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Validity and Reliability of the HAIs-IPC Learning Experiences Questionnaire among nursing students in Vietnam

Authors: Truong Tuan Anh^{1*}, Marja Silén-Lipponen², Dinh Thi Dieu Hang³, Sabo Ojano⁴, Vannarith Nhem⁵, PrevInf Group⁷ and João Graveto⁷.

¹ Nam Dinh University of Nursing, Nam Dinh, Vietnam;

² Savonia University of Applied Sciences, Health and Social Care, Kuopio, Finland

³ Hai Duong Medical Technical University, Hai Duong, Vietnam

⁴ International University, Phnom Penh, Cambodia

⁵ Bolyo Institute, Phum Ou Rung, Cambodia;

⁶ see Acknowledgments for contributors;

⁷ Health Sciences Research Unit: Nursing, Nursing School of Coimbra (ESENfC), Coimbra, Portugal.

Corresponding author:

Truong Tuan Anh, MD, PhD, Researcher, Lecturer,

Nam Dinh University of Nursing, Nam Dinh city, Nam Dinh Province, 420000, Vietnam

Email: anhtt@ndun.edu.vn

Orcid ID: 0009-0006-4236-4066

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INTRODUCTION

Healthcare-associated infections (HAIs) are a major public health concern around the world. According to a report by the World Health Organization (WHO), an estimated 7-10% of all patients admitted to hospitals in developed countries will acquire at least one healthcare-associated infection, while this figure rises to 15% in developing countries (WHO, 2011). In low- and middle-income countries, the prevalence of HAIs is generally higher due to several factors, including inadequate infrastructure, poor infection control practices, and limited resources for surveillance and prevention of HAIs (Allegranzi & Pittet, 2007). The rate of infections acquired in intensive care units (ICUs) is at least 2-3 times higher than in high-income countries (Haque, Sartelli, McKimm, Abu Bakar, 2018). In Vietnam, a study by Vu Dinh Phu conducted in an adult ICU showed a high incidence of HAIs (29.5%) (Phu, 2011). HAIs can lead to significant morbidity, mortality, and economic burden, and are associated with increased healthcare costs, prolonged hospital stays (Klevens, Edwards & Richards, 2002), prolonged average hospital stay from 7 to 15 days; Increased use of antibiotics leads to increased drug resistance of microorganisms and increases the cost of treatment for an infection, often 2 to 4 times compared to cases without infection (Haque et al., 2018).

It has been emphasized that providing quality education is essential for the development of appropriate competencies, knowledge, and skills among future healthcare professionals, enabling them to provide safe and high-quality care (Bui, 2020). The Vietnamese Government has stressed the need to promote preventive health measures and strengthen epidemic surveillance, warning, and proactive disease prevention systems, which includes conducting research and establishing disease prevention and control units (Ministry of Health - Vietnam, 2019). To ensure that healthcare students receive adequate infection prevention and control training, the Ministry of Health has instructed schools to include infection prevention and control content in the curriculum (Ministry of Health - Vietnam, 2019). However, infection prevention and control training for healthcare students varies in terms of content, training methods, assessment, and accreditation, which results in different learning experiences among students regarding infection prevention and control in healthcare practice (Nguyen et al., 2020).

According to a review of the literature, there are currently no standardized measurements available to assess student learning experiences in infection prevention and control in healthcare (Hoang et al., 2021). This highlights the need for a set of reliable and valid scales to measure student learning experiences. Fortunately, the PrevInf project, with the support of the European Commission, has developed a questionnaire for evaluating learning experiences in healthcare-associated infections (HAIs) prevention and control. This questionnaire consists of a questionnaire with 24 items, covering two areas - previous experiences in infection prevention and control related to healthcare (12 items) and learning experiences in the field of HAIs prevention and control after applying the PrevInf model (12 items). The original questionnaire has already been used in several European countries with a reliability of 0.83 (Paireira et al., 2022; PrevInf, 2018). Therefore, it is a promising questionnaire to assess student learning experiences in infection prevention and control. In this study, we aim to examine the validity and reliability of the translated questionnaire in the Vietnamese context among nursing students. This study will contribute to the development of a more comprehensive understanding of learning experiences in the field of HAIs-IPC among nursing students.

METHODS

The HAIs-IPC learning experiences questionnaire

Researchers utilized the HAIs-IPC learning experiences questionnaire to evaluate the learning experiences in the field of HAIs-IPC among the participants (Paireira et al, 2022). The HAIs-IPC learning experiences questionnaire consisted of 24 items divided into two areas. The first area included 12 items related to the participants' previous experiences in the field of infection control and prevention in healthcare. The second area included 12 items related to the participants' learning experiences after applying the PrevInf model in the field of infection control and prevention in healthcare. The participants were asked to rate their level of agreement with each statement on a 7-point Likert scale, with 1 indicating "strongly disagree" and 7 indicating "strongly agree". Total scores ranged from 24 to 168, while scores on the sub-scales ranged from 12 to 84. Higher scores on the sub-scales indicated more positive learning experiences.

Study Design

The research was conducted using a cross-sectional descriptive study that involved two stages of translation and cross-cultural adaptation, and psychometric validation of the Vietnamese version of the HAIs-IPC learning experiences questionnaire.

During the initial stage, the HAIs-IPC learning experiences questionnaire was translated into Vietnamese following the cross-cultural adaptation guidelines outlined by Beaton et al. The translation process involved six steps, and two nursing experts proficient in English and knowledgeable in psychology were invited to translate the questionnaire. The research team, along with the translators, reviewed the back-translations to arrive at a consensus on the pre-final version. To evaluate the clarity and accessibility of the items, 30 nursing students were asked to answer the questionnaire within 15 minutes during the piloting step. The feedback provided by the students was used to finalize the Vietnamese version of the HAIs-IPC learning experiences questionnaire. In the second stage, psychometric validation of the Vietnamese version of the HAIs-IPC learning experiences questionnaire was conducted among nursing students from June to July 2023. This involved examining the reliability and validity of the questionnaire in the Vietnamese context.

Study setting

This study was conducted in four nursing higher education institutions in Vietnam.

Sample and sampling method

In the pilot stages of the PrevInf project, nursing students from universities were selected to participate. The inclusion criteria for the study were students who had participated in all stages of the PrevInf model, simulation pedagogy, and simulation scenario implementation. Students who were unable to complete all stages of the project were excluded from the study.

To ensure that the sample size was appropriate for the study, the researchers followed the guidelines suggested by Hair and collaborators (Hair et al., 2010), which recommended 10 participants per item. Therefore, a minimum of 240 participants would be required for the study. In the end, 430 students participated in the study. The recruitment process used a non-probability, convenient sampling approach to select participants.

Data collection

During the period between May and August 2023, data was collected for the study using the HAIs-IPC learning experiences questionnaire, which was presented in Vietnamese. To identify eligible participants, the investigator created a list of nursing students from universities and provided them with information about the study's objectives and procedures. Those who agreed to participate in the study were asked to sign a consent form before they were given the questionnaire to complete at the end of the pilot stage.

Data analysis

The study employed SPSS 20.0 and AMOS 20.0 software for data analysis. Descriptive statistics, including mean, percentage, and standard deviation, were utilized to characterize the research variables. Confirmatory factor analysis (CFA) was performed using AMOS to assess the structural model, while Cronbach's alpha was utilized to gauge the dimensions' reliability.

Ethical considerations

The research was conducted with the approval of the Health Sciences Research Unit: Nursing 151 (UICISA: E) of the Nursing School of Coimbra (Portugal), with the reference number P761-3/2021. The Asian partner universities granted permission for data collection and all universities where the students were involved granted permission for the study to be conducted. The researcher informed the participants about the study's objectives, data collection procedures, and their rights to participation. It is important to note that the study was conducted without any physical interventions, and students were made aware of their right to withdraw from the study at any time without facing any negative consequences.

3. RESULTS

3.1. Descriptive statistics of research participants

Table 3.1 General information of the research participants (n = 430)

Characteristics		Frequency	Percentage
Age		19.6 ± 1.445 years old	
Gender	Male	97	22.6
	Female	33	77.4
Academic school year	1 st year	96	22.3
	2 nd year	232	54
	3 th year	100	23.3
	4 th year	2	0.4
University	U1	121	28.1
	U2	56	13.0
	U3	143	33.3
	U4	110	25.6

430 nursing students participated in the study. The average age of students was 19.6 ± 1.445 years old. Most of them were female students (77.4%). More than half of the students were 2nd year students (54%).

3.2. Psychometric property of the HAIs-IPC learning experiences questionnaire in Vietnamese

Table 3.2 Factor loading of the HAIs-IPC learning experiences questionnaire in Vietnamese

Items	Previous learning experiences in HAIs-IPC (PLE)	Learning experiences in HAIs-IPC when using the PrevInf Model (LEUP)
1. I oversee my development in the field.	.88	
2. My practice must be informed by the best available evidence in the field.	.86	
3. Peer learning is important to develop my skills and knowledge in the field	.86	
4. Critical thinking is an essential ability for my development in the field.	.80	
5. It is my responsibility to develop my competencies in this field.	.86	
6. Creativity plays a fundamental role in tackling challenges in this field	.9	
7. I explore different learning sources to develop my competencies in this field.	.97	
8. It is important to reflect on current practices to deliver quality care	.86	
9. I value the importance of evidence-informed practice in this field.	.86	

10. I adopt a proactive attitude and explore different opportunities to improve my competencies in this field.	.88	
11. My ability to innovate can lead to better care outcomes for patients in this field	.89	
12. My learning environment plays a fundamental role in the development of my competencies in the field		.88
13. I oversee my development in the field		.81
14. My practice must be informed by the best available evidence in the field		.88
15. Peer learning is important to develop my skills and knowledge in the field.		.90
16. Critical thinking is an essential ability for my development in the field		.95
17. It is my responsibility to develop my competencies in this field		.88
18. Creativity plays a fundamental role in tackling challenges in this field		.92
19. I must explore different learning sources to develop my own competencies in this field		.92
20. It is important to reflect on current practices to deliver quality care		.90
21. I value the importance of evidence-informed practice in this field.		.92
22. I must adopt a proactive attitude and explore different opportunities to improve my competencies in this field		.93

23. My ability to innovate can lead to better care outcomes for patients in this field.		.90
24. My learning environment plays a fundamental role in the development of my competencies in the field		.82

Table 3.2 indicated that all of the items were sorted into two groups of Previous learning experiences in HAIs-IPC and Learning experiences in HAIs-IPC when using PrevInf Model, in which item 12 in the Previous learning experiences in HAIs-IPC came into the Learning experiences in HAIs-IPC when using PrevInf Model in Vietnamese version. The observed variables in the table were very meaningful to be included in the model because the factor loading coefficient was higher than 0.5.

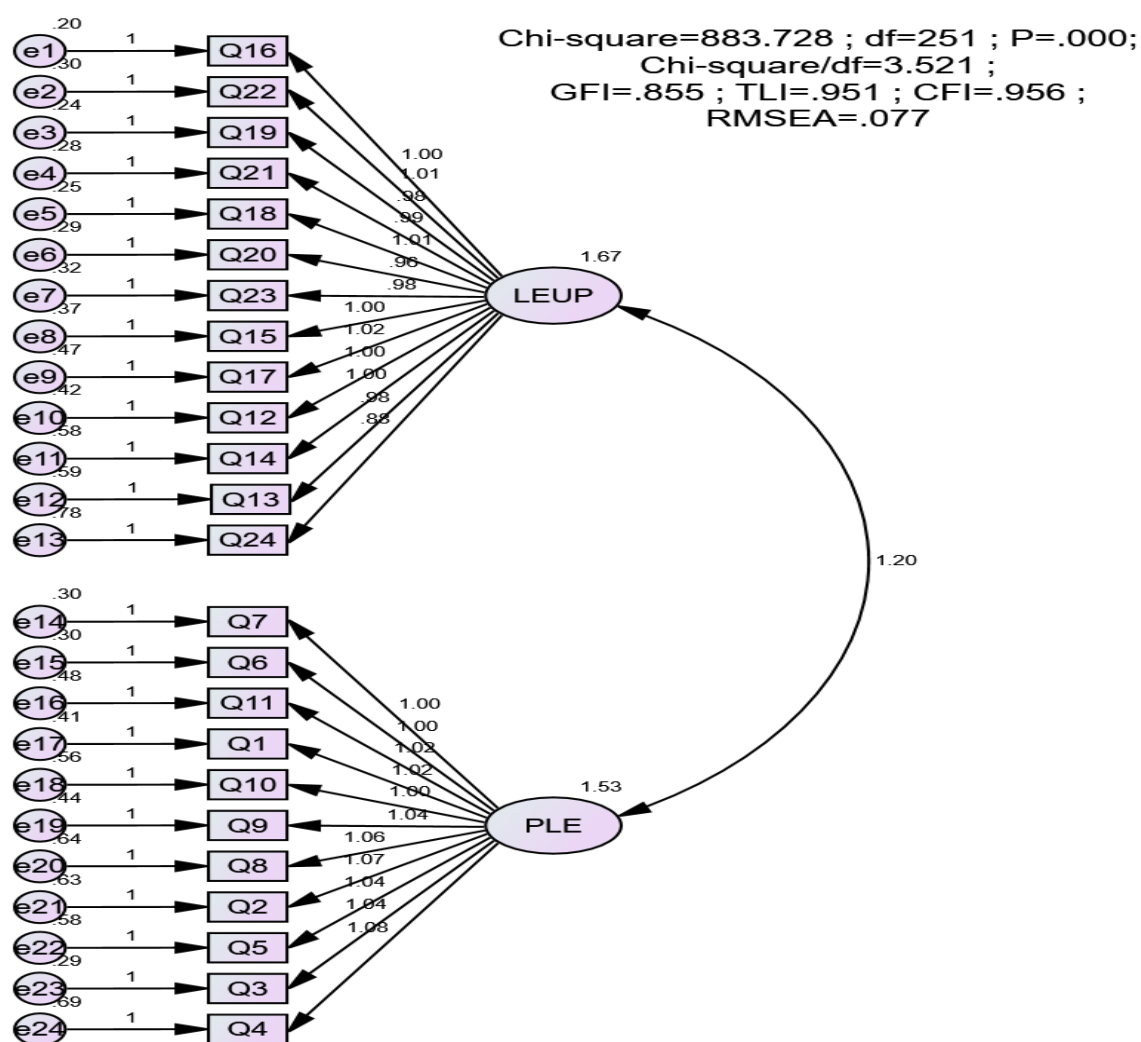


Figure 1- Model and Goodness of fit indexes obtained in Confirmatory Factor Analysis of the HAIs-IPC learning experiences Questionnaire in Vietnamese

The statistical significance was assumed at the 0.05 level. All subscales were integrated into the model as presented in Figure 1. The Model Fit indicated that $CMIN/DF = 3.521 < 5$ is acceptable; $GFI = .855 > .8$ is acceptable; $CFI = .956 > .95$ is very good; $RMSEA = .077 < .08$ is good. Therefore, the model achieved a good fit (Hair et.al, 2010)

Descriptive statistics of the HAIs-IPC learning experiences Questionnaire in Vietnamese

Table 1: Descriptive statistics of the HAIs-IPC learning experiences Questionnaire in Vietnamese (n = 430)

Subscales	Min	Max	Mean ± SD
Previous learning experiences in HAIs-IPC (PLE)	1	7	5.82 ± 1.29
Learning experiences in HAIs-IPC when using PrevInf Model (LEUP)	1	7	5.89 ± 1.29
Total	1	7	5.85 ± 1.20

The nursing students used substance abuse coping strategies at the lowest level (0.36 ± 0.69).

Table 2. Results of the reliability analysis performed for the dimensions of the HAIs-IPC learning experiences in Vietnamese (n = 430)

Subscales	Cronbach Alpha
Previous learning experiences in HAIs-IPC (PLE)	0.97
Learning experiences in HAIs-IPC when using PrevInf Model (LEUP)	0.98
Total	0.98

The Cronbach's Alpha reliability coefficient of the total questionnaire and two subscales were very good (greater than 0.9). As a result, the questionnaire demonstrated reliability, and the observed variables possessed significant explanatory value.

DISCUSSION

The results of participants’s characteristics indicated that a large number of nursing students participated in the study, with the majority being female students. In addition, more than half of the students were in their second year of study. These findings are in line with previous studies that have shown a higher percentage of female students in nursing programs (Fernandes et al., 2018). The age of the participants, which averaged 19.6 years, is also consistent with

previous research that has shown nursing students to be relatively young (Al Ghabeesh et al., 2019).

Construct validity of the HAIs-IPC learning experiences Questionnaire

This study produced a two-factor construct via factor loading that was the same as the original validated HAIs-IPC learning experiences Questionnaire (Pairreira et al, 2022). This can be explained by the original validated scale's cultural adaptation (Borsa, 2012). Thus, the two factors are the Previous learning experiences in HAIs-IPC (items 1-11) and the Learning experiences in HAIs-IPC when using PrevInf Model (items 12-24). The research team named the two factors based on the meanings of all items under it. The number of Items in the factors is inconsistent with the original study which has shown that the Previous learning experiences in HAIs-IPC (items 1-12) and the Learning experiences in HAIs-IPC when using the PrevInf Model (items 13-24) (Pairreira et al, 2022). This can be explained that the learning experiences are unstable and vary according to the stages of studies. The EFA generated 2 factors loading that varied from 0.57 to 0.97. All items remained and were included in the confirm factor analysis since they have factor loading higher than 0.5 (Hair, 2010).

The model's fit quality was assessed using several fit indicators. The model had a good CFI score of 0.956, and a good RMSEA of 0.077 while GFI and CMIN/DF were acceptable (Hair, 2010) suggesting a good fit model. Moreover, all items attained a satisfactory factor loading of more than 0.5. These indices showed that the two-factor model fit well in this study.

The relationship between the two-factor model (Figure 1) implied high correlations between LEUP and PLE ($r = 0.75$). It meant that there was a strong correlation between the two factors in the model. Specifically, there was a high correlation between Learning experiences in Healthcare-Associated Infections and Infection Prevention and Control (HAIs-IPC) when using the PrevInf model ($r = 0.75$). This suggests that the implementation of the PrevInf model led to a positive impact on the student's learning experiences in the field of HAIs-IPC. These findings are consistent with previous studies that simulation-based learning can enhance nursing students' learning experiences (Durham et al., 2018; Shinnick et al., 2015).

Reliability of the HAIs-IPC Learning Experiences Questionnaire

The high value of Cronbach's alpha reliability coefficient for the total questionnaire and the two subscales in this study indicates that the questionnaire was highly reliable in measuring nursing students' learning experiences in the field of HAIs-IPC. The high reliability of the questionnaire suggests that it was able to produce consistent and accurate results, making the study's findings valid and reliable. These findings are consistent with previous research that has used Cronbach's alpha to assess the reliability of questionnaires in healthcare settings (Sousa & Rojjanasrirat, 2011). The use of Cronbach's alpha as a measure of reliability is a well-established method in research, and its high value in this study indicates that the findings can be considered to be valid and reliable.

The use of CFA and Cronbach's alpha helped to ensure the validity and reliability of the data collected in this study. These statistical methods, along with the large sample size, provide a strong foundation for the study's conclusions. The high reliability of the questionnaire used in this

study suggests that it can be used effectively in future research to assess nursing students' learning experiences in the field of HAIs-IPC.

While the study provides valuable insights into nursing students' learning experiences in the field of HAIs-IPC, it is not without limitations. One of the limitations of the study is that it was conducted among nursing students from four healthcare universities only. Therefore, the findings may not be generalizable to other populations or settings. Another limitation of the study is that it utilized a non-probability, convenient sampling approach to select participants. It may have introduced bias into the sample, making it less representative of the population of nursing students as a whole. Additionally, the study relied solely on self-reported data from the participants, which may have led to social desirability bias. Participants may have provided responses that they believed were more socially acceptable, rather than their true opinions or experiences. Despite these limitations, the study provides valuable insights into nursing students' learning experiences in the field of HAIs-IPC and provides a foundation for future research in this area.

This questionnaire obtained adequate Cronbach's alpha values for the reliability of both the entire scale and its subscales. This demonstrated that all parts of the instrument measure the same concept. This data is supportive of the internal consistency reliability of the scale. These results are consistent with previous studies (Pairreira et al, 2022) in which all subscales achieved very good Cronbach's alpha.

The two factors of the HAIs-IPC learning experiences Questionnaire have strong psychometric properties. Researchers and healthcare professionals in Vietnam will find it helpful in examining the HAIs-IPC learning experiences among nursing students. This model will make it possible to implement further HAIs-IPC education in the future to improve students' HAIs-IPC competency using simulation pedagogy. Moreover, applying this scale can also be used as input to design future interventions appropriately for healthcare students and staff in improving their HAIs-IPC competency.

The study's use of CFA and Cronbach's alpha helped to ensure the validity and reliability of the data collected. Additionally, the large sample size provides a strong basis for the study's conclusions. The results of this study suggest that the implementation of the PrevInf model can have a positive impact on nursing students' learning experiences in the field of HAIs-IPC. Further research is needed to explore the efficacy of this model in other settings and among other populations.

Author Contributions: Conceptualization: J. Graveto, P. Parreira, J. Pardal, M. Silén-Lipponen and L. Koponen; Methodology: T.A. Truong, T.L.A. Mai, J. Graveto, P. Parreira, J. Pardal, M. Silén-Lipponen and L. Koponen; Software: T.A. Truong, T.L.A. Mai; Validation: T.A. Truong, T.L. Vu, T.M.T. Hoang, T.B.N. Pham, T.T.H. Nguyen, T.L.A. Mai, M. Silén-Lipponen, L. Koponen, T.T.H. Do, T.T.P. Pham, T.H. Nguyen, T.T. Dam, T.H. Do, N. Barom, N. Buntha, N. Manndy, Y Sokchhay, V. Phisith and C. Kry; Formal analysis: T.A. Truong, T.L. Vu, T.M.T. Hoang, T.T.H. Nguyen, T.L.A. Mai, T.T.C. Pham, M. Silén-Lipponen, L. Koponen, T.T.H. Do, T.T.P. Pham, T.H. Do, T.Q. Vu, N. Barom, N. Buntha, N. Manndy, Y Sokchhay and C. Kry; Investigation: T.A. Truong, T.L. Vu, T.M.T. Hoang, T.B.N. Pham, T.T.H. Nguyen, T.L.A. Mai,

V.C. Le, T.T.C. Pham, T.T.H. Do, T.T.P. Pham, T.H. Nguyen, T.T. Dam and T.H. Do, T.H. Vu, T.Q. Vu, S. Ojano, N. Barom, N. Buntha, N. Mannandy, Y Sokchhay, V. Phisith, C. Kry and T. Soksambat; Resources: J. Graveto, P. Parreira, J. Pardal; Writing original draft preparation: T.A. Truong, T.L.A. Mai, M. Silén-Lipponen and L. Koponen; Writing review and editing: T.A. Truong, T.L.A. Mai, J. Graveto, P. Parreira, A. Salgueiro-Oliveira, L. Lomba, P. Santos-Costa, F. Paiva-Santos, J. Pardal, M. Silén-Lipponen, L. Koponen, N. Barom and N. Mannandy; Visualization: M. Silén-Lipponen and L. Koponen; V.T. Vu, H.H. Ngo; Supervision: T.A. Truong, V.T. Vu, H.H. Ngo, T.L.A. Mai, J. Graveto, P. Parreira, A. Salgueiro-Oliveira, L. Lomba, P. Santos-Costa, F. Paiva-Santos, J. Pardal, M. Silén-Lipponen, L. Koponen, T.T.H. Do, T.X. Dinh, T.C.H. Pham, T.D.H. Dinh, S. Ojano, N. Barom and Y Sokchhay; Project administration: V.T. Vu, H.H. Ngo, T.L.A. Mai, J. Graveto, P. Parreira, A. Salgueiro-Oliveira, L. Lomba, P. Santos-Costa, F. Paiva-Santos, J. Pardal, T.X. Dinh, T.C.H. Pham, T.D.H. Dinh and V. Phisith. All authors have read and agreed to the published version of the manuscript.

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PrevInf Group:

Vu Van Thanh, Nam Dinh University of Nursing, Vietnam

Email: vuthanhdhdd@gmail.com

Orcid: 0009-0009-4531-8657

Ngo Huy Hoang, Nam Dinh University of Nursing, Vietnam

Email: ngohoang64@gmail.com

Orcid: 0000-0002-5895-3352

Mai Thi Lan Anh, Nam Dinh University of Nursing, Vietnam

Email: lananh@ndun.edu.vn

Orcid: 0000-0003-2487-7766

Vu Thi La, Nam Dinh University of Nursing, Vietnam

Email: vula_ynd@yahoo.com.vn

Orcid: 0009-0009-7635-6461

Hoang Thi Minh Thai, Nam Dinh University of Nursing, Vietnam

Email: hoangminhthai@ndun.edu.vn

Orcid: 0000-0002-5614-5124

Nguyen Thi Thanh Huong, Nam Dinh University of Nursing, Vietnam

Email: huong.ndun@gmail.com

Orcid: 0000-0002-6860-2521

Pham Thi Bich Ngoc, Nam Dinh University of Nursing, Vietnam

Email: phamngoc.ndun@gmail.com

Orcid: 0000-0003-2676-8854

Le Van Cuong, Nam Dinh University of Nursing, Vietnam

Email: levancuong2521991@gmail.com

Orcid: 0009-0007-7445-2631

Mai Thi Thanh Thu, Nam Dinh University of Nursing, Vietnam

Email: maithanhthu@ndun.edu.vn

Orcid: 0000-0002-9556-7688

Pham Thi Thuy Chinh, Nam Dinh University of Nursing, Vietnam

Email: thuychinh.pham85@gmail.com

Orcid: 0000-0003-2640-5578

Orcid: 0000-0001-6974-9421

Pedro Parreira, Escola Superior De Enfermagem De Coimbra, Portugal

Email: parreira@esenfc.pt

Orcid: 0000-0002-3880-6590

Anabela Salgueiro-Oliveira, Escola Superior De Enfermagem De Coimbra, Portugal

Email: anabela@esenfc.pt

Orcid: 0000-0002-8231-8279

Lurdes Lomba, Escola Superior De Enfermagem De Coimbra, Portugal

Email: mlomba@esenfc.pt

Orcid: 0000-0003-1505-5496

Paulo Santos-Costa, Escola Superior De Enfermagem De Coimbra, Portugal

Email: paulocosta@esenfc.pt

Orcid: 0000-0003-0761-6548

Filipe Paiva-Santos, Escola Superior De Enfermagem De Coimbra, Portugal

Email: filipesantos@esenfc.pt

Orcid: 0000-0003-0962-6635

João Pardal, Escola Superior De Enfermagem De Coimbra, Portugal

Email: jgrpardal@esenfc.pt

Orcid: 0000-0001-8162-4808

Marja Silén-Lipponen, Savonia University of Applied Sciences, Finland

Email: marja.silen-lipponen@savonia.fi

Orcid: 0000-0001-6452-2447

Leena Koponen, Savonia University of Applied Sciences, Finland

Email: leena.koponen@savonia.fi

Orcid: 0009-0004-0213-1263

Ulla Korhonen, Savonia University of Applied Sciences, Finland

Email: ulla.korhonen@savonia.fi

Mikko Myllymäki, Savonia University of Applied Sciences, Finland

Email: mikko.myllymaki@savonia.fi

Dinh Thi Xuyen, Hai Duong Medical Technical University, Vietnam

Email: xuyendt@hmtu.edu.vn

Orcid: 0000-0002-9001-5681

Do Thi Thu Hien, Hai Duong Medical Technical University, Vietnam

Email: dohienhmtu@gmail.com

Orcid: 0000-0002-9428-5099

Pham Thi Thanh Phuong, Hai Duong Medical Technical University, Vietnam

Email: phuonghmtu@gmail.com

Orcid: 0009-0008-9607-5862

Nguyen Thi Hue, Hai Duong Medical Technical University, Vietnam

Email: huenguyennguyen89@gmail.com

Orcid: 0009-0003-3063-7395

Vu Thi Hai, Hai Duong Medical Technical University, Vietnam

Email: vuthihai82@gmail.com

Orcid: 0009-0005-6367-9756

Dam Thi Thuy, Hai Duong Medical Technical University, Vietnam

Email: damthuy90@gmail.com

Orcid: 0000-0002-7456-7662

Dinh Thi Dieu Hang, Hai Duong Medical Technical University, Vietnam

Email: hangdtd@hmtu.edu.vn

Orcid: 0000-0002-4143-1419

Pham Thi Cam Hung, Hai Duong Medical Technical University, Vietnam

Email: phamcamhungal@hmtu.edu.vn

Orcid: 0000-0002-0712-6058

Do Thi Hue, Hai Duong Medical Technical University, Vietnam

Email: dothihuehmtu@gmail.com

Orcid: 0009-0008-5069-3024

Vu Thi Quyen, Hai Duong Medical Technical University, Vietnam

Email: quyenvt@hmtu.edu.vn

Orcid: 0009-0008-8886-938X

Nget Manndy, International University, Cambodia

Email: manndy.mn@gmail.com

Orcid: 0000-0002-5787-2585

Neth Barom, International University, Cambodia

Email: camnethbarom@gmail.com

Vouch Phisith, International University, Cambodia

Email: vouchphisith@gmail.com

Gnan Channoeun, International University, Cambodia

Email: channoeun_gnan@yahoo.com

Chhay Kry, International University, Cambodia

Email: chhaykry72@gmail.com

Y Sokchhay, International University, Cambodia

Email: y.sokchhay@gmail.com

Siv Sarin, Bolyno Institute, Cambodia

Email: siv_sarin@yahoo.com

Im Soresreyrath, Bolyno Institute, Cambodia

Email: imsoreysreyrath@gmail.com

Ouch Bory, Bolyno Institute, Cambodia

Email: ouchborydoctor@gmail.com

Sek Sophon, Bolyno Institute, Cambodia

Email: sophonsek.66@gmail.com

Mao Eam, Bolyno Institute, Cambodia

Email: meomeoxiaomao21@gmail.com

Vannarith Nhem, Bolyno Institute, Cambodia

Email: vannarithnhem@gmail.com

Song Chhiay, Bolyno Institute, Cambodia

Email: chhiay1970@gmail.com

Heng Socheat, Bolyno Institute, Cambodia

Email: hengsocheat007@gmail.com

Em Sovannarith, Bolyno Institute, Cambodia

Email: emsovannarith@gmail.com

Pao Panha, Bolyno Institute, Cambodia

Email: paopanha.show@gmail.com

João Graveto, Escola Superior De Enfermagem De Coimbra, Portugal

Email: jgraveto@esenfc.pt

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