



Differences in Perspective Toward Organ Donation Between Second-Year and Final-Year Medical Students in a Thai Medical School

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Abstract

Medical students, as prospective physicians, should develop a good attitude toward organ donation since physicians can positively affect the decision to donate organs. This study compared perspectives toward organ donation between Thai second-year and final-year (sixth-year) medical students, and explored changes that might occur during medical school training. Second-year and final-year medical students at the Faculty of Medicine Siriraj Hospital, Mahidol University, were invited to participate in the survey. The demographic data of the participants were collected and the attitudes toward organ donation were measured from the questionnaire. In total, 89 second-year and 60 final-year medical students voluntarily enrolled in the study. Nearly all the participating medical students supported organ donation and were willing to donate their organs after death. The majority of participants had a positive attitude toward organ donation in many perspectives, e.g., their beliefs, family issues, and donation procedure. There was a statistical difference between the proportion of second-year and final-year students who supported that a brain death condition is a true death (59.6% and 93.3%, respectively, $p < 0.001$) and who did not feel uncomfortable mentioning organ donation (82.0% and 96.7%, respectively, $p = 0.007$). In conclusion, there were significant differences in perspective between second-year and final-year students regarding brain death and discomfort perceived during organ donation-related situations. Experience gained during medical school could generate a more positive attitude toward organ donation. Therefore, medical schools play an essential role in nurturing a positive perspective toward organ donation in future physicians.

Keywords Organ donation · Medical student · Awareness · Brain death

Introduction

Organ transplantation is the only treatment available for patients suffering from organ failure, such as heart failure and liver failure. Organ transplantation is also the best alternative for end-stage renal disease patients in terms of improving their quality of life and treatment cost-effectiveness [1]. In Thailand, from 1994 to 2019, despite there being more than 6700 cases of organ transplantation, there was still a scarcity of deceased donated organs. This scarcity creates a backlog problem as the number of organ recipients has tremendously

increased in recent years, with the consequence that each recipient now expects to have to wait for a long period of time before a suitable organ becomes available. The average waiting times for obtaining a deceased donated kidney and liver are 954 and 256 days, respectively. Some of these patients may not tolerate and pass away before receiving the organ. In recent years, the number of organ donations has increased but is still insufficient to meet the transplantation demand [2].

Physicians play many active roles in the organ procurement procedure [3], such as identifying potential donors, diagnosing brain death, and communicating with relatives to obtain permission [4]. Hence, physicians play critical roles in this process. The organ donation rate can be improved by physicians having a well-established relationship with patients and their relatives. With proper communication skills, such as displaying empathy and providing adequate information, physicians can positively affect the decision to donate an organ of a deceased [5, 6].

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Medical students, as prospective physicians, should also have a good attitude toward organ donation. Medical schools aim to help students cultivate sound knowledge and a positive attitude during their studies. Thus, the development of a positive attitude toward organ donation in medical school could influence the practice of physicians in counseling patients or their relatives about organ donation. There are many reports regarding the attitudes toward organ donation of medical students from various countries. Most surveys were conducted in countries where Islam or Christianity is their largest religion, unlike Thailand where Buddhism is the largest religion. However, to the best of our knowledge, no studies have yet been performed assessing the attitude of medical students toward organ donation in Thailand or any Buddhist-majority countries. Consequently, this study aimed to investigate the Thai medical students' attitude toward organ donation and their willingness to be organ donors themselves. Moreover, this study also compared the findings between second-year medical students who had just started pre-clinical classes and sixth-year (final-year) medical students undertaking clerkship training toward becoming independent general practitioners.

Methods

The survey was designed as a cross-sectional study which was conducted among second-year and sixth-year medical students from the same medical institution through voluntary completion of a 24-item electronic questionnaire. The study was approved by the Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand.

Study Population

The study population comprised second-year medical students and sixth-year medical students who were enrolled at the Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand, in the 2018 academic year. The second-year medical students had just started the first year of their pre-clinical course, while the sixth-year (final-year) medical students were almost finishing medical school and had already learned about brain death and organ donation procedures in a prior forensic medicine class during their fifth-year training.

The participants were recruited through convenience sampling. Participation in the survey was voluntary. A brief explanation about the survey was given, and the students were required to electronically sign a consent form before starting the questionnaire. The participants were reassured of the confidentiality of their data by ensuring the data collected showed no connection between the signed consent form and the answered questionnaire.

Questionnaire

The literature review of attitude toward organ donation in medical students was conducted before designing the questionnaire. Information obtained from various surveys was used in drafting the questionnaire to cover broad topics which might influence the perspective on organ donation. The questionnaire was evaluated by two medical education experts and one legal medicine expert before conducting the survey. The designed 24-item questionnaire was composed of two parts. The first part was designed to collect the demographic data of the participants, including their gender, year of study, religion, region of origin, and region where they attended upper secondary school (5 items). The second part consisted of 19 items measuring the participants' attitudes toward organ donation. In this second part, 13 items were measured with a 4-point Likert scale (strongly agree, agree, disagree, and strongly disagree) and 6 items were measured as yes or no responses. For 4-point Likert scale items, respondents will be categorized as supporters if they agree or strongly agree with the argument or opposers if they disagree or strongly disagree.

Statistical Analysis

Quantitative data were presented as the frequency and percentage. The differences between groups were analyzed by using a chi-square test performed in Microsoft Excel 2013 (Microsoft Corporation, Redmond, WA, USA). The difference was considered statistically significant if the p value was less than 0.05 ($p < 0.05$).

Results

There are 281 second-year medical students and 286 sixth-year medical students enrolled at the Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand, in the 2018 academic year. In total, 149 students voluntarily participated in the study, comprising 89 second-year medical students and 60 sixth-year medical students. The demographic data of each group are presented in Table 1. The majority of the students were Buddhist, came from the central region of Thailand, and had completed their high school diploma in the central region of Thailand.

Nearly all the second-year ($n = 84$, 94.4%) and sixth-year ($n = 59$, 98.3%) medical students supported organ donation. The majority in both years were also willing to donate their own organs after death and register as organ donors. Most of them were also willing to receive donated organs for transplantation if needed. The number of second-year medical students who knew any person registered as an organ donor was significantly less than the case for the sixth-year

Table 1 Demographic data of the study participants

Variables	Second-year students (n = 89)	Sixth-year students (n = 60)
Gender		
Male	52 (58.4%)	30 (50.0%)
Female	37 (41.6%)	30 (50.0%)
Religion		
Buddhism	86 (96.6%)	56 (93.3%)
Christianity	0	4 (6.7%)
Islam	0	0
Others	3 (0.03%)	0
Region of origin		
Central	58 (65.1%)	43 (71.7%)
Northern	4 (4.5%)	2 (3.3%)
Northeastern	6 (6.7%)	5 (8.3%)
Eastern	3 (3.4%)	4 (6.7%)
Western	5 (5.6%)	2 (3.3%)
Southern	13 (14.6%)	4 (6.7%)
Region of high school		
Central	74 (83.1%)	54 (90.0%)
Northern	2 (2.2%)	1 (1.7%)
Northeastern	3 (3.4%)	3 (5.0%)
Eastern	1 (1.1%)	0
Western	3 (3.4%)	0
Southern	6 (6.7%)	2 (3.3%)

medical students (18.0% and 43.3%, respectively, $p = 0.002$). Furthermore, significantly fewer second-year medical students knew any transplantation-needed patients than the case for the sixth-year medical students (9.0% and 43.3%, respectively, $p < 0.001$) (Table 2).

In terms of their positive beliefs regarding organ donation, no statistically significant difference was observed between the second-year students and sixth-year students. The majority in both groups supported that the organs of the deceased should not be wasted and that the benefits of a deceased’s organs should be maximized, including the acknowledgement that this could prolong the lives of others.

Moreover, they both supported that organ donation increases the value of the donor’s life and enhances the donor’s merit (Table 3).

In regard to the negative beliefs toward organ donation, there was a statistical difference between the proportion of second-year students and sixth-year students who supported that a brain dead condition is a true death (59.6% and 93.3%, respectively, $p < 0.001$). Significantly, the number of students in the second-year students group who did not feel uncomfortable when mentioning organ donation was lower than that in the sixth-year students group (82.0% and 96.7%, respectively, $p = 0.007$). Nevertheless, the majority of both second-year ($n = 62$, 69.7%) and sixth-year ($n = 50$, 83.3%) students opposed that organ donation would disfigure the donor’s body and they would be handicapped in the next life. In addition, most of the second-year ($n = 87$, 97.8%) and sixth-year ($n = 58$, 96.7%) medical students opposed that organ donation was against their beliefs, religion, and moral values (Table 3).

Most of the families of both the second-year ($n = 80$, 89.9%) and sixth-year ($n = 54$, 90.0%) medical student were not opposed to organ donation. The majority of the second-year medical students ($n = 87$, 97.8%) and sixth-year medical students ($n = 58$, 96.7%) supported the argument that states “I would donate the organs of my deceased family members if I was asked to make such a decision.” Furthermore, most of the medical students in both years also supported the argument that states “I will donate my organs to strangers after death.” Surprisingly, a higher proportion of sixth-year medical students opposed that physicians might undertreat patients who are organ donors compared to second-year students, but the difference was not statistically significant (83.3% and 69.7%, respectively, $p = 0.058$).

Discussion

The demographic data of the participating second-year and sixth-year medical students revealed that most were Buddhist. From our literature review, none of the previous

Table 2 Percentage of response from yes/no questions indicating positive attitude toward organ donation

Items	Second-year students (n = 89)	Sixth-year students (n = 60)	p value
6. Support deceased organ donation	84 (94.4%)	59 (98.3%)	0.229
7. Willing to donate organ after death	69 (77.5%)	44 (73.3%)	0.557
8. Willing to register as an organ donor	75 (84.3%)	51 (85.0%)	0.904
9. Willing to receive a donated organ	57 (64.0%)	44 (73.3%)	0.234
10. Know any registered organ donors	16 (18.0%)	26 (43.3%)	0.002*
11. Know any patients who need a donated organ for transplantation	8 (9.0%)	26 (43.3%)	<0.001*

*Statistically significant question ($p < 0.05$)

Table 3 Percentage of respondents who support (agree and strongly agree) arguments related to organ donation

Items	Second-year students (<i>n</i> = 89)	Sixth-year students (<i>n</i> = 60)	<i>p</i> value
Positive beliefs			
12. The organs of the deceased should not be wasted but their benefits should be maximized	82 (92.1%)	58 (96.7%)	0.254
13. Organ donation enhances a donor's merit	70 (78.7%)	50 (83.3%)	0.479
14. Organ donation could prolong another's life	89 (100.0%)	59 (98.3%)	0.222
15. Organ donation increases the value of a donor's life	74 (83.1%)	46 (76.7%)	0.327
Negative beliefs			
16. Organ donation will not disfigure the donor's body	62 (69.7%)	50 (83.3%)	0.058
17. In the next life, the donor will not be handicapped	86 (96.6%)	59 (98.3%)	0.528
18. Brain death condition is a true death	53 (59.6%)	56 (93.3%)	<0.001*
19. Thinking or talking about organ donation is not an uncomfortable situation	73 (82.0%)	58 (96.7%)	0.007*
20. Organ donation is not against your beliefs, religion, and moral values	87 (97.8%)	58 (96.7%)	0.687
Family issues			
21. Your family is not against organ donation	80 (89.9%)	54 (90.0%)	0.982
22. I will donate deceased family member's organs if I was asked to make such a decision	87 (97.8%)	58 (96.7%)	0.687
Donation procedure			
23. It is not possible that physicians would undertreat patients who are donors	62 (69.7%)	50 (83.3%)	0.058
24. I will donate my own organs to strangers after death	71 (79.8%)	47 (78.3%)	0.832

*Statistically significant argument ($p < 0.05$)

studies covered a Buddhist-majority population since most previous studies were conducted in Christian-majority Western countries or Muslim-majority Middle Eastern countries. Therefore, to the best of our knowledge, this study is the first survey in a Buddhist-majority country. Although there is no clear concept of brain death in Buddhism, organ donation can be considered an act of generosity and selflessness and could enhance a donor's merit which will bring good fortune in the present life and improve the conditions of the next life.

This survey found that nearly all the medical students supported organ donation, which was similar to the findings from the studies conducted in other countries. When asked about the students' willingness to donate their own organs, most of the students agreed, without any significant difference between the second-year students and sixth-year students. Interestingly, the result from this study about organ donation willingness from item 7 was higher than in most studies conducted in Asia, such as 44.9% in Pakistan [7], 45% in Japan [8], and 50% in Turkey [9]. The result was similar to that of a study conducted in Malaysia (72.7%) [10] but lower than that of a study conducted in Iran (85%) [11]. However, the results were lower than reported in most of the studies in Western countries, such as 86% in the USA [12], 88.6% in Puerto Rico [13], 81.9% in Argentina [14], 81.4% in Romania [15], 93% in Poland [16], 81.1% in France [17], and 80% in the Netherlands [18]. Therefore, there is still room for improvement in terms of Thai medical students' willingness to donate their own organs.

Although the majority of students from both years were willing to receive organ transplantation from donors in item 9, the rate was still lower than in Turkey (89.0%) [9] and the UK (89.7%) [19]. The number of sixth-year medical students who knew a registered organ donor from item 10 was significantly higher than for the second-year medical students. The same trend was observed in the number of students who knew a patient with organ failure waiting for transplantation in item 11. The students' clinical exposure during their clinical years could explain this outcome. Patient contact is inevitable during patient ward rotation. Thus, medical students in their clinical years will have more clinical experience than those in their pre-clinical years and will have encountered a greater variety of patients, including possible patients needing organ transplantation.

Most of the medical students in both years shared positive beliefs about organ donation, without any significant difference. The study result of item 14 about prolongation of another's life was the same as that found in other countries. In Puerto Rico [13] and Croatia [20], most medical students agreed that organ donation will prolong the recipient's life. Turkish medical students who consented to donate their own organs mostly gave the reason that it was an act that could help save another person's life (90.5%) [9]. A survey among medical students in the Netherlands indicated that altruism was the most common reason cited by medical students for being organ donors (76%) [18]. A study in medical schools in Spain also revealed that solidarity with patients was the

highest reason cited by medical students for their support of organ donation (67%) [21].

There was a significant difference between the second-year and sixth-year students concerning brain death knowledge in item 18. Interestingly, brain death skepticism remains a negative influence on many people's refusal to donate organs. In one study, half of the medical undergraduates from an Italian university who had a negative attitude toward organ donation had questions about the validity of brain death [22]. The most common reason for organ donation refusal among medical students in Argentina is a fear that a condition with brain death might not be a true death, and indeed, the understanding of the concept of brain death was also significantly different between donor and non-donor groups [14]. The acceptance of brain death as true death by medical students was also reported to be low in reports from Japan (46%) [8] and the UK (61%) [19]. Nevertheless, studies in Spain [23] and the USA [24] revealed that medical students in higher years understand brain death significantly better than medical students in lower years. At the Faculty of Medicine Siriraj Hospital, medical students learn about brain death and organ donation during forensic medicine rotation in their fifth year of training. Therefore, from our study and other reports, understanding brain death concepts can be nurtured by medical education.

Furthermore, a significant difference was observed regarding the perception of mentioning organ donation in item 19. More medical students in the sixth year were comfortable in this situation than in the second year, which could be explained by the greater accumulation of clinical experience of the sixth-year students during their clinical clerkship. During their clinical clerkship, medical students can observe physicians discussing treatment plans with patients and relatives. The discussed topics may include invasive procedures to be performed in life-threatening situations where some difficult issues may need to be decided on, such as permission to perform cardiopulmonary resuscitation or endotracheal tube intubation. Medical students can garner experience and familiarity with various formidable situations, possibly including organ donation. Interestingly, a study in Hong Kong medical students pinpointed that discomfort with this issue negatively impacted their attitude toward organ donation [25]. Therefore, medical students should be acquainted with organ donations during their study in medical school to help them generate a more favorable attitude toward organ donation in the future.

In terms of other negative beliefs, there were no significant differences between the second-year and sixth-year medical students. Although the need to maintain an intact body that aligns with item 16 was one of the reasons for organ donation refusal in Turkey [9] and the Netherlands [18], our results followed the same trend as reported in studies in Puerto Rico [13] and Greece [26], in which medical students believed that it was not mandatory for deceased

bodies to remain intact. The majority of students in our study also believed that organ donation is not against their religion or moral values in item 20. This finding is similar to those of studies in English and Greek medical students [19, 26]. Interestingly, surveys conducted in Pakistan [7] and Iran [11] revealed that the perception of a religion's permission to donate organs influenced the student attitudes toward organ donation. Therefore, education about organ donation from the perspective of religions and beliefs may help strengthen medical students' positive attitude toward organ donation.

Regarding family issues, the result of item 21 in our study was similar to those of studies performed in Spain [21] and Hong Kong [25], which reported that the family members of medical students were not opposed to organ donation. Nearly 80% of medical students in both years in our study also reported they would donate the organs of deceased family members in item 22. Although this result was lower than in some other countries, such as Spain (90.8%) [21], Poland (91.9%) [16], and Puerto Rico (83.7%) [13], it was still higher than the results from many Western countries, such as Argentina (69.1%) [14], Romania (61.4%) [15], and the Netherlands (51.3%) [18]. Surprisingly, our result was higher compared to those of some other Asian nations, such as Japan (22%) [8], Turkey (58%) [9], Iran (70%) [11], and Hong Kong (71.3%) [25]. Hence, Thai medical students could play a positive and vital role in supporting their family decision-making process regarding donating a family member's organs.

In our study, nearly 80% of students in both years agreed they would donate their organs to strangers after death in item 24, which was similar to a study in Italy, where the majority of both pre-clinical and clinical medical students agreed they would donate any organ without any preferences [22]. The majority of students in both years in our study also believed in the integrity of attending physicians and that they would not undertreat patients who were registered as organ donors in item 23. This result followed the same trend in Hong Kong, in which only a small proportion of medical students were anxious about a premature termination of treatment in organ donors [25]. In Greece, approximately half of medical students (51.5%) were confident that being a registered organ donor would not lead to inadequate treatment [26], which was worse than our study result. Thus, prospective physicians have confidence in the adequacy of treatment received by organ donors.

The limitation of this study is the low survey participation rate which is 31.7% and 21.0% in second-year medical students and sixth-year medical students, respectively. The survey is conducted by convenience sampling which might also have several limitations such as representativeness and participation bias. Thus, the participants might represent the fraction of students who support organ donation while the opinion of non-participants who did not join the survey

remains unknown. However, the result might provide a glimpse of the attitude toward organ donation in the institution and the difference between second-year and sixth-year medical students which could be strengthened in medical school before graduation.

Conclusions

In conclusion, nearly all participating Thai medical students in the Faculty of Medicine Siriraj Hospital supported organ donation and were even willing to donate their own organs after death, including registering as an organ donor. The majority of participants had a positive attitude toward organ donation in many perspectives, such as their beliefs, family issues, and the donation procedure. However, there were two significant differences between second-year students and sixth-year students in some aspects. There was a lower percentage of sixth-year students than second-year students who disagreed that brain death is a true death and who perceived organ donation–related situations as uncomfortable, which may result from the different experience gained in clinical clerkship and in a brain death lecture. Since it is clear that medical schools play an essential role in nurturing a positive perspective toward organ donation in future physicians, organ donation and its related knowledge such as the diagnosis of brain death condition should be emphasized in multiple student learning experiences. Moreover, curriculum designers should also enhance medical students' experience in organ donation–related situations to ensure that they will be comfortable during their practice after graduation.

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Data Availability The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics Approval This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Institutional Review Board of the Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand.

Consent to Participate Informed consent was obtained from all individual participants included in the study.

Consent for Publication Not applicable.

Conflict of Interest The authors declare no competing interests.

References

1. World Health Organization. WHO Human organ transplantation. 2020. <http://www.who.int/transplantation/organ/en/>. Accessed 11 Mar 2020.
2. Thai Red Cross Society. Organ Donation Center 2019 Annual Report. 2020 <https://www.organdonate.in.th/assets/files/odc2562.pdf>. Accessed 11 Mar 2020.
3. Williams MA, Lipsett PA, Rushton CH, et al. The physician's role in discussing organ donation with families. *Crit Care Med*. 2003;31(5):1568–73.
4. Matesanz R, Domínguez-Gil B, Coll E, et al. Spanish experience as a leading country: what kind of measures were taken? *Transpl Int*. 2011;24:333–43.
5. Bocci MG, D'Alò C, Barelli R, et al. Taking care of relationships in the intensive care unit: positive impact on family consent for organ donation. *Transplant Proc*. 2016;48:3245–50.
6. Birtan D, Arslantas MK, Dincer PC, et al. Effect of interviews done by intensive care physicians on organ donation. *Transplant Proc*. 2017;49:396–8.
7. Ali N, Qureshi A, Jilani B, Zehra N. Knowledge and ethical perception regarding organ donation among medical students. *BMC Med Ethics*. 2013;14.
8. Ohwaki K, Yano E, Shirouzu M, et al. Factors associated with attitude and hypothetical behaviour regarding brain death and organ transplantation: comparison between medical and other university students. *Clin Transplant*. 2006;20:416–22.
9. Naçar M, Çetinkaya F, Baykan Z, Elmali F. Knowledge attitudes and behaviors about organ donation among first- and sixth-class medical students: a study from Turkey. *Transplant Proc*. 2015;47:1553–9.
10. Tumin M, Tafran K, Tang LY, et al. Factors associated with medical and nursing students' willingness to donate organs. *Medicine (Baltimore)*. 2016;95: e3178.
11. Tagizadieh A, Shahsavari Nia K, Moharamzadeh P, et al. Attitude and knowledge of medical students of Tabriz University of Medical Sciences regarding organ donation. *Transplant Proc*. 2018;50:2966–70.
12. Essman C, Thornton J. Assessing medical student knowledge, attitudes, and behaviors regarding organ donation. *Transplant Proc*. 2006;38:2745–50.
13. Marqués-Lespier JM, Ortiz-Vega NM, Sánchez MC, et al. Knowledge of and attitudes toward organ donation: a survey of medical students in Puerto Rico. *P R Health Sci J*. 2013;32:187–93.
14. Atamañuk AN, Ortiz Fragola JP, Giorgi M, et al. Medical students' attitude toward organ donation: understanding reasons for refusal in order to increase transplantation rates. *Transplant Proc*. 2018;50:2976–80.
15. Jung H. Reluctance to donate organs: a survey among medical students. *Transplant Proc*. 2013;45:1303–4.
16. Rydzewska M, Drobek NA, Małyszko ME, et al. Opinions and attitudes of medical students about organ donation and transplantation. *Transplant Proc*. 2018;50:1939–45.
17. Mekahli D, Liutkus A, Fargue S, et al. Survey of first-year medical students to assess their knowledge and attitudes toward organ transplantation and donation. *Transplant Proc*. 2009;41:634–8.
18. Figueroa CA, Mesfum ET, Acton NT, Kunst AE. Medical students' knowledge and attitudes toward organ donation: results of a Dutch survey. *Transplant Proc*. 2013;45:2093–7.
19. Bedi KK, Hakeem AR, Dave R, et al. Survey of the knowledge, perception, and attitude of medical students at the University of Leeds toward organ donation and transplantation. *Transplant Proc*. 2015;47:247–60.
20. Topic I, Brkljacic T, Grahovac G. Survey of medical students about attitudes toward organ donation. *Dialysis Transplant*. 2006;35:571–8.

21. Ríos A, López-Navas A, López-López A, et al. A multicentre and stratified study of the attitude of medical students towards organ donation in Spain. *Ethn Health*. 2019;24:443–61.
22. Burra P, De Bona M, Canova D, et al. Changing attitude to organ donation and transplantation in university students during the years of medical school in Italy. *Transplant Proc*. 2005;37:547–50.
23. Ríos A, López-Navas A, López-López A, et al. Do Spanish medical students understand the concept of brain death? *Prog Transplant*. 2018;28:77–82.
24. Tawil I, Gonzales SM, Marinero J, et al. Do medical students understand brain death? A survey study *J Surg Educ*. 2012;69:320–5.
25. Chung CK, Ng CW, Li JY, et al. Attitudes, knowledge, and actions with regard to organ donation among Hong Kong medical students. *Hong Kong Med J*. 2008;14:278–85.
26. Symvoulakis EK, Rachiotis G, Papagiannis D, et al. Organ donation knowledge and attitudes among health science students in Greece: emerging interprofessional needs. *Int J Med Sci*. 2014;11:634–40.

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