KNOWLEDGE, ATTITUDES AND PRACTICES OF MEDICAL STUDENTS REGARDING INFLUENZA VACCINATION

Jun Jean Ong[1], Sharmathi Dhanapal[1], Yuki Julius We Yong Ng[1], Wei Cheen Gan[1] and Xin Yi Chan[1]

[1]Department of Medicine, International Medical University Clinical Campus Seremban, Seremban, Negeri Sembilan, Malaysia

Abstract. Medical students are at risk of contracting influenza and spreading it to others including vulnerable patients. We aimed to assess the knowledge, attitudes and practices of medical students regarding influenza vaccination, as an effort to promote influenza vaccination among this population. Study subjects were medical students studying in their first to fifth years at International Medical University, Kuala Lumpur, Malaysia. Each subject was asked to complete an online questionnaire about their knowledge, attitudes and practices regarding influenza vaccination and some demographic questions. The study was conducted from August until November 2017. A total of 315 students were included in the study; 40.3% were male. The mean [± standard deviation (SD)] age of study subjects was 22.0 (± 1.8) years. Ninety-one (28.9%) of subjects had previously received influenza vaccination; however, 70(76.9%) had received it > 1 year prior to the study. Those who had previously received influenza vaccination were significantly more likely to be in a preclinical study year ($p < 0.05$) or have a higher influenza knowledge score ($p< 0.05$). The mean influenza vaccine knowledge scores were significantly higher among the vaccinated subjects (11.5 *vs* 10.3, $p<0.05$) and the clinical year students (11.1 *vs* 9.5, $p< 0.001$). Thirty-six point eight percent of non-vaccinated subjects intended to be vaccinated against influenza. Commonly given reasons for not being vaccinated were the perception that they were healthy and did not need it, lack of time, vaccine cost and lack of recommendation by health care providers. In summary, subject influenza vaccine uptake and intention to be vaccinated were low. Improvement of influenza vaccination uptake in the study population can be further increased by educating subjects regarding the risks of contracting influenza, recommendation by the institution and vaccine made easily available.

Keywords: influenza, vaccine, medical students, influenza like illness, knowledge, attitude

INTRODUCTION

Influenza is potentially fatal in high-risk individuals like children, the elderly and the immunocompromised. Seasonal influenza mortality rates are in the range of 4.0-8.8 per 100,000 population annually; the highest rates being in Africa

Correspondence: Jun Jean Ong, Department of Medicine, International Medical Unversity, Clinical Campus Seremban, Jalan Rasah, 70300 Seremban, Malalysia.
Tel: +6 6767 7798
E-mail: OngJunJean@imu.edu.my

followed by Southeast Asia (Iuliano *et al*, 2018). Influenza is contagious even before symptom onset and healthcare workers (HCWs) are potential carriers who can spread it in the healthcare setting (CDC, 2017b). Influenza vaccination is the most effective preventive method. The Centers for Disease Control and Prevention in the United States recommends all HCWs should receive annual influenza vaccination (CDC, 2017b). In Malaysia, the government also recommends the following groups of individuals; HCWs, elderly, children and people who plan to go on pilgrimage to receive annual influenza vaccination (Lim, 2014).

Medical students in their clinical years are also at risk for contracting and spreading influenza, similar to other HCWs. Therefore, it is important to have high influenza vaccination uptake rates among medical students. Influenza vaccination not only reduces cases of influenza but also reduces the number of sick leave days taken resulting in better school attendance and thereby better school performances among university students (Nichol *et al*, 2008).

A previous study from Malaysia assessed the knowledge and attitudes of working HCWs about influenza and influenza vaccination uptake (Hudu *et al*, 2016), but the knowledge, attitudes and practices about influenza and influenza vaccination have not been previously studied among medical students in Malaysia. We aimed to assess the knowledge of medical students regarding influenza, influenza vaccination, their intention to be vaccinated and the prevalence of influenza- type symptoms among medical students.

MATERIALS AND METHODS

Study population

All medical students enrolled full time in a five-year undergraduate medical program at the International Medical University, Kuala Lumpur, Malaysia were invited to participate in the study. The undergraduate program consists of preclinical years for 2 years 6 months, followed by clinical years for 2 years 6 months. Influenza vaccination is recommended for all medical students by Centers for Disease Control and Prevention (2017a) but not mandatory at the study institution. Interested students have to purchase the vaccine at the university healthcare clinic or from a registered health practitioner.

Questionnaire

An anonymous questionnaire was made available to all students through "SurveyMonkey' (SurveyMonkey.com, LLC, USA) between August 2017 and November 2017 for all medical students at the study institution; a link to the questionnaire was given to all the students and for those who preferred a paper questionnaire, it was made available. The questionnaire consisted of demographic questions, smoking status, exposure to cigarette smoke and presence of medical problems. The questionnaire also contained 17 knowledge statements about influenza and influenza vaccinations covering data from international and local guidelines (Lim, 2014; CDC, 2017a) and a literature search regarding influenza vaccination (Nichol *et al*, 2008; Walker *et al*, 2016). Students were asked to determine if the statements were true or false. The questionnaires also asked about a history of an influenza like illness during the previous 6 months, the subject's influenza vaccination status, the subject's intention to get vaccinated in the future and reasons for refusing influenza vaccination. The questionnaire was pilot tested on 8 medical students. No changes

were deemed necessary.

Statistical analysis

The data were analyzed using SPSS version 25 (IBM, Armonk, NY). Descriptive statistics were used to classify the demographic data and subjects' reasons for refusing vaccination. The *t*-test was used to examine differences in influenza and influenza vaccine knowledge scores between vaccinated and non-vaccinated subjects. The chi-square test was used to examine associations between categorical variables among vaccinated and non- vaccinated subjects. Further correlational analysis using Spearman rank order was used to explore the relationship between influenza vaccine knowledge scores with influenza vaccination status and the subjects' year of study.

Ethical considerations

This study was approved by the Joint Committee for Research and Ethics, International Medical University, Malaysia. Subject participation was voluntary and completion of the questionnaire implied consent to be included in the study.

RESULTS

A total of 315 students, 128 (40.6%) males were involved in the study. The mean [± standard deviation (SD)] age of study subjects was 22 (±1.8) years; 27.6% preclinical years. Two hundred eighty-two (89.5%) had no chronic medical problems, while 22 (7.0%) had asthma, 1 (0.3%) had diabetes mellitus and 10 (3.2%) had other medical problems such as allergic rhinitis or migraine. Five point one percent of subjects smoked cigarettes and 2.2% had a roommate or partner who smokes (Table 1).

Ninety-one subjects (28.9%) reported having previously received the influenza vaccine. Those who had previously received influenza vaccination were significantly more likely to be in a preclinical study year ($p < 0.05$) or have a higher influenza knowledge score ($p< 0.05$) (Table 1). There were no significant differences in gender, living arrangements and exposure to smoke between influenza vaccinated and non-vaccinated subjects.

Knowledge scores (Table 2)

The average [± standard deviation (SD)] knowledge score was 10.65 (±3.2). Ninety-six (30.4%) subjects scored ≥75% correct answers and 242 (76.8%) scored ≥ 50% correct answers. However, only 94 (29.8%) subjects knew that "It is recommended that I receive influenza vaccination every year" and 68 (21.6%) does not believe that "There is a risk of getting influenza-like illness from influenza vaccination". The mean knowledge scores were also significantly higher among the vaccinated group (11.5 *vs* 10.3, $p<0.05$) and the clinical year students (11.1 *vs* 9.5, $p< 0.001$).

Correlational studies indicate that the knowledge scores were positively associated with subjects who had received influenza vaccination, $r= 0.144$, $p< 0.05$ and subject's year of study, $r = 0.188$, $p< 0.01$. Therefore, subjects who had been vaccinated against influenza and students in their clinical years were more knowledgeable about influenza vaccine.

Influenza-like illness during the previous 6 months

One hundred four subjects (33.1%) had one or more ILI during the previous 6 months. The effects of ILI on study subjects during the previous 6 months are presented in Table 3. Significantly more ($p<0.01$) clinical year students (27.7%) than preclinical year students (5.4%) had an ILI during the previous 6 months.

Table 1
Selected characteristics of study subjects.

Characteristics	Vaccinated	Non-vaccinated	*p*-value
Age, mean (± SD)	21.8 (2.0)	22.0 (1.6)	NS
Gender, *n* (%)			NS
Female	53 (28.2)	134 (71.8)	
Male	38 (29.7)	90 (70.3)	
Race, *n* (%)			<0.05
Chinese	45 (23.8)	144 (76.2)	
Indian	19 (35.2)	35 (64.8)	
Malay	18 (22.0)	23 (88.0)	
Others	9 (29.0)	22 (71.0)	
Study year, *n* (%)			<0.05
Preclinical	35 (40.2)	52 (59.8)	
Clinical	56 (24.6)	172 (75.4)	
Comorbids, *n* (%)			NS
None	80 (28.3)	202 (71.6)	
Asthma	7 (31.8)	15 (68.2)	
Others	4 (36.4)	7 (63.6)	
Living arrangements, *n* (%)			NS
Living alone	71 (30.0)	166 (70.0)	
1 roommate	12 (27.3)	32 (72.7)	
≥ 2 roommates	8 (23.5)	26 (76.5)	
Exposure to smoke, *n* (%)			NS
None	82 (28.1)	210 (71.9)	
I smoke	6 (37.5)	10 (62.6)	
Partner or roommate smoke	3 (42.9)	4 (57.1)	
Knowledge scores, mean (± SD) (Maximum score=17)	11.4 (2.5)	10.3 (3.3)	<0.05
ILI in the previous 6 months, *n* (%)			NS
None	62 (29.4)	149 (70.6)	
Yes	29 (27.9)	75 (72.1)	
1 episode	15 (28.8)	37 (71.2)	
2 episodes	8 (23.5)	26 (76.5)	
>2 episodes	6 (33.3)	12 (66.7)	

ILI, influenza like-illness; NS, not significant; SD, standard deviation.

However, there was no significant difference (p=0.802) between the vaccinated subjects (9.2%) and non-vaccinated subjects (23.6%) in the occurrence of ILI during the previous 6 months. There was also no significant association between smoking exposure or living arrangements and the number of ILI episodes in the previous 6 months.

Intention to be vaccinated

Among the non-vaccinated subjects,

Table 2
Study subjects' knowledge of influenza and influenza vaccination.

Knowledge statements	Correct responses		
	Vaccinated *n* (%)	Not vaccinated *n* (%)	Total *n* (%)
1. Influenza is a highly contagious virus.	85 (27.0)	201 (63.8)	286 (90.8)
2. Influenza infection can be treated with antibiotics.	75 (23.8)	186 (59.0)	261 (82.8)
3. Influenza infection is benign and self-limiting in all age groups.	68 (21.6)	146 (46.3)	214 (67.9)
4. The spread of influenza infection can be reduced through hand washing and practicing cough etiquette.	83 (26.3)	204 (64.8)	287 (91.1)
5. It is recommended that I receive the influenza vaccine every year.	36 (11.4)	58 (18.4)	94 (29.8)
6. Ministry of Health Malaysia highly recommends annual influenza vaccination to all healthcare workers.	42 (13.3)	90 (28.6)	132 (41.9)
7. Pregnant women are recommended to receive influenza vaccine.	42 (13.3)	71 (22.5)	113 (35.8)
8. Healthy older adults (>50 years old) do not need influenza vaccination, as they rarely get sick from influenza.	60 (19.0)	136 (43.2)	196 (62.2)
9. I am at risk of influenza during my clinical years in medical school.	72 (22.9)	153 (48.6)	225 (71.5)
10. I am at risk of transmitting influenza to my household contacts.	73 (23.2)	148 (47.0)	221 (70.2)
11. I am at risk of transmitting influenza to my patients.	74 (23.5)	167 (53.0)	241 (76.5)
12. Health care workers are a source of infection for their patients.	77 (24.4)	163 (51.7)	240 (76.1)
13. I had influenza infection before therefore I do not need the influenza vaccination.	74 (23.5)	152 (48.3)	226 (71.8)
14. There is a risk of getting influenza- like illness from the influenza vaccination.	23 (7.3)	45 (14.3)	68 (21.6)
15. I may still get flu symptoms even though I have received influenza vaccination.	78 (24.8)	180 (57.1)	258 (81.9)
16. In some health situations, influenza vaccines should not be given.	48 (15.2)	112 (35.6)	160 (50.8)
17. Influenza vaccination should be initiated in the first week of life.	36 (11.4)	81 (25.7)	117 (37.1)

Table 3
Effects of influenza like-illness on study subjects during the previous 6 months.

Factors	Yes, *n* (%)	No, *n* (%)
Have you missed class due to an ILI?	35 (33.7)	69 (66.3)
Did you perform poorly in class due to an ILI?	35 (33.7)	69 (66.3)
Did you perform poorly on an exam due to an ILI?	18 (17.3)	86 (82.7)
Have you visited a health care provider for an ILI?	39 (37.5)	65 (62.5)

ILI, influenza like-illness.

36.8% intended to get vaccinated in the next 3 months. Subjects (68.3 %) who agreed with the statement, "Influenza vaccination should be compulsory for all medical students", were significanlty more likely to be vaccinated during the next 3 months ($p< 0.05$). The reasons given for not being vaccinated are shown in Fig 1. The most common reasons given for not being vaccinated were: I am healthy (29.5%), no time (28.1%), vaccine cost (14.4%), not being recommended by own doctor (8.6%) and belief the vaccine is ineffective (7.2%). A few students were afraid of needles, had little knowledge about influenza vaccine.

Ninety-one (28.9%) of subjects had previously received influenza vaccination. Seventy(76.9%) subjects who had been previously vaccinated reported their last influenza vaccination was greater than one year previously and 51(56%) reported their last influenza vaccination was greater than 3 years previously. In addition, 21(23.1%) subjects were vaccinated less than a year previously (data not shown).

DISCUSSION

In this study, we found that the influenza vaccination rate among study subjects was low (28.9%). Among those vaccinated, 76.9% had not updated their annual influenza vaccination and among the subjects who had not been vaccinated, 63.2% had no intention of being vaccinated in the next 3 months. A higher vaccination rate among medical students was associated with higher influenza vaccine knowledge scores.

Influenza vaccination uptake is generally low among medical students in various universities worldwide. The numbers are variable and is influenced greatly by the countries health guidelines and the universities involvement in persuading medical students to receive influenza vaccination. Australia has one of the highest reported influenza vaccination uptake with 86.6% of medical students reported to have ever received influenza vaccine (Walker *et al*, 2016). Other countries like Italy (Gallone *et al*, 2017) reported a much lower uptake rate of 20.9%, Greece (Mavros *et al*, 2010) reported an 8% uptake rate and China (Tuohetamu *et al*, 2017) reported 17.1% students ever receiving an influenza vaccine. Health professional universities in the United States (18.4%) have begun to incorporate influenza vaccination into the university entry requirements (Miller *et al*, 2011), therefore requiring students to provide proof of influenza vaccination. In Australia, free influenza vaccines are offered in on campus clinics (Walker *et al*, 2016) as an effort to improve influenza vaccination uptake. Free vaccine cost and the convenience of an on campus clinics

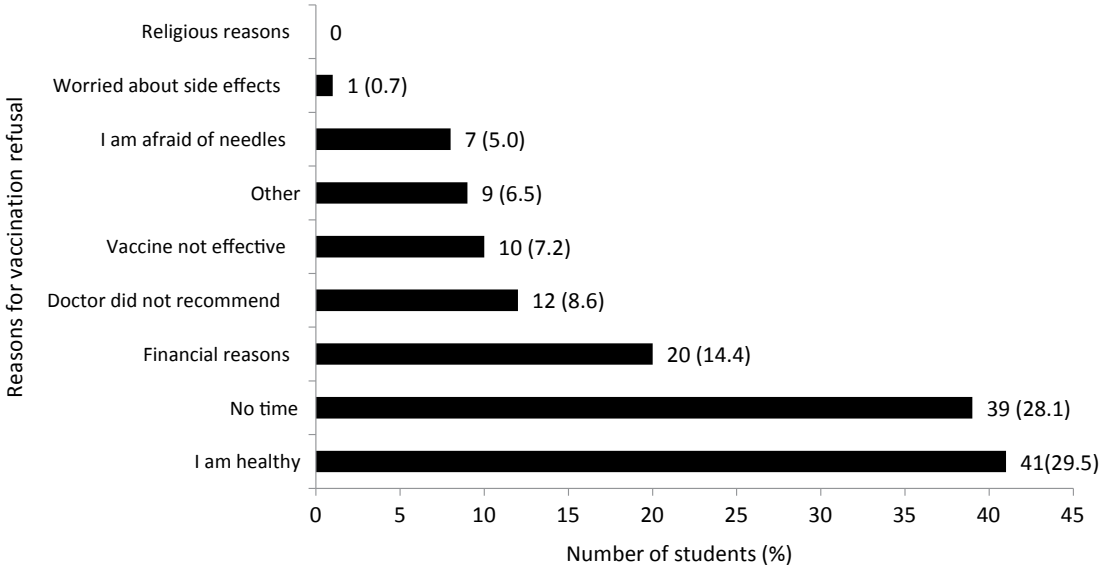

Fig 1-Reasons given by subjects for not having influenza vaccination.

have removed the excuses of influenza vaccine refusal among medical students. The universities further increased their efforts by actively promoting influenza vaccination through social media, campaigns and educational trainings (Walker *et al*, 2016; Gallone *et al*, 2017).

In Malaysia, national and international guidelines recommend annual influenza vaccination for all health care workers including medical students (Lim, 2014; CDC, 2017b). A local study reported that 51.4% of health care workers in Malaysia were vaccinated against influenza (Hudu *et al*, 2016) but there are no published studies of influenza vaccination rates among medical students in Malaysia. Our study is the first of its kind in Malaysia and it indicates a need to improve vaccination rates in this group. Influenza vaccination during medical school years will create a habit of annual influenza vaccination that continues in their professional life. Cornally *et al* (2013) found that nursing students vaccinated against influenza during university years were more likely to continue to be vaccinated during their professional years. A previous history of vaccination is associated with an intention to be vaccinated again thus stressing the importance of incorporating vaccination during university years (Machowicz *et al*, 2010; Abalkhail *et al*, 2017).

Knowledge about influenza and influenza vaccination is associated with vaccine acceptance by healthcare workers. Studies among healthcare workers found that inadequate knowledge about influenza was a barrier to be vaccinated and in recommending others to be vaccinated (Martinello *et al*, 2003; Esposito *et al*, 2007). Poor knowledge about influenza may lead to the misconception that they are not at risk for contracting infection, that influenza is a mild disease, that the influenza vaccine is ineffective or that it has many side effects (Wicker *et al*, 2013; Abalkhail *et al*, 2017). These are similar common

reasons given by our study subjects for not being vaccinated. Other reasons given by university students for not being vaccinated include inconvenience, not being recommended by the university or doctor and having inadequate time (Takayanagi *et al*, 2007; Lee *et al*, 2012; Wicker *et al*, 2013; Walker *et al*, 2016; Abalkhail *et al*, 2017).

Many of our study subjects had poor knowledge about influenza and influenza vaccination. Clinical year medical students in this study had better knowledge level of influenza vaccination compared to preclinical student. These knowledge gap will be an area for improvement that will be major drivers for students to obtain influenza vaccination (Cornally *et al*, 2013; Wicker *et al*, 2013; Walker *et al*, 2016). Therefore, interventions aim to increase influenza vaccine knowledge among medical students early on in their medical education could address many of the reasons given for not being vaccinated in our study except cost and convenience which needs to be address by the university. The benefits of improving medical students' knowledge about influenza will additionally influence friends and colleagues to also be vaccinated (Takayanagi *et al*, 2007; Machowicz *et al*, 2010).

Preclinical year subjects in our study were more likely to be vaccinated against influenza, possibly because the healthcare clinic for student is at the university preclinical campus, giving easier access to preclinical students. No student healthcare clinic is available on the clinical campus. The neighboring teaching national hospital does not provide influenza vaccines for the public, hence clinical students who wish to be vaccinated would need to go to the preclinical campus healthcare clinic or other private clinics in the vicinity which may be an inconvenience. Their misperception of low self-risk with possibly poor encouragement from all sides are reasons for their poor personal motivation. Religious reason was not a barrier, which is an encouraging progress towards decreasing vaccine misconception.

Influenza vaccination is recommended for healthcare workers to reduce the number of influenza episodes and the risk of transmission to vulnerable patients. In one study (Chiu *et al*, 2017), 21.6% of US healthcare personnel interviewed, reported working while suffering with ILI during the 2014-2015 influenza season. Several studies (Nichol *et al*, 2005; Tan *et al*, 2015) also reported 25-36% of various university students interviewed to have ILI during the period of 2002-2009. In Malaysia, ILI rates from May to September 2005 among unvaccinated dental students were reported to be 33.5% (Hui *et al*, 2008). Similarly, a third (33%) of our study subjects contracted ILI during the last 6 months prior to the study period and they may had attended teaching sessions despite being unwell to avoid being reprimanded.

Steps should be taken to resolve the problem of low uptake of influenza vaccination among medical students. This study stressed the important of improving their knowledge about influenza and influenza vaccine. This can be achieved by incorporating the topic in the syllabus during early preclinical years (Afonso *et al*, 2013) and stressing the importance repeatedly during clinical years. The university healthcare staff should further strive to be influential role models and advocate for influenza vaccination.

Our study had several limitations; the numbers of preclinical and clinical subjects were not the same, therefore, under-representing the preclinical year subjects. The data were also self-reported by subjects which may be affected by

subject bias and our study cohort does not represent other institution in Malaysia.

In our study, influenza vaccine knowledge was inadequate among the study subjects and uptake of influenza vaccine was poor, partly due to inadequate knowledge and also other factors such as vaccine cost, inconvenience of getting vaccinated and lack of recommendations by doctors. These factors need to be remedied by changes made by the institution in the study program, the healthcare clinic and at the university and national level to help ensure that influenza vaccine is more affordable to students. Further studies are needed to determine if these efforts will be effective or not.

ACKNOWLEDGEMENTS

We thank all the medical students who contributed their time to complete the questionnaire. This study was funded by International Medical University, Malaysia.

REFERENCES

Abalkhail MS, Alzahrany MS, Alghamdi KA, *et al*. Uptake of influenza vaccination, awareness and its associated barriers among medical students of a University Hospital in Central Saudi Arabia. *J Infect Public Health* 2017; 10: 644-8.

Afonso N, Kavanagh M, Swanberg S. Improvement in attitudes toward influenza vaccination in medical students following an integrated curricular intervention. *Vaccine* 2014; 32: 502-6.

Centers for Disease Control and Prevention (CDC). Key facts about influenza (flu). Atlanta: CDC, 2017a. [Cited 2018 Apr 8]. Avaiable from: https://www.cdc.gov/flu/keyfacts.htm

Centers for Disease Control and Prevention (CDC). Influenza vaccination information for health care workers. Atlanta: CDC, 2017b. [Cited 2018 Apr 8]. Available from: https://www.cdc.gov/flu/healthcare-workers.htm

Chiu S, Black CL, Yue X, *et al*. Working with influenza-like illness: presenteeism among US health care personnel during the 2014-2015 influenza season. *Am J Infect Control* 2017; 45: 1254-8.

Cornally N, Deasy EA, McCarthey G, McAuley C, Moran J, Weathers E. Student nurses' intention to get the influenza vaccine. *Br J Nursing* 2013; 22: 1207-11.

Esposito S, Tremolati E, Bellasio M, *et al*. Attitudes and knowledge regarding influenza vaccination among hospital health workers caring for women and children. *Vaccine* 2007; 25: 5283-9.

Gallone MS, Gallone MF, Cappelli MG, *et al*. Medical students' attitude toward influenza vaccination: results of a survey in the University of Bari (Italy). *Hum Vaccin Immunother* 2017; 13: 1937-41.

Hudu SA, Harmal NS, Malina O, Sekawi Z. Influenza vaccination among Malaysian healthcare workers: a survey of coverage and attitudes. *Med J Malaysia* 2016; 71: 231-7.

Hui LS, Rashwan H, bin Jaafar MH, Hussaini HM, Isahak DI. Effectiveness of influenza vaccine in preventing influenza-like illness among Faculty of Dentistry staff and students in Universiti Kebangsaan Malaysia. *Healthcare Infect* 2008; 13: 4-9.

Iuliano AD, Roguski KM, Chang HH, *et al*. Estimates of global seasonal influenza-associated respiratory mortality: a modelling study. *Lancet* 2018; 391(10127): 1285-300.

Lee SI, Aung EM, Chin IS, *et al*. Factors affecting medical students' uptake of the 2009 pandemic influenza A (H1N1) vaccine. *Influenza Res Treat* 2012; 2012: 753164.

Lim VKE. Guidelines for adult immunisation. 2nd ed. Kuala Lumpur: Malaysian Society of Infectious Diseases and Chemotherapy, 2014: 77-83.

Machowicz R, Wyszomirski T, Ciechanska J, *et al*. Knowledge, attitudes, and influenza vaccination of medical students in Warsaw, Strasbourg, and Teheran. *Eur J Med Res* 2010;15: 235.

Martinello RA, Jones L, Topal JE. Correlation between healthcare workers' knowledge of influenza vaccine and vaccine receipt. *Infect Contr Hospl Epidemiol* 2003; 24: 845-7.

Mavros MN, Mitsikostas PK, Kontopidis IG, Moris DN, Dimopoulos G, Falagas ME. H1N1v influenza vaccine in Greek medical students. *Eur J Public Health* 2010; 21: 329-32.

Miller BL, Lindley MC, Ahmed F, Wortley PM. Student immunity requirements of health professional schools: vaccination and other means of fulfillment—United States, 2008. *Infect Control Hosp Epidemiol* 2011; 32: 908-11.

Nichol KL, Heilly SD, Ehlinger E. Colds and influenza-like illnesses in university students: impact on health, academic and work performance, and health care use. *Clin Infect Dis* 2005; 40: 1263-70.

Nichol KL, D'Heilly S, Ehlinger EP. Influenza vaccination among college and university students: impact on influenza like illness, health care use, and impaired school performance. *Arch Pediatr Adoles Med* 2008; 162: 1113-8.

Takayanagi IJ, Cardoso MR, Costa SF, Araya ME, Machado CM. Attitudes of health care workers to influenza vaccination: why are they not vaccinated?. *Am J Infect Control* 2007; 35: 56-61.

Tan AL, Virk RK, Tambyah PA, *et al*. Surveillance and clinical characterization of influenza in a university cohort in Singapore. *PLOS One* 2015; 10: e0119485.

Tuohetamu S, Pang M, Nuer X, *et al*. The knowledge, attitudes and practices on influenza among medical college students in Northwest China. *Hum Vaccin Immunother* 2017; 13: 1688-92.

Walker L, Newall A, Heywood AE. Knowledge, attitudes and practices of Australian medical students towards influenza vaccination. *Vaccine* 2016; 34: 6193-9.

Wicker S, Rabenau HF, von Gierke L, Francois G, Hambach R, De Schryver A. Hepatitis B and influenza vaccines: important occupational vaccines differently perceived among medical students. *Vaccine* 2013; 31: 5111-7.