception regarding on vaccination program as a requirement of employment				
COVID-19	255 (62.65)	185 (63.79)	70 (59.83)	0.454
Influenza	265 (65.11)	193 (66.55)	72 (61.54)	0.337

IQR, interquartile range.

\*Low risk, health care personnel exposure to confirmed/suspected COVID-19 infections <5 patients/month

†High risk, health care personnel exposure to confirmed/suspected COVID-19 infections ≥5 patients/month

‡Dyslipidemia, Allergic rhinitis, thyroid disease, old cerebrovascular accident, coronary artery disease

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reinforced for “high-risk” HCP and should be incorporated in Thai national guidelines.

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